DIMETHOMORPH (225)

The 1st draft was prepared by Mr. David Lunn New Zealand Food Safety Authority, Wellington, New Zealand

EXPLANATION

Dimethomorph, a cinnamic acid derivative, is a member of the morpholine group of fungicides and consists of a mixture of the E and Z isomers in approximately equal proportions. Its mode of action is through the disruption of fungal cell wall formation. When applied as a foliar spray, dimethomorph penetrates the leaf surface and is translocated within the leaf to provide protectant action against plant pathogenic Phytophthora species and a number of downy mildew diseases of fruit, vegetables and potatoes.

Residue and analytical aspects of dimethomorph were considered for the first time by the present meeting. The manufacturer submitted studies on metabolism, analytical methods, supervised field trials, processing, freezer storage stability, environmental fate in soil and rotational crop residues. Information on GAP was also provided by Australia.

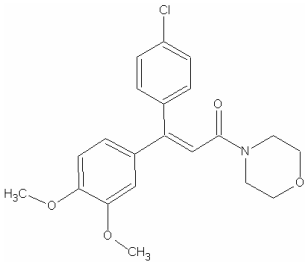
IDENTITY

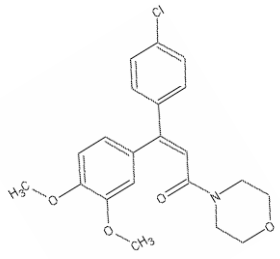
ISO common name:	Dimethomorph	
Synonyms or code numbers	AC	336379
	CL	336379
	CME	151
	AG	151
	L	127294
	BAS 550 F	
IUPAC name:	(E,Z) 4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)acryloyl]morpholine	
CA name:	(E,Z) 4-[3-(4-chlorophenyl)-3-(3,4-dimethoxy-phenyl)-1-oxo-2-propenyl]-morpholine	
CAS number	110488-70-5	
	E isomer	113210-97-2
	Z isomer	113210-98-3
CIPAC number	483	
Molecular mass:	387.9 g/mol	

ISO common name: Dimethomorph

Molecular formula C21H22ClNO4

Structural formula: E isomer Z isomer





PHYSICAL AND CHEMICAL PROPERTIES

Pure active ingredient (%purity)

Characteristic	Value		Reference
Colour, odour and physical state	49/51 E/Z mixture (98.8%), White crystalline odourless solid at room temperature		Cevasco, 1999 [Ref: DK-301-007]
Melting point	48/52 E/Z mixture (99.1%)	125.2 - 149.2 °C	Allman & Henke, 1989 [Ref: DK-303-001]
	E isomer (98.9-99.6%)	136.8 - 139.4 °C	Daum A., 2002 [Ref: 2002/1008775]
	Z isomer (96.3-98.7%)	166.3 - 171.1 °C	[Ref: 2002/1008776]
Boiling point	Not applicable		
Temperature of decomposition	Start of decomposition (colour change):		Daum, 2002
	E-isomer (98.9%)	about 270°C	[Ref: 2002/1008775]
	Z-isomer (96.3%)	about 280°C	[Ref: 2002/1008776]

Characteristic	Value	Reference
Relative density	48/52 E/Z mixture (99.1%) 1.318 g/cm^3 at 20 °C	Allman & Henke, 1989 [Ref: DK-308-001]
Vapour pressure	48/52 E/Z mixture (99.1%) at 20 °C E-isomer 9.7 x 10^{-7} Pa Z isomer 1.0 x 10^{-6} Pa	Rech & Henke, 1989 [Ref: DK-306-004]
Solubility in water	44/56 E/Z mixture (97.6%) at 20 °C Deionized water 0.06 g/litre pH 4 0.08 g/litre pH 7 0.05 g/litre pH 9 0.04 g/litre E isomer (98.9%) Deionised water 0.05 g/litre Z isomer (96.3%) Deionised water 0.01 g/litre	Akkari, 2002 [Ref: DK-311-007] Akkari, 2002 [Ref: DK-311-006]
Solubility in organic solvents	48/52 E/Z mixture (99.1%) at 20 °C: Solvent E isomer Z isomer Total n-Hexane 0.076 0.036 0.112 g/litre Methanol: 31.5 7.5 39 g/litre Toluene: 39.0 10.5 49.5 g/litre Ethyl acetate: 39.9 8.4 48.3 g/litre Acetone : 84.1 16.3 100.4 g/litre Dichloromethane: 296 165 461 g/litre 44/56 E/Z mixture (97.6%) at 20 °C: Solvent E isomer Z isomer Total n-Heptane: 0.12 0.053 0.173 g/litre Xylene: 22.2 6.4 28.6 g/litre Methanol 33.7 7.4 41.1 g/litre Ethyl acetate: 46.6 9.5 56.1g/litre Acetone: 105.6 18 123.7 g/litre 1,2-dichloroethane 182.5 92.5 275.1 g/litre	Grimm & Henke, 1989 [Ref: DK-312-001] Werle, 1999 [Ref: DK-312-003]
Dissociation constant	Calculated pKa -1.305	Martin, 2002 [Ref: DK-390-059]
Henry's law constant	Approx 50/50 E/Z mixture at 20 °C: E isomer 5.4 x 10^{-6} Pa m^3/mol Z isomer 2.5 x 10^{-5} Pa m^3/mol	Martin, 2002 [Ref: DK-390-060]
Partition coefficient (n-octanol/water)	E/Z mixture (99.1%) at 20 ± 1 °C: E isomer log Pow 2.63 Z isomer log Pow 2.73	Rech & Henke, 1989 [Ref: DK-315-001]

Characteristic	Value	Reference
Hydrolysis rate	50/50 E/Z mixture (99.2%) After 10 weeks incubation at 70 °C and pH 4, pH 7 and pH 9, max 6.1% degradation to polar (unidentified) residues. Gradual shift in E:Z isomer ratio from 60:40 to 52:48 after 10 weeks. After 10 weeks incubation at 90°C and pH 4, no degradation or polar residues observed	Ochsenbein, 1989 [Ref: DK-322-003]
Photochemical degradation	50/50 ^{14}C labeled E/Z mixture (99.2%): Estimated DT_{50} of 25 – 28 days under continuous illumination at pH 5 and 20°C. Five minor (uncharacterised) photolytic degradation products measured, all < 7% applied radioactivity. The E:Z isomer ratio shifted from 47:53 to 24:76 within 1 day with little further movement.	Van Dijk, 1990 [Ref: DK-630-001]
	^{14}C labeled 45/55 E/Z mixture (> 98%): Extrapolated DT_{50} values of 107 days (chlorophenyl label) and 86 days (morpholine label) under continuous irradiation at pH 5 and 20-23 ºC. Minor (uncharacterised) photolytic degradation products measured, all < 6% applied radioactivity. The E:Z isomer ratio shifted from 45:55 to about 20:80 within 4 days with little further movement.	Panek et al., 2001 [Ref: DK-324-006]
	44/56 E/Z mixture (97.6%): Calculated mean DT_{50} of 12.6 days under continuous irradiation at pH 7 and 20 ± 2 °C and a mean quantum yield , Φ, of 6.71 x 10^{-6}.	Knoch & Holman, 1998 [Ref: DK-324-004]

FORMULATIONS

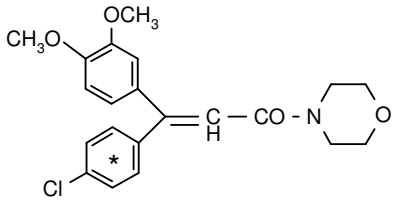
Dimethomorph formulations available include wettable powders, water soluble granules, suspension concentrates and a dispersible concentrate. In many cases, dimethomorph is co-formulated with other fungicides such as mancozeb, folpet, dithianon, copper or chlorothalonil to facilitate disease resistance management.

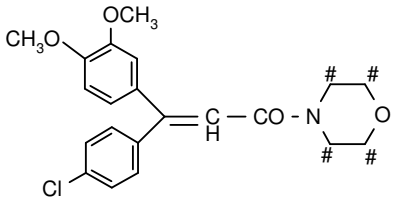
Formulation type	Active ingredient	Trade Name
Suspension concentrates (SC)	500 g/litre dimethomorph	Forum SC
	100 g/litre dimethomorph + 500 g/litre chlorothalonil	Forum Plus, Acrobat CT 60 SC
Wettable powders (WP)	500 g/kg dimethomorph	Forum, Forum 500 WP, Acrobat DF
	90 g/kg dimethomorph + 600 g/kg mancozeb	Acrobat, Acrobat MZ, Acrobat MZ 69 WP
	75 g/kg dimethomorph + 667 g/kg mancozeb	Acrobat MZ
	60 g/kg dimethomorph + 400 g/kg dithianon	Forum 6/40 WP
Water dispersible granule (WG)	90 g/kg dimethomorph + 600 g/kg mancozeb	Acrobat Plus WG, Acrobat MDG, Forum MZ
	75 g/kg dimethomorph + 667 g/kg mancozeb	Acrobat, Acrobat Extra, Invader
	113 g/kg dimethomorph + 600 g/kg folpet	Pantheos, Forum Star

Formulation type	Active ingredient	Trade Name
	150 g/kg dimethomorph + 350 g/kg dithianon	Forum DTI, Forum Gold
	60 g/kg dimethomorph + 400 g/kg dithianon	Acrobat R, Acrobat Co, Forum R, Forum R Blu, Forum 6/40 WP
Dispersible concentrate (DC)	150 g/litre dimethomorph	Forum, Forum 15 DC

METABOLISM

Radiolabelled dimethomorph was used in plant and animal metabolism studies and in two rotational crop studies. In the animal metabolism studies, rotational crop studies and in four of the five plant metabolism studies, the phenyl ring was uniformly labelled with ^{14}C. In one potato metabolism study, the morpholine ring was labelled with ^{14}C.



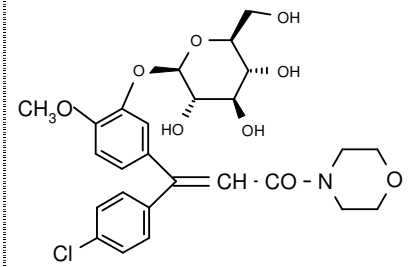
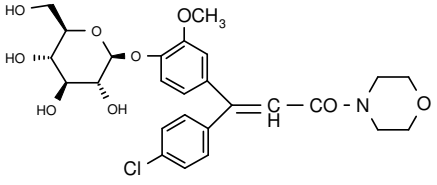
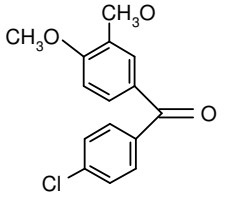


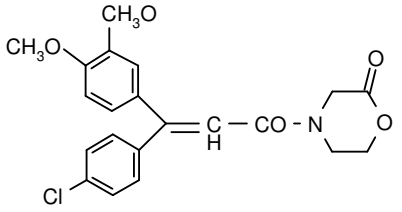
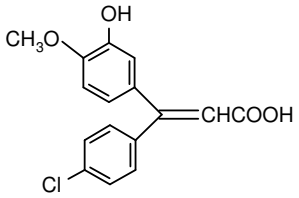
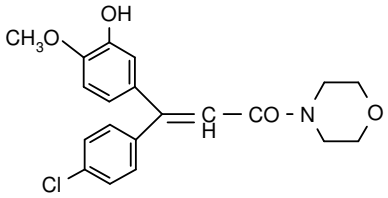
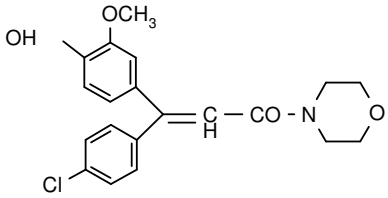
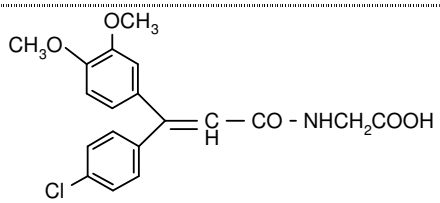
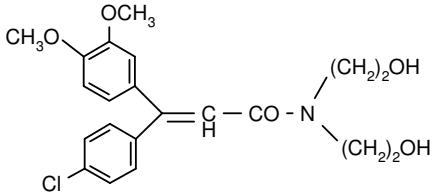
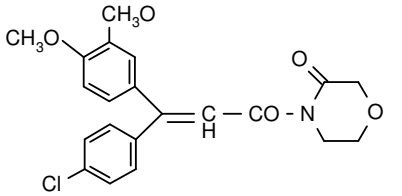
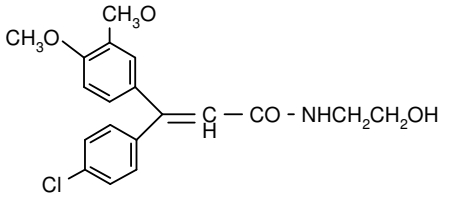
* denotes uniformly labelled ^{14}C-chlorophenyl ring # denotes ^{14}C-morpholine ring label

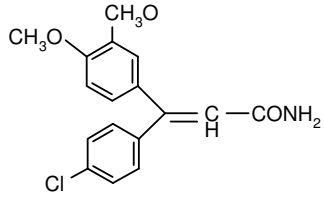
Figure 1. Positions of ^{14}C in metabolism studies

In most studies, radioactivity was determined by liquid scintillation and combustion analysis with identification by thin layer chromatography and HPLC-UV and confirmed by HPLC-MS or GC-MS.

Structures, names and codes for metabolites reported in the plant and animal metabolism studies are summarised below.

CL 199322 (beta-D-glucopyranoside) 5-[(1Z)-1-(4-chlorophenyl)-3-(4-morpholinyl)-3-oxo-1-propenyl]-2-methoxyphenyl	
CL411266 (beta-D-glucopyranoside) 4-[(1Z)-1-(4-chlorophenyl)-3-(4-morpholinyl)-3-oxo-1-propenyl]-2-methoxyphenyl	
Z7 (CL 1336305) 4-Chloro-3',4'-dimethoxy-benzophenone	

Z37 (CL 153868) 4-[3-(4-chlorophenyl)-3-3,4-dimethoxy-phenyl)-1-oxo-2-propenyl]-2-oxo-morpholine	
Z43 3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)-propenoic acid	
Z67 (CL 900987) 4-[(E) -and (Z)-beta-(p-Chlorophenyl)-3-hydroxy-4-methoxycinnamoyl]morpholine or (E/Z)-4-(3-(4-Chlorophenyl)-3-(3'-methoxy-4'-hydroxyphenyl)-1-oxo-2-prophenyl)-morpholine	
Z69 (CL 900986) 4-[(E) -and (Z)-beta-(p-Chlorophenyl)-4-hydroxy-3-methoxycinnamoyl]morpholine or (E/Z)-4-(3-(4-Chlorophenyl)-3-(3'-hydroxy-4'-methoxyphenyl)1-oxo-2-prophenyl)-morpholine	
Z89 (CUR 7117) N-[3-(4-chlorophenyl)-3-3,4-dimethoxyphenyl)-1-oxo-2-propenyl-glycine	
Z93 (CL 901423, WL 376084) 3-(4-chlorophenyl)-3-(3,4-dimethoxy-phenyl)-N,N-bis-(2-hydroxyethyl) acrylamide	
Z94 (CUR 7586) 4-[3-(4-chlorophenyl)-3-3,4-dimethoxyphenyl)-1-oxo-2-propenyl]-3-oxo-morpholine	
Z95 (CL 153827, CUR 7216) N-[3-(4-chlorophenyl)-3-3,4-dimethoxyphenyl)-1-oxo-2-propenyl-ethanolamine	

Z98 (CL 153815) 3-(4-chlorophenyl)-3-(3,4-dimethoxy-phenyl)-acrylamide	

Animal metabolism

The Meeting received animal metabolism studies on rats, lactating goats and laying hens, following oral dosing with [p-chlorophenyl-U-^{14}C]-dimethomorph.

Rats

The metabolism of dimethomorph in rats was evaluated by the WHO Core Assessment Group of the 2007 JMPR, where it was concluded that after oral gavage with single doses of 10 or 500 mg/kg bw per day to male and female rats, the low dose was quantitatively absorbed and excreted to more than 90% via bile and to 7% via urine in both sexes. At 500 mg/kg bw per day, absorption was decreased to 65% in males and to 40% in females. Pre-treatment of the animals with non-labeled dimethomorph at the low dose did not influence the excretion pattern. At 10 mg/kg bw per day, the radioactivity reached a maximum within 1.4 – 2.8 h and excretion was virtually complete after 48 h. Less than 1% of dose was found in carcass and in liver and less or equal to 0.2% of dose in kidneys and plasma. In all other organs, radioactivity was no longer quantifiable. At 500 mg/kg bw per day, some delay in depletion from organs was observed since radioactivity as percentage of dose was approximately 3 fold greater when compared to the 10 mg/kg bw group. After 168 h the pattern of distribution was the same as at the low dose at 24 h with the exception of very low radioactivity in the gastrointestinal tract. Dimethomorph is extensively metabolized by demethylation of one of the methoxy groups and formation of O-conjugate and degradation products of morpholine ring opening were found.

Lactating goats

A metabolism study was conducted on two lactating goats, with each goat receiving oral doses of 0.55 mg ^{14}C-dimethomorph/kg body weight (target dose of 1.1 mg/kg bw per day, equivalent to about 25 ppm in the diet) after each morning and afternoon milking for 7 days and after the morning milking on day-8 (4 h before sacrifice). The results of this study have been reported by Van Dijk, 1990 [Ref: DK-440-005] and Van Dijk, 1991 [Ref: DK-440-008].

The majority of the administered radioactivity (TRR) was present in the excreta, with 70 – 74% found in the faeces and 14 – 16% present in the urine. The radioactivity level in milk reached a level of about 0.05 mg/kg after the 3rd administration (day 2) (Table 1), with residues increasing slowly to about 0.1 mg/kg at the time of sacrifice. After fractionation of the milk, about 80% of the TRR was found in the whey (0.08 – 0.09 mg/kg) with lower levels being measured in milk fat (0.014 – 0.015 mg/kg) and in the protein pellet (0.004 – 0.005 mg/kg). Together with residual radioactivity in cage wash, organs, tissues and blood, the total recovery at sacrifice amounted to 88 – 92% of the TRR.

At sacrifice, 0.1 – 0.2% of the TRR was detected in the muscle, fat and kidney with higher levels being found in liver (1.5% and 1.9% TRR in the two goats).

Table 1. Distribution of ^{14}C residue in lactating goats dosed orally for 8 days with 1.0 mg/kg bw/day ^{14}C-[chlorophenyl]-dimethomorph (25 ppm equivalent in feed)

Matrix	Goat 1		Goat 2	
	mg/kg equivalent	%TRR	mg/kg equivalent	%TRR
Milk – day 1 am	0.002		0.002	
Milk – day 1 pm	0.02		0.012	
Milk – day 2 am	0.043		0.045	
Milk – day 2 pm	0.045		0.078	
Milk – day 3 am	0.038		0.045	
Milk – day 3 pm	0.045		0.077	
Milk – day 4 am	0.039		0.054	
Milk – day 4 pm	0.069		0.032	
Milk – day 5 am	0.065		0.045	
Milk – day 5 pm	0.083		0.033	
Milk – day 6 am	0.067		0.051	
Milk – day 6 pm	0.104		0.08	
Milk – day 7 am	0.069		0.028	
Milk – day 7 pm	0.046		0.09	
Milk – day 8 am	0.05		0.052	
Milk – day 8 pm	0.10		0.11	
Kidney	0.289	< 0.1	0.270	< 0.1
Liver	7.718	1.9	6.550	1.5
Heart	0.073	< 0.1	0.050	< 0.1
Muscle	0.032	0.2 [a]	0.022	0.1 [a/]
Fat	0.088	0.1 [a]	0.057	0.1 [a/]
Blood	0.066	0.1 [a]	0.066	0.1 [a/]
Bile	16.289	< 0.1	9.204	0.2

Milk: Combined results from the morning and evening milking just before dosing, except for day 1 (evening milk only) and day 8 (just before the morning dose and at sacrifice). Background level was 0.002 mg/kg equivalents

a - Calculated on the assumption of 40% bodyweight being muscle, 12% being fat and 8% being blood

In milk, the major identified residue was the polar Z89 metabolite, measured at 0.047 – 0.052 mg/kg (about 48% TRR) with a further five unidentified metabolite fractions being present at concentrations below 0.015 mg/kg.

In kidney, besides the parent compound (0.019-0.034 mg/kg or 6.8 – 12% TRR), residues of the Z67 and Z93 metabolites were found at levels averaging 0.033 mg/kg and 0.019 mg/kg respectively, with six unidentified metabolites also present at levels ranging from 0.012 – 0.045 mg/kg. In liver, the main component was the unchanged parent, present at 4.5 – 5.8 mg/kg (63 – 81% TRR) with other identified metabolites being Z67 (0.14 – 0.42 mg/kg, 1.9 – 5.9%TRR) and Z69 (0.12 – 0.33 mg/kg, 1.6 – 4.6% TRR). Four unidentified minor metabolites were detected at about 0.05 – 0.3 mg/kg.

In muscle, low levels of the parent compound (0.002 – 0.015 mg/kg, about 7.5% TRR) were detected, with five unidentified metabolite fractions also being measured at < 0.015 mg/kg. In fat, besides two unknown metabolite fractions (0.003 – 0.006 mg/kg), the parent compound was the main component, accounting for 0.045 – 0.065 mg/kg (62 – 89% TRR). The results are summarised in Table 2.

Table 2. Identification of ^{14}C residues in tissues and milk of two lactating goats dosed orally for 8 days with 1.0 mg/kg bw/day [^{14}C-chlorophenyl]-dimethomorph (25 ppm equivalent in feed)

Component	Concentration, mg/kg, expressed as parent equivalents				
	Milk	Muscle	Fat	Liver	Kidney
Dimethomorph	nd	0.002	0.055	5.14	0.027
Z67	nd	nd	nd	0.28	0.033
Z69	nd	nd	nd	0.22	nd
Z93	nd	nd	nd	nd	0.019
Z89	0.05	nd	nd	nd	nd
Unidentified metabolites (number)	0.03 (5)	0.018 (5)	0.009 (2)	0.47 (4)	0.15 (6)
Not extracted	0.02	0.003	0.004	0.8	0.02
Total ^{14}C residues (TRR)	0.1	0.027	0.073	7.13	0.28

Residues are mean values from two goats

nd = Not Detected

In general, about 90% of the administered dose was excreted in faeces and urine and radioactivity in the edible organs and tissues was readily and almost completely extracted, indicating that dimethomorph or its metabolites were not bound in the organs and tissues. The major component of the extractable residue in liver, muscle and fat was the unchanged parent, with dimethomorph and the Z67 metabolite being the predominant residues identified in kidney. The Z67 metabolite was also found in liver, as was the Z69 metabolite, both at relatively low levels. Low levels of the Z93 metabolite were found in kidney and the only residue identified in milk was the Z89 metabolite.

The proposed metabolic pathway for dimethomorph in the lactating goat is similar to that proposed for rats, and involves the demethylation of one of the phenolic methoxy-groups, with an alternative pathway being the cleavage of the morpholine-ring.

Laying hens

In a study reported by Van Dijk[1990, DK-440-003 and 1991, DK-440-007] three groups of 6 - 9 hens received two oral doses per day (each being 1.0 mg/kg bw), equivalent to 40 ppm in the feed) for seven consecutive days, with a final dose on the morning of day 8 (a total of 15 doses). Hens in the three groups were sacrificed 8 hours (Group 1), 7 days (Group 2) and 12 days (Group 3) after the last administration.

Most of the administered radioactivity was recovered in the excreta (84.8%) and the cage wash (2.9%). About 0.4% of the ^{14}C remained in organs and tissues of hens sacrificed 8 hours after the last of 15 doses and < 0.1% of the dose remained in eggs. The material balance after dosing with ^{14}C-dimethomorph with the chlorophenyl radiolabel accounted for 88.2% of the administered dose.

In whites of eggs, ^{14}C residues were low, reaching a maximum of 0.056 mg/kg after 4 days, while in yolks, highest residues (0.49 mg/kg) were found one day after the last administration (Table 3). At the end of the depuration period (12 days) the radioactivity levels had decreased to about the background levels of 0.011 mg/kg (egg whites) and 0.017 mg/kg (yolks).

In the edible organs and tissues (Table 4.), namely heart, gizzard, fat and skin, low concentrations of residual radioactivity levels (0.054 – 0.075 mg/kg) were found. The highest ^{14}C residue was observed in liver (1.06 mg/kg) with lower levels in kidney (0.31 mg/kg) and muscle (0.016 mg/kg).

Table 3. Mean residues of ^{14}C residue in pooled whites and yolks of eggs from laying hens dosed orally for 8 days with 1.96 mg/kg bw/day of ^{14}C-[chlorophenyl]-dimethomorph (40 ppm equivalent in feed).

Component	TRR (mg/kg)			
	Egg Yolks		Egg Whites	
	am	pm	am	pm
Day 1	0.018	-	0.011	-
Day 2	0.025	0.027	0.025	0.033
Day 3	0.076	0.13	0.022	0.034
Day 4	0.16	0.3	0.021	0.056
Day 5	0.23	-	0.028	-
Day 6	0.33	-	0.027	-
Day 7	0.4	0.51	0.032	0.029
Day 8	0.47	0.38	0.024	0.02
Day 8+0	0.43		0.024	
Day 8+1	0.49		0.022	
Day 8+2	0.47		0.014	
Day 8+3	0.41		0.013	
Day 8+4	0.34		0.011	
Day 8+5	0.27		0.013	
Day 8+6	0.19		0.012	
Day 8+7	0.12		0.012	
Day 8+8	0.069		0.013	
Day 8+9	0.045		0.013	
Day 8+10	0.03		0.012	
Day 8+11	0.024		0.01	
Day 8+12	0.023		0.011	

TRR values for eggs are average residues in pooled eggs from each day, not corrected for background radioactivity (0.011 mg/kg – egg whites, 0.017 mg/kg – egg yolks)

Table 4. Distribution of ^{14}C residue in laying hens dosed orally for 8 days with 1.96 mg/kg bw/day of ^{14}C-[chlorophenyl]-dimethomorph (40 ppm equivalent in feed).

Component	TRR	Extractable residue		Non-extractable residue		%Recovery
	mg/kg	mg/kg	%TRR	mg/kg	%TRR	
Egg Yolks	0.38	0.177[a]	46.5	0.204	53.5	96.9
Egg Whites	0.011	0.009	81.7	0.002	18.3	
Plasma	0.158	0.117	73.9	0.041	26.1	100.0
Liver	1.051	0.717	78.0	0.334	36.3	78.0
Kidney	0.301	0.235	88.4	0.066	24.6	88.4
Muscle	0.016	0.014	105.4	0.002	15.6	90.3
Heart	0.049	0.036	79.9	0.013	29.8	78.3
Gizzard	0.038	0.034	96.0	0.004	12.7	85.7
Skin	0.037	0.032	91.6	0.005	14.3	87.4
Fat	0.037	0.035	97.8	0.002	7.0	97.8

Results corrected for background radioactivity (0.009 mg/kg – kidney & muscle, 0.013 mg/kg – liver, 0.016 mg/kg – gizzard & plasma, 0.022 mg/kg – fat, 0.023 mg/kg – fat and 0.026 mg/kg – heart, 0.011 mg/kg – egg whites, 0.017 mg/kg – egg yolks)

a - Extractability of protein-free fraction

Dimethomorph, the parent compound (Table 5), was not found in any edible tissues except fat and skin, where residues were 0.017 mg/kg and 0.01 mg/kg respectively.

In muscle, low levels (0.002-0.003 mg/kg) of the Z69/Z67 and Z93 metabolites were measured, while in liver the Z69/Z67 metabolites were the only identified metabolites found (0.132 mg/kg). In kidney, the major metabolite fraction was Z67/Z69 and accounted for 0.032 mg/kg with minor levels of Z43 (0.015 mg/kg) also being detected. In both liver and kidney, 10 – 11 unidentified metabolites were also measured, but at low levels, not exceeding 8 – 9% TRR (max 0.07 mg/kg in liver and max 0.02 mg/kg in kidney).

In egg yolks, the major metabolite fraction Z67/Z69 accounted for 0.07 mg/kg. Metabolite fractions Z43 (0.045 mg/kg), Z95 (0.038 mg/kg) and Z93 (0.018 mg/kg) were also detected, with a further three minor or unidentified metabolites being measured at 0.009 – 0.016 mg/kg.

Table 5. Identification of ^{14}C residues in tissues and eggs of laying hens dosed orally for 8 days with 1.96 mg/kg bw/day [^{14}C-chlorophenyl]-dimethomorph (40 ppm equivalent in feed)

Component	Concentration, mg/kg, expressed as parent equivalents					
	Egg yolks	Liver	Kidney	Muscle	Fat	Skin
Dimethomorph	nd	nd	nd	nd	0.017	0.01
Z67 Z69	0.07	0.13	0.032	0.003	nd	nd
Z93	0.018	nd	nd	0.002	nd	nd
Z95	0.038	nd	nd	nd	nd	nd
Z43	0.045	nd	0.018	nd	nd	nd
Unidentified metabolites (number)	0.037 (3)	0.41 (11)	0.1 (10)	0.004 (2)	0.014 (3)	0.021 (3)
Total ^{14}C residues (TRR)	0.21	0.55	0.15	0.009	0.031	0.031

nd = Not Detected

In general, dimethomorph is rapidly eliminated in hens, with about 0.4% of the applied radio-label remaining in tissues eight hours after the end of the dosing period. Highest ^{14}C residues were found in liver (approx 1.0 mg/kg) and in kidney (0.3 mg/kg). In eggs, ^{14}C residues did not exceed 0.05 mg/kg in egg whites and while residues in yolks increased during the 8 day dosing period (up to 0.5 mg/kg), radioactive residues at the end of the 12-day depuration period were close to the background level.

Residues of the parent compound were only found in fat and skin (0.01 – 0.017 mg/kg), with the most common metabolites being Z67/Z69 (up to 0.13 mg/kg in liver), indicating that the primary metabolic pathway is by demethylation of one of the phenolic methoxy groups. The occurrence of metabolites Z93 (yolks, muscle), Z95 (yolks) and Z43 (yolks, kidney) at relatively low levels suggests that dimethomorph can also be metabolized via morpholine-ring cleavage. These pathways, shown in Figure 2, are similar to those proposed for rats and lactating goats.

Metabolic Pathway of dimethomorph in Goat (G), Rat (R) and Hen (H)

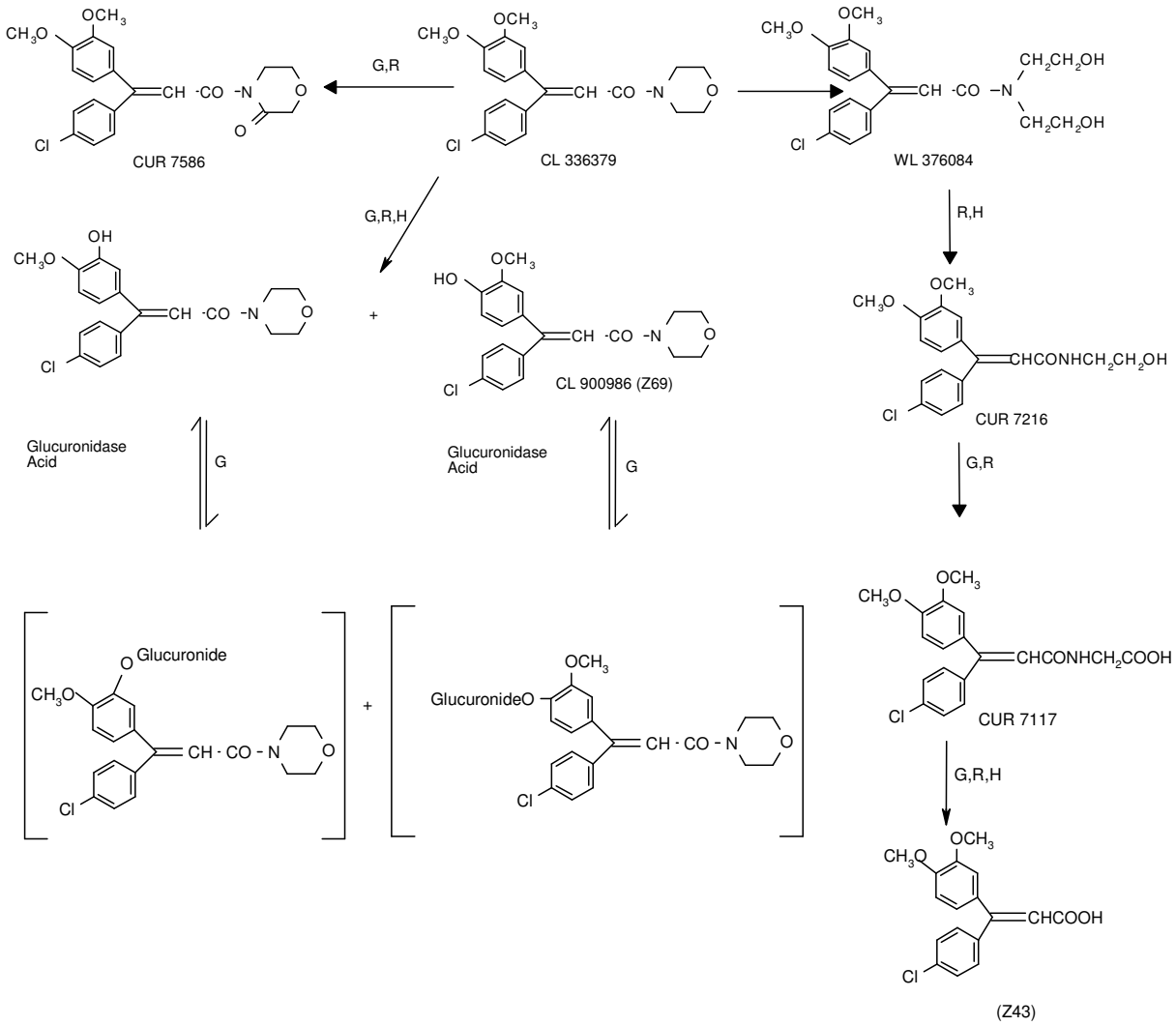


Figure 2. Metabolic pathway of ^{14}C-dimethomorph in rats, goats and laying hens

Plant metabolism

The Meeting received plant metabolism studies on grapes, potato, lettuce and tomato, following treatment with either an EC or a DC formulation of [p-chlorophenyl-U-^{14}C]-dimethomorph and on potato following treatment with an EC formulation of [morpholine-U-^{14}C] dimethomorph.

Grapes

In a study reported by Schlüter, 1990 [DK 640-005 and DK 640-010], ^{14}C-dimethomorph formulated as a 10% EC was applied by syringe to selected grapes and grape leaves (both surfaces) at a concentration of 0.09 kg ai/hL (equivalent to 0.9 kg ai/ha) with four applications being made at 9 – 10 day intervals up to 35 days before harvest. Grapes and leaves were sampled after each individual treatment and stored at < -18 ^{o}C for up to 5 weeks before extraction and analysis. Surface residues were removed in acetone, after which the samples were homogenised and the remaining residues extracted first in acetone and then in methanol.

In treated grapes, 100% of the applied radioactivity was recovered (Table 6), 72.5% of which was found in the surface wash, while in treated leaves 70 – 76% of the applied radioactivity was

recovered, 95% of which was present in the surface wash. Untreated grapes and leaves close to the treated leaves contained only low levels of radioactivity (< 0.03 mg/kg dimethomorph equivalents) mostly as surface residues, indicating negligible systemic movement from treated leaves. Total recovery rates were 100 – 102% and only 2 – 3% of the applied ^{14}C was not extractable with acetone or methanol.

Table 6. Distribution of ^{14}C residues in grapes and grape leaves 35 days after 4 applications of ^{14}C-[chlorophenyl]-dimethomorph at a concentration equivalent to 0.09 kg ai/hL

Component	Treated Grapes	Untreated Grapes	Treated Leaves
TRR (mg/kg)	14.6	0.026	90.1
%TRR in surface wash	72.5	95.2	95
%TRR in homogenate	25.7	-	2
%TRR extracted	98.2	95.2	97
%TRR non extractable	1.8	4.2	3.1

Surface residues extracted in acetone, homogenate residues extracted in acetone then methanol

The majority of the extractable residue was identified (Table 7) as unchanged parent, dimethomorph, which accounted for 86.3% (equivalent to12.6 mg/kg) and 82.9% (equivalent to 74.8 mg/kg) of the TRR in grapes and leaves, respectively. In treated leaves, a trace amount of the metabolite Z7 was found (1.6% TRR or 1.44 mg/kg). The remaining fractions (grapes: 11.9%, 1.74 mg/kg; leaves: 14%, 12.6 mg/kg) were not characterized.

Table 7. Identification of ^{14}C residues in grapes and grape leaves 35 days after 4 applications of ^{14}C-[chlorophenyl]-dimethomorph at a concentration equivalent to 0.09 kg ai/hL

Component	Concentration & %TRR					
	Treated Grapes		Untreated Grapes		Treated Leaves	
	mg/kg	%TRR	mg/kg	%TRR	mg/kg	(% TRR)
Dimethomorph	12.6	86.3	0.013	48.8	74.7	82.9
Metabolite Z7	nd	-	nd	-	1.44	1.6
Metabolite Fraction 1 [a]	0.84	5.8	0.004	16.7	7.75	8.6
Metabolite Fraction 2 [a]	0.70	4.7	0.005	20.8	1.08	1.2
Acetone extract (leaves)	-	-	-	-	1.8	2.0
Others	0.2	1.4	0.002	9.5	0.54	0.6
Total	14.6	98.2	0.026	95.8	90.1	96.9

a - One dimensional TLC using pre-coated silica gel plates and acetonitrile, ethyl acetate and chloroform/acetone 9:1 solvent systems.

Potato

In a study reported by Thiele, 1990 [DK 640-004 and DK 640-009], ^{14}C-dimethomorph formulated as a 10% EC was applied to greenhouse potato plants at a concentration of 0.06 kg ai/hL (equivalent to 0.6 kg ai/ha) with four applications (40 ml/plant) being made at 10 day intervals up to 7 days before harvest. Stems, leaves and tubers were sampled at harvest time and stored at < -18 ^{o}C for up to 5 weeks before extraction and analysis. Surface residues were removed in acetone, after which the samples were homogenised and the remaining residues extracted in methanol.

At harvest, 41.7% (23.5 mg/kg dimethomorph equivalents) of the applied ^{14}C was recovered from the treated foliage. Small amounts of radioactivity were measured in tubers from treated plants (0.04 – 0.08% of the TRR), predominantly in peel where radioactive residues of < 0.02 mg/kg were found (except in two samples with higher values of 0.09 – 0.18 mg/kg, attributed to spray contamination). In treated foliage (stems and leaves), the acetone surface wash contained 61% of the TRR with a further 36.5% TRR being measured in the methanol-extracted homogenate.

The majority of the extractable residue in foliage was identified as unchanged parent (Table 8), dimethomorph, which accounted for 68% of the TRR. Most of the remaining extractable residue (14% TRR in the acetone wash and 15.8% in the methanol homogenate consisted of several unknown (mainly polar) metabolites, with only trace amounts of the metabolite Z7 being identified (< 0.5% TRR).

Table 8. Distribution and characterisation of ^{14}C residues in potato tubers and foliage 7 days after 4 applications of ^{14}C-[chlorophenyl]-dimethomorph at a concentration equivalent to 0.06 kg ai/hL

Component	Foliage mg/kg	Tubers (peel) mg/kg	Tubers (peeled) mg/kg
TRR (mg/kg)	23.5	0.024 [a]	0.01 [a]
TRR in surface wash (%TRR)			
Dimethomorph	(47.3%)		
Metabolite Z7	(< 0.5%)		
Not identified	(14%)		
Total	14.1 (61.3%)		
TRR in homogenate (%TRR)			
Dimethomorph	(20.7%)		
Metabolite Z7	(< 0.5%)		
Not identified	(15.8%)		
Total	8.4 (36.5%)		
TRR extracted mg/kg	23 (87.8)		
TRR non extractable (%TRR)	0.53 (2.2%)		

Surface residues extracted in acetone, homogenate residues extracted in methanol

a - Mean of 7 tubers. Excludes results from one upper layer tuber (0.18 mg/kg in peel, 0.04 mg/kg peeled) assumed to be contaminated during application

In a further study reported by Edwards, 1992 [DK 640-014], potato plants growing in a lysimeter were treated with a 150 g ai/L DC formulation of ^{14}C-[chlorophenyl]-dimethomorph at a rate equivalent to 0.3 kg ai/745 L/ha three times during the growing period. Treatment intervals were 10 days. Foliage and tubers (washed) were sampled at harvest about 28 days after the last treatment. Samples were stored at <-18 ^{o}C for 4 – 6 months before extraction and analysis.

Most of the radioactivity was found in the leaves, accounting for about 98%. Only 0.8% (equivalent to 0.12 mg/kg dimethomorph was found in the peel and 0.7% (equivalent to 0.025 mg/kg) in the peeled potato. The calculated total residue in whole potato residue was 0.146 mg/kg (1.5% TRR).

Residues in both tuber peel and peeled tuber were extracted with methanol/water and water, with 63.3% of the radioactivity in peel and 47.7% of the radioactivity in peeled tubers being extracted (Table 9). These extracts were partitioned with dichloromethane to measure and characterise the organo-soluble and water-soluble components.

In the organo-soluble fraction dimethomorph residues were 0.056 mg/kg (46.3% TRR) in peel and 0.003 mg/kg (12.0%) in the peeled tubers. Low levels of the desmethyl metabolites Z67 (11.6% TRR, 0.014 mg/kg) and Z69 (5% TRR, 0.006 mg/kg) were also found in peel but not in the peeled tubers.

In both the peel and the peeled tubers, the water-soluble fraction contained several minor polar components accounting for 8.3% (0.01 mg/kg) and 24.0% (0.006 mg/kg) of the TRR, respectively, and were not further characterized.

Table 9. Distribution and characterisation of ^{14}C residues in potato tubers 28 days after 3 applications of ^{14}C-[chlorophenyl]-dimethomorph at a rate equivalent to 0.3 kg ai/ha (lysimeter study)

Component	Organosoluble				Water soluble			
	Tuber Peel		Peeled Tuber		Tuber Peel		Peeled Tuber	
	mg/kg	(% TRR)	mg/kg	(% TRR)	mg/kg	(% TRR)	mg/kg	(% TRR)
Dimethomorph	0.056	(46.3)	0.003	(12.0)	0.002	(21.0)	0.012	(29.4)
Metabolite Z67	0.014	(11.6)	nd		nd		nd	
Metabolite Z69	0.006	(4.96)	nd		nd		nd	

nd not detected; the water soluble fractions was composed of several minor polar components which precluded further characterization

A potato metabolism study using dimethomorph labelled with ^{14}C in the morpholine ring was also provided to the Meeting (Thiele, 1990 [DK 640-006and Thiele, 1991 DK 640-011]. In this study, ^{14}C-dimethomorph formulated as a 10% EC was applied to greenhouse potato plants at a concentration of 0.06 kg ai/hL (equivalent to 0.6 kg ai/ha) with four applications (40 ml/plant) being made at 10 day intervals up to 7 days before harvest. Stems, leaves and tubers were sampled at harvest time and stored at < -18 ^{o}C for up to 5 weeks before extraction and analysis. Surface residues were removed in acetone, after which the samples were homogenised and the remaining residues extracted in methanol.

At harvest, 48.6% (18.2 mg/kg dimethomorph equivalents) of the applied ^{14}C was recovered from the treated foliage (Table 10). Small amounts of radioactivity were measured in tubers from treated plants predominantly in peel where radioactive residues of < 0.03 mg/kg were found. In treated foliage (stems and leaves), the acetone surface wash contained 72.3% of the TRR with a further 25.7% TRR being measured in the methanol-extracted homogenate.

The majority of the extractable residue in foliage was identified as unchanged parent, dimethomorph, which accounted for 76% of the TRR (13.8 mg/kg). The remaining extractable residue (11% TRR in the acetone wash and 11% in the methanol homogenate consisted of several unknown (mainly polar) metabolites, but at levels too low to identify.

Table 10. Distribution and characterisation of ^{14}C residues in potato tubers and foliage 7 days after 4 applications of ^{14}C-[morpholine]-dimethomorph at a concentration equivalent to 0.06 kg ai/hL

Component	Foliage mg/kg (%TRR)	Tubers (peel) mg/kg (%TRR)	Tubers (peeled) mg/kg (%TRR)
TRR (mg/kg)	18.2	0.015	0.014
TRR in surface wash (%TRR)			
Dimethomorph	(61.2%)		
Not identified	(11.1%)		
Total	13.1 (72.3%)		
TRR in homogenate (%TRR)			
Dimethomorph	(14.7%)		
Not identified	(11%)		
Total	4.7 (25.7%)		
TRR extracted mg/kg	17.8 (97.9)		
TRR non extractable (%TRR)	0.38 (2.1%)		

Surface residues extracted in acetone, homogenate residues extracted in methanol

Lettuce

In a study with field grown lettuce reported by Goodyear, 1995 [DK 640-021], chlorophenyl ring labelled ^{14}C-dimethomorph formulated as a 0.15 kg ai/litre DC was applied in four successive foliar applications at a rate equivalent to a mean treatment rate of 1.14 kg ai/ha. Applications were made 30 days after sowing of lettuce seed (8 days after transplanting) and again at intervals of 9, 10 and 11 days. Plants (without roots) were sampled four days after the final application and processed immediately.

The total radioactivity in lettuce was 102 mg/kg (Table 11), 95% of which was found in macerated acetone extracts with a further 3.6% being extracted in acetone:water (1:1) and 1.6% being unextracted.

Most of the extractable residue (93% TRR) was identified as unchanged dimethomorph (94.9 mg/kg) of the TRR in lettuce. Trace levels of the metabolites Z7 and Z67 were also reported, each accounting for 0.5% TRR (0.5 mg/kg). The remaining extractable residue (4.5%, 4.6 mg/kg) consisted of several minor unknown polar components, which were not further characterized.

Table 11. Distribution and characterisation of ^{14}C residues in lettuce 4 days after 4 applications of ^{14}C-[chlorophenyl]-dimethomorph at a mean rate equivalent to 1.14 kg ai/ha

Component	Residues (mg/kg)	%TRR
TRR	102	
Acetone extract	96.7	94.8
Acetone:water extract	3.7	3.6
Total extracted	100	98.4
Unextracted	1.6	1.5
Dimethomorph	94.9	93
Metabolite Z7	0.5	0.5
Metabolite Z67	0.5	0.5
Unidentified	4.6	4.5

Tomato

A study investigating the metabolism of ^{14}C-[chlorophenyl]-dimethomorph in tomato plants following root uptake was reported by Schüter and Varga, 1995 [DK-640-020]. In this study, ^{14}C dimethomorph was added to the nutrient hydroponic solution (8 mg ai/L) for uptake through the roots of young tomato plants for a 7-day application period. Samples were taken 0, 14 and 28 days after termination of the application. Samples of plants (without roots) were weighed and kept frozen until preparation for analysis.

Radioactive residues in the freeze-dried samples were extracted with acetone, methanol and methanol: water (4:1) for subsequent quantification with and without partitioning into dichloromethane and HCl hydrolysis.

Total radioactive residues at the end of the 7 day exposure period were 24.5 mg/kg dimethomorph equivalents, reducing to 12.5 mg/kg 14 days later and to 7 mg/kg at the end of the experiment (28 days after the end of the application period (Table 12).

Table 12. Distribution of ^{14}C residues in young tomato plants at intervals following a 7-day exposure to ^{14}C-[chlorophenyl]-dimethomorph (8 mg ai/litre) in a hydroponic nutrient solution

	Concentration, mg/kg and (%TRR)		
	0 days	14 days	28 days
TRR	24.5 (mean)	12.5 (mean) [13.4] (*)	7 (mean) [6.6][a/]
Acetone extract	13.1 (53.5%)	4.2 (31.7%)	1.3 (18.8%)
Methanol extract	10.3 (41.9%)	7.7 (57.9%)	2.9 (43.2%)
Methanol:water extract	0.45 (1.9%)	0.25 (1.9%)	1.2 (18.3%)
Total extracted	23.8 (97.3%)	11.4 (90.7%)	5.84 (83.3%)
Unextracted	0.67 (2.7%)	1.16 (9.3%)	1.17 (16.7%)

a - [TRR] in the sample used for further investigations

Dimethomorph was the predominant residue, initially comprising 66% of the TRR and reducing to 28% after 14 days and to 16% after 28 days. The calculated half-life of the parent compound was about 13 days. The demethylated metabolite Z69 (including conjugates) was the major metabolite found, with Z93, Z95 and Z98 also identified, mostly at levels < 10% TRR (Table 13).

Table 13. Identification of ^{14}C residues in young tomato plants at intervals following a 7-day exposure to ^{14}C-[chlorophenyl]-dimethomorph (8 mg ai/litre) in a hydroponic nutrient solution

	Concentration, mg/kg and (%TRR)		
	0 days	14 days	28 days
Dimethomorph	15.75 (66%)	3.18 (28%)	0.93 (16%)
Metabolite Z69	≤ 3.1 (≤ 13%)	2.05-3.75 (18-33%)	0.76-1.98 (13-34%)
Metabolite Z93	1.91 (8%)	1.93 (17%)	0.52 (9%)
Metabolite Z95	≤ 1.43 (≤ 6%)	0.45-0.91 (4-8%)	≤ 0.41 (≤ 7%)
Metabolite Z98	≤ 1.43 (≤ 6%)	0.11-0.57 (1-5%)	≤ 0.41 (≤ 7%)

In summary, the metabolic pathways of dimethomorph in plants show a common pattern, with the unchanged parent being the only significant component of the total residue in grapes, potatoes and lettuce. The primary metabolic pathway involves either the demethylation of the dimethoxyphenyl ring to produce 4-[(E) -and (Z)-beta-(p-chlorophenyl)-3-hydroxy-4-methoxycinnamoyl]morpholine (Z67) and 4-[(E) -and (Z)-beta-(p-chlorophenyl)-4-hydroxy-3-methoxycinnamoyl]morpholine (Z69) with the probable formation of the associated glucose conjugates. A secondary pathway involves the hydrolysis of dimethomorph to form 4-chloro-3',4'-dimethoxy-benzophenone (Z7)

In summary (Table 14), the predominant residue (dimethomorph) was mostly found as a surface residue in grape, with negligible systemic translocation, while in potato only low residues were found in tubers (almost all in the peel), suggesting that translocation from treated aerial parts to the tuber is negligible. In lettuce the predominant residue was dimethomorph with all other metabolites being < 5% TRR. In tomato plants exposed to dimethomorph in a hydroponic nutrient solution, residues were taken up by the roots and two metabolic pathways were proposed, one involving demethylation of the 4-methoxy group of the dimethoxyphenyl ring followed by conjugate formation, the other being the stepwise degradation of the morpholine ring.

Table 14. Summary of dimethomorph metabolites in grapes, potato and lettuce

Crop	Rate (PHI)	Matrix	Parent %TRR	Metabolite	Metabolite % TRR
Grapes	4× 0.9 kg ai/ha (35 days)	Leaf	83.0	Z7	1.5
		Grape	86.5	nd	-
Potato	4× 0.6 kg ai/ha (7 days)	Foliage	66.5	Z7	< 0.5
		Peel	-	-	-
		Peeled tuber	-	-	-
Potato	4× 0.6 kg ai/ha (7 days)	Foliage	74.5	nd	nd
		Peel	-	-	-
		Peeled tuber	-	-	-
Potato	3× 0.3 kg ai/ha (28 days)	Foliage	-	-	-
		Peel	46.3	Z67 Z69	11.6 4.96
		Peeled tuber	12.0	Z67 Z69	nd nd
Lettuce	4× 1.1kg ai/ha (4 days)	Foliage	93.0	Z7 Z67 or Z37 Z69	< 0.5 < 0.5 < 0.5
Tomato (hydroponic)	8 mg ai/litre	Foliage Day 0 Day 14 Day 28	 66 28 16	 Z69/Z93 [a] Z69/Z93 [a] Z69/Z93 [a]	 13/8 18–33/17 13–34/9

nd not detected

a - Two other metabolites also measured, but at levels < 10% TRR

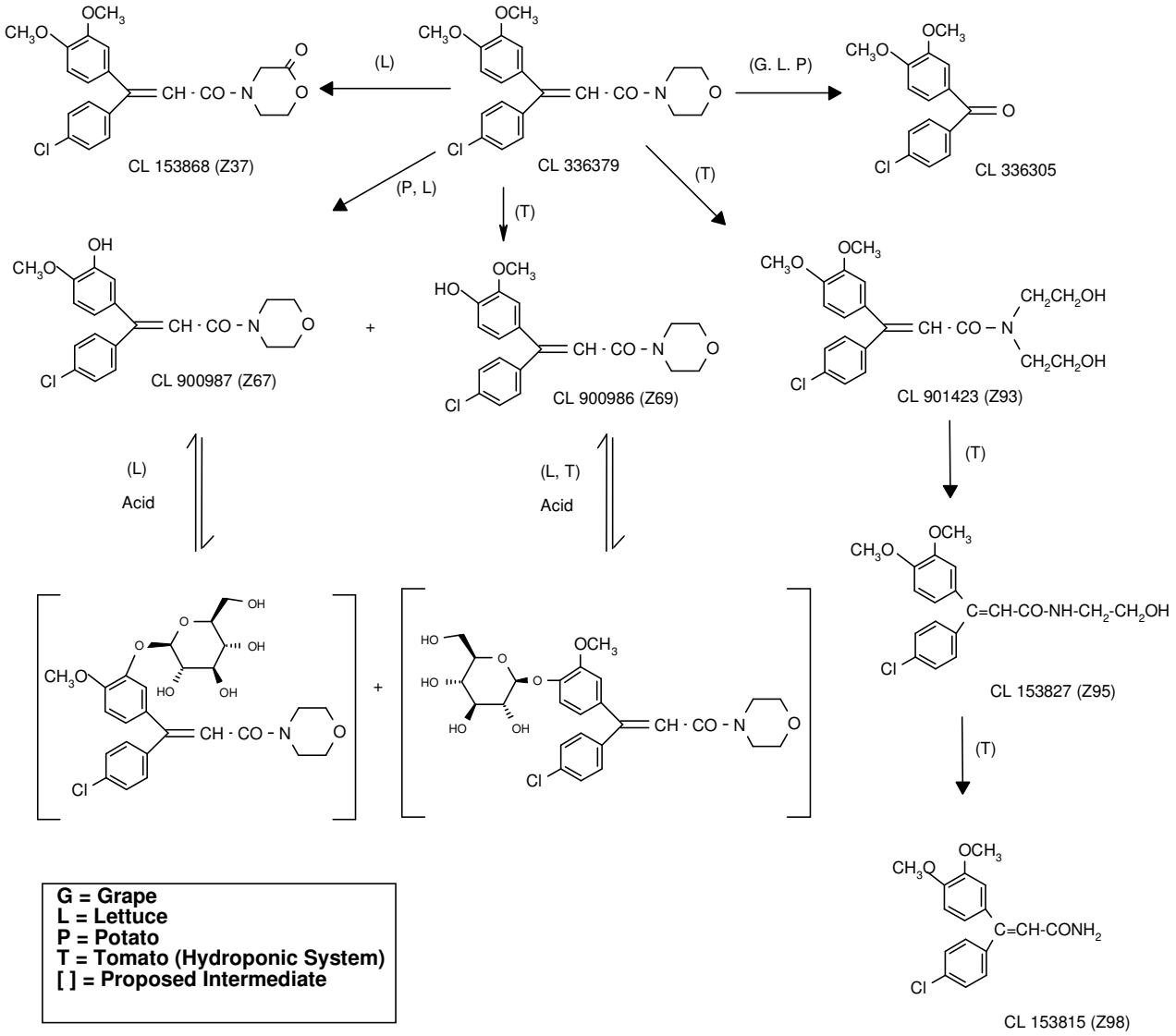


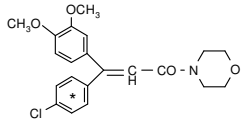
Figure 3. Metabolic pathway of ^{14}C-dimethomorph in grape, lettuce, potato and tomato

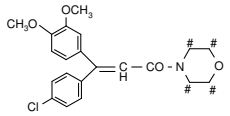
Environmental fate

The Meeting received information on the environmental fate of dimethomorph in soil, including studies on aerobic and anaerobic soil metabolism, photodegradation, soil adsorbtion and desorbtion, field dissipation and mobility. Because dimethomorph is used on some root crops (onions, potatoes, taro and radish), studies on aerobic soil metabolism and soil dissipation have been evaluated.

Environmental fate studies in aquatic and water-sediment systems were also provided, but because these studies do not assist significantly in defining the residue of concern or in estimating residue levels, these studies were not evaluated (as indicated in Revised Data Requirements for Studies of Environmental Fate (JMPR 2003, section 2.11, p. 12).

Dimethomorph uniformly labelled with ^{14}C in the phenyl ring or in the morpholine ring was used in the aerobic soil degradation studies.





* denotes uniformly labelled ^{14}C-chlorophenyl ring # denotes ^{14}C-morpholine ring label

Aerobic soil metabolism

A study in a sandy loam soil by Schlüter, 1990 [DK-620-010] showed that dimethomorph residues in soil incubated in the dark at 22°C decreased to 42.0% TRR after 60 days and to 2.9% TRR after 362 days and the amount of unextracted radiolabel increased to about 57% TRR after one year. The amount of $^{14}CO_2$ collected in the potassium hydroxide traps increased throughout the study and accounted for 17% of the applied radioactivity after one year of incubation, indicating extensive mineralization of the chlorophenyl ring. Small amounts of unidentified polar metabolites were seen ranging from 3.7 to 7.4% of the applied radioactivity between day 0 and day 362, with the highest amount observed at 30 days. During the first 60 days of the study, the dimethomorph E:Z ratio changed from approximately 1:1 to 1:3.

Aerobic soil metabolism			Schlüter, 1990 [Ref: DK-620-010]	
Test material: ^{14}C-[chlorophenyl]-dimethomorph			Dose rate: 5 mg/kg dry soil	
Sandy loam		pH: 7.0	Organic matter: 1.86%	
Duration: 362 days		Temp: 22 °C	Moisture: adjusted to 75% field capacity	
Half-life of dimethomorph: 47 days (DT90 = 154 days)				
% dimethomorph remaining, day 362 = 2.9% AR			Mineralization, day 362 = 17% AR	
	Dimethomorph Total (%AR)	% E-isomer	% Z-isomer	Unextracted residues (%AR)
Day 0	94.8	48	52	0.7
Day 7	88.3	45	56	3.7
Day 14	81.9	42	58	12.2
Day 30	62.5	36	64	23.4
Day 60	42	32	68	41.8
Day 90	28.1	28	72	50.3
Day 119	17.3			56.1
Day 180	6.4			56.7
Day 270	4.3			48.1
Day 362	2.9			56.9

In a similar study by Edwards and Standen, 1990 [DK-620-012] using ^{14}C-[morpholine]-dimethomorph in a silty clay loam, dimethomorph residues in soil incubated in the dark at 22°C decreased to 47% TRR after 90 days and to about 12% TRR after 365 days. The amount of unextracted radiolabel increased to about 48% TRR after one year. The amount of $^{14}CO_2$ collected in the potassium hydroxide traps increased throughout the study and accounted for about 28% of the applied radioactivity, indicating extensive mineralization of the chlorophenyl ring. Small amounts of unidentified polar metabolites (up to 2.4% TRR) were measured 30-365 days after treatment. Over the 1 year incubation period the dimethomorph E:Z ratio changed from about 1:1 to 1:3.

Aerobic soil metabolism			Edwards & Standen, 1990 [Ref: DK-620-012]	
Test material: ^{14}C-[morpholine]-dimethomorph			Dose rate: 4.9 mg/kg dry soil	
Silty clay loam		pH: 5.8	Organic matter: 1.6%	
Duration: 365 days		Temp: 22 °C	Moisture: adjusted to 26% field capacity	
Half-life of dimethomorph: 80 – 90 days				
% dimethomorph remaining, day 365 = 11.9%AR			Mineralization, day 365 = 27.9% AR	
	Dimethomorph Total (%AR)	% E-isomer	% Z-isomer	Unextracted residues (%AR)
Day 0	99	50	50	0.2
Day 7	94.9			2.8
Day 30	82.6			9.6
Day 61	62.1			20.8
Day 90	47	36	64	31.2

Aerobic soil metabolism — Edwards & Standen, 1990 [Ref: DK-620-012]
Test material: ^{14}C-[morpholine]-dimethomorph — Dose rate: 4.9 mg/kg dry soil
Silty clay loam — pH: 5.8 — Organic matter: 1.6%
Duration: 365 days — Temp: 22 °C — Moisture: adjusted to 26% field capacity
Half-life of dimethomorph: 80 – 90 days
% dimethomorph remaining, day 365 = 11.9%AR — Mineralization, day 365 = 27.9% AR

	Dimethomorph Total (%AR)	% E-isomer	% Z-isomer	Unextracted residues (%AR)
Day 120	38.9			35.5
Day 180	28.4			43
Day 271	17.5			43.8
Day 365	11.9			48.1
Day 362	2.9	27	73	43.5

A study in a loamy sand soil by Steinführer *et. al.*, 1998 [DK-620-037] showed that dimethomorph residues in soil incubated in the dark at 22°C decreased to about 36% of the applied radioactivity (AR) after 118 days and the E:Z isomer ratio changed from about 1:1 at day 0 to about 1:4 after 118 days. The amount of extractable radioactivity (including NaOH extraction) decreased to 62% AR at 118 days, about 46% of which were extracted with organic solvents (acetone and methanol/water). The amount of $^{14}CO_2$ increased steadily over time to reach 6.3% of the applied radioactivity after 118 days. Unidentified extractable radioactivity accounted for 5.3 to 10.2% of the applied radioactivity.

Aerobic soil metabolism — Steinführer et. al., 1998 [Ref: DK-620-037]
Test material: ^{14}C-[chlorophenyl]-dimethomorph — Dose rate: 1.7 mg/kg dry soil
Loamy sand — pH: 5.7 — Organic matter: 2.5%
Duration: 118 days — Temp: 20 °C — Moisture: adjusted to 16% field capacity
Half-life of dimethomorph: 77 days (E-isomer = 38 days, Z-isomer = 162 days)
% dimethomorph remaining, day 118 = 36% AR — Mineralization, day 118 = 6.3% AR

	Dimethomorph Total (%AR)	E-isomer (%AR)	Z-isomer (%AR)	Unextracted residues (%AR)
Day 0	92.3	44.2	48.1	0.8
Day 3	86.6	42.5	44.1	5.2
Day 7	80.6	36.7	43.9	10.5
Day 13	71.9	30.3	41.6	16.7
Day 21	61.5	23.4	38.1	21.1
Day 30	61.1	23.3	37.8	25.7
Day 59	51.2	14.5	36.7	32.2
Day 90	41.9	10	31.9	32.3
Day 118	36	7.7	28.3	36.9

A study by McCullough and Yan, 1998 [DK-620-028] investigated the aerobic soil metabolism using dimethomorph labelled at either the chlorophenyl or the morpholine ring in a sandy loam soil and in acidic sandy soil (using ^{14}C-[chlorophenyl]-dimethomorph).

In the sandy loam soil incubated in the dark at 25 °C 31% and 41%, respectively, of the applied dose from the chlorophenyl and morpholine labels was converted to $^{14}CO_2$ during the 9 month incubation period. The amount of non-extractable residues remaining in soil increased to maximum of 57% at 3 months and about 48% at 2 months for the chlorophenyl and morpholine labels respectively, then slowly decreased to respective levels of 51% after 6 months and 42% after 4 months. Extractability from the sandy soil decreased slightly over time, with unextracted radioactive residues ranged from 2 to 7.4% of the applied radioactivity throughout the study. Less than 2% of the applied radioactivity was converted to $^{14}CO_2$ in the acidic sandy soil.

In the sandy loam soil, dimethomorph decreased from 95 – 97% of applied radioactivity at day 0 to about 10% after 6 months of incubation. In the acidic sandy soil, the amount of dimethomorph decreased more slowly, from 99% at day 0 to 86% after 4 months. The E/Z ratio of dimethomorph changed from approximately 1:1 at day 0 to approximately 1:2.3 after 6 months of incubation in the sandy loam soil, while it remained at around 1:1 throughout the incubation period in

the acidic sandy soil. At least three unidentified extractable metabolites were detected, accounting for a maximum combined amount of about 4.5% of the applied radioactivity for both labels in the sandy loam, and 2.6% in the sandy soil. No metabolite fraction in the solvent extracts exceeded 2.5% of the applied radioactivity.

Aerobic soil metabolism — McCullough & Yan, 1998 [Ref: DK-620-028]
Test material: ^{14}C-[chlorophenyl]-dimethomorph or ^{14}C-[morpholine]-dimethomorph — Dose rate: 1.5 mg/kg dry soil
Sandy loam — pH: 6.8 — Organic matter: 13%
Duration: 9 months — Temp: 25 °C — Moisture: adjusted to 75% field capacity
Half-life of dimethomorph: 51 – 60 days (E-isomer = 41-52 days, Z-isomer = 58 – 67 days)
% dimethomorph remaining, day 180 = 9.2 – 10.7% AR — Mineralization, 9 months = 31 – 40.5% AR

	Dimethomorph Total (%AR)	E-isomer (%AR)	Z-isomer (%AR)	Unextracted residues (%AR)[a]
Chlorophenyl label				
Day 0	97.2	47	50.2	0.9
Day 3	91.1	43.1	48	6.2
Day 7	89	42.2	46.8	9.5
Day 14	76.7	33.7	43	13.9
Day 21	61.3	22.9	38.4	25.5
Day 30	45.4	12	33.3	45.7
Day 60	48.8	17.4	31.5	35.3
Day 90	24.9	7.2	17.8	57
Day 120	15.9	5.5	10.4	47.9
Day 180	10.7	3.4	7.3	51.4
Morpholine label				
Day 0	95.2	43.8	51.4	1.2
Day 3	90.8	41.5	49.3	6.2
Day 7	86.5	38.4	48.1	10.3
Day 14	77.1	32.2	44.9	15
Day 21	59.7	23.3	36.4	30.5
Day 30	43.2	11.6	31.6	43.4
Day 60	32.4	8.8	23.6	47.5
Day 90	20.4	5	15.3	50.2
Day 120	14.4	3.5	10.9	42.2
Day 180	9.2	2.8	6.5	-

a - Unextracted residues after acetone and methanol/water extraction and after further extraction after treatment with 0.5 N NaOH

Aerobic soil metabolism — McCullough & Yan, 1998 [Ref: DK-620-028]
Test material: ^{14}C-[chlorophenyl]-dimethomorph — Dose rate: 1.5 mg/kg dry soil
Sand (99% sand, 1% silt) — pH: 3.5 — Organic matter: 5.1%
Duration: 9 months — Temp: 25 °C — Moisture: adjusted to 75% field capacity
Half-life of dimethomorph: 86% remaining after 120 days
% dimethomorph remaining, day 120 = 86% AR — Mineralization, 4 months = 1.3% AR

	Dimethomorph Total (%AR)	E-isomer (%AR)	Z-isomer (%AR)	Unextracted residues (%AR)[a]
Chlorophenyl label				
Day 0	98.7	48.6	50.1	2
Day 7	99.9	49.1	50.8	4.2
Day 14	98.7	49	49.7	4.7
Day 21	96.7	47.5	49.3	5.7
Day 30	97	47.1	49.9	6.1
Day 60	91.8	43.9	47.9	6.8
Day 90	89.2	42.7	46.5	6
Day 120	86	41.5	44.5	7.4

a -Unextracted residues after acetone and methanol/water extraction and after further extraction after treatment with 0.5 N NaOH

A study in a sterile sandy loam soil by Bissinger, 1997 [DK-620-029] investigated the metabolism of dimethomorph in soil incubated in the dark at 8 °C and 22 °C for up to 122 days.

Residues of dimethomorph remained at about 92% of the applied radioactivity in the soil incubated at 8 °C for up to 122 days and decreased to about 87% AR in the soil incubated at 22 °C. Unextracted residues remained below 5% of applied radioactivity throughout the incubation period.

Aerobic soil metabolism
Test material: ^{14}C-[chlorophenyl]-dimethomorph
Sterile sandy loam
Duration: 122 days
pH: 6.5
Temp: 8 ° or 20 °C
Bissinger, 1997 [Ref: DK-620-029]
Dose rate: 0.33 mg/kg dry soil
Organic matter: 1.3%
Moisture: adjusted to 40% field capacity

% dimethomorph remaining, day 122 = 93.8% AR
Mineralization, 122 days = 0% AR

	Dimethomorph Total (%AR)	% E-isomer	% Z-isomer	Unextracted residues (%AR) [a]
8 °C incubation		Initial=42%	Initial=58%	
Day 0	92.6			0.2
Day 3	90.5			0.4
Day 7	91.4			0.8
Day 14	93.1			0.8
Day 28	92.9			1.2
Day 60	93			1.7
Day 90	93.1			2.1
Day 122	93.8			1.8
20°C incubation				
Day 0	95.3			0
Day 3	93.6			0.7
Day 7	92.6			1.8
Day 14	89.9			2.9
Day 28	85.5			3.2
Day 60	84.9			3.8
Day 90	87.5			4.7
Day 122	86.6			5

a - Unextracted residues after acetone and methanol/water extraction and after further extraction after treatment with 0.5 N NaOH

A study in a sandy loam soil by Hall & Lowrie, 2001 [DK-620-049] investigated the degradation of ^{14}C-[morpholine]-dimethomorph in soil incubated in the dark at 10 °C for up to 120 days. Dimethomorph residues decreased to about 32% of the applied radioactivity (AR) after 120 days and the E:Z isomer ratio (initially 44:56) changed from about 1:1 at day 0 to about 1:5 after 120 days. Acetonitrile extraction recovered about 32% of the applied radioactivity and a further 16.8% was extracted with NaOH. The amount of $^{14}CO_2$ released over the study period accounted for about 17% of the applied radioactivity. Unidentified extractable radioactivity accounted for < 1% of the applied radioactivity.

Aerobic soil metabolism
Test material: ^{14}C-[morpholine]-dimethomorph
Sandy loam
Duration: 120 days
Half-life of dimethomorph: 74 days
pH: 5.7
Temp: 10 °C
Hall & Lowrie, 2001 [Ref: DK-620-049]
Dose rate: 1.66 mg/kg dry soil
Organic matter: 1.3%
Moisture: adjusted to 75% field capacity

% dimethomorph remaining, day 118 = 36% AR
Mineralization, day 120 = 16.8% AR

	Dimethomorph Total (%AR)	E-isomer (%AR)	Z-isomer (%AR)	Unextracted residues (%AR)
Day 0	101.6	52.9	48.7	1.8
Day 15	77.2	38.1	39.1	15.3
Day 30	64.3	27.6	36.7	23.7
Day 45	50.9	16.9	34	33
Day 60	52.6	17.8	34.8	33.5
Day 75	39.4	9.5	29.9	40.8
Day 90	35.7	6.6	29.1	44.6
Day 105	34.9	6.9	28	39.9
Day 120	31.5	5	26.5	49

In five field dissipation studies summarised by Beigel, 2001 [DK-620-048], dimethomorph was applied to bare field plots at rates of between 0.43 kg ai/ha and 0.6 kg ai/ha and soil samples (20 – 30 cm cores) were taken at regular intervals over 5 – 7 month periods. Soil types used in these studies were loamy sand (1), sandy loams (3) and clay (1) with pH values between 5.2 and 7.3 and organic matter contents of about 1 – 7%. Samples were extracted successively with acetone, acetone/water and water, partitioned in dichloromethane and analysed for dimethomorph using HPLC with uv-detection (Method FAMS 053-01). The individual studies were conducted by Thiele, 1990 [DK-620-006, DK-620-007], Thiele, 1991 [DK-620-015 andDK-620-020] and Thiele & Buch, 1991 [DK-620-021].

In these studies detectable residues were only found in the top 10 cm with initial residues of 0.1 – 0.3 mg/kg, reducing to 0.01 – 0.03 mg/kg by the end of the 5 – 7 month study periods. The dissipation rates for the E-isomer were consistently faster than for the Z-isomer with levels of the E-isomer decreasing to 0.002 – 0.008 mg/kg and the Z-isomer to 0.008 – 0.024 mg/kg. Over the study periods, the approximate E:Z isomer ratios changed 1:1 to 1:3 to 1:4. The best fit DT_{50} values ranged from 14 days to 57 days and the DT_{90} values were from 133 – 226 days (Tables 15, 16).

Table 15. Best-fit field dissipation DT_{50} and DT_{90} values for dimethomorph reported in five field dissipation studies in Germany

Study	Soil Type	DT_{50} (days)	DT_{90} (days)	Kinetics
DK-620-006	sandy loam	14	154	$C=a/b^{\sqrt{t}}$
DK-620-007	sandy loam	25	226	$C=1/(a+bt)$
DK- 620-015	clay	26	133	$C=1/(a+bt)^2$
DK-620-020	sandy loam	19	207	Not specified
DK-620-021	loamy sand	57	189	Not specified

Table 16. Estimated first-order dissipation DT_{50} and DT90 values for dimethomorph reported in five field dissipation studies in Germany

Study	Compound	DT_{50} (days)	DT_{90} (days)	r^2
DK-620-006	Dimethomorph	33.8	112.4	0.951
	E-Isomer	16.9	56.1	0.974
	Z-Isomer	48.7	161.7	0.977
DK-620-006	Dimethomorph	38.9	129.3	0.889
	E-Isomer	16.5	54.9	0.986
	Z-Isomer	51.1	169.9	0.958
DK-620-015	Dimethomorph	40.1	133.3	0.990
	E-Isomer	31.0	102.9	0.999
	Z-Isomer	57.9	192.4	0.982
DK-620-020	Dimethomorph	45.7	151.7	0.955
	E-Isomer	a	a	a
	Z-Isomer	a	a	a
DK-620-021	Dimethomorph	52.9	175.7	0.947
	E-Isomer	38.0	126.1	0.998
	Z-Isomer	77.4	257.1	0.928

a - Insufficient number of data points available

Field dissipation studies on a further three soil types in UK, France and Spain have been reported by Bayer & Zangmeister, 2002 [DK-620-050] where dimethomorph (E:Z isomer ratio of approximately 50:50) was applied to bare field plots at a target rate of 0.6 kg ai/ha and soil samples (25 – 30 cm cores) were taken at regular intervals over a 7 month period. Soil types used in these studies were loamy sand (2) and sand (1) with pH values between 6.5 and 6.7 and organic matter contents of about 0.4 – 1.5%. Samples were extracted successively with acetone/HCl, partitioned in dichloromethane with silica gel cleanup before GC/MS analysis. The mean fortification recovery rate in the field samples was 86.1% ± 10.3% (n=36).

Dimethomorph residues were only found in the top 10 cm with trace amounts of the two desmethyl metabolites (Z67 and Z69) being found in the top 20 cm layer but only during the first 2

months of the study. Initial residues of dimethomorph were about 0.3 – 0.4 mg/kg, decreasing to < 0.05 mg/kg after 7 months. The first order DT_{50} values (Table 17) for dimethomorph ranged from 10 days to 61 days and the DT_{90} values were from 30 – 287 days.

Table 17. Estimated first-order dissipation DT_{50} and DT_{90} values for dimethomorph reported in three field dissipation studies in Spain, France and UK

Study	Compound	DT_{50} (days)	DT_{90} (days)	r^2
Spain	Dimethomorph	61	203	0.831
	E-Isomer	30	101	0.891
	Z-Isomer	86	287	0.807
France	Dimethomorph	34	112	0.995
	E-Isomer	20	68	0.993
	Z-Isomer	42	140	0.986
UK	Dimethomorph	10	33	0.98
	E-Isomer	11	38	0.966
	Z-Isomer	9	30	0.977

Soil photodegradation

A study by Van Dijk, 1989 [DK-620-008] investigated the photodegradation of dimethomorph in a sandy loam soil containing 5 mg/kg dimethomorph and irradiated under a xenon arc lamp for 15 days continuous light. The results showed a small decrease in dimethomorph residues over the exposure period (from 103% to 91% of the applied radioactivity) with two minor (unidentified) metabolites being found at levels up to 4.2% AR. Small amounts of amount $^{14}CO_2$ were collected in the potassium hydroxide traps, accounting for 1.2% of the applied radioactivity. There was a shift in the dimethomorph E: Z isomer ratio from about 2:3 to 1:2 over the 15 day exposure period but not in the dark control, suggesting that this shift was a result of photochemical reactions.

Soil photodegradation — Van Dijk, 1989 [Ref: DK-620-008]
Test material: ^{14}C-[chlorophenyl]-dimethomorph — Dose rate: 5 mg/kg dry soil
Sandy loam (sterile) — pH: 7 — Organic matter: 1.86%
Duration: 15 days under xenon arc lamp — Temp: 22 °C — Moisture: 1:1 ratio of air-dried soil: water

% dimethomorph remaining, day 15 = 91% AR			Mineralization, day 15 = 1.2% AR	
	Dimethomorph Total (%AR)	%E-isomer	%Z-isomer	Unextracted residues (%AR)
Day 0	103.1	42.5	57.5	1.5
Day 1	95.8	44.8	55.2	2.9
Day 2	97.4	49.3	50.7	1.7
Day 4	96.7	43	57	3.7
Day 7	90.3	33.2	66.8	5.1
Day 15	91	33.8	66.2	6.4
Day 15 (dark)	96	42.6	57.4	3.8

In summary dimethomorph is moderately persistent in soil with half-lives of between 47 and 90 day in laboratory aerobic soil metabolism studies and between 10 and 61 days in field studies. Dimethomorph is stable in soil under sterile conditions and the primary route of degradation of dimethomorph is by microbial action. Degradation products in soil are not extractable in aqueous/organic solvents and slowly mineralise to CO_2. No significant degradation products have been detected in four soils. The E-isomer of dimethomorph appears to degrade faster in soil than the Z-isomer under aerobic conditions. Dimethomorph is slowly degraded in the soil under the influence of light to give two minor unidentified photolysis products.

Confined rotational crops

The Meeting was provided with data from a confined crop rotation trial using ^{14}C-[chlorophenyl]-dimethomorph (50:50 E:Z isomer ratio), reported by Schlüter, 1990 [DK-640-008]. In this study, ^{14}C-dimethomorph was applied to sandy loam soil at a rate equivalent to 4 kg ai/ha before being aged for 29, 120 and 361 days and then mixed with untreated soil (1:6.5 ratio to simulate tillage to 15 cm). Carrots, lettuce seedlings and wheat were planted as representative crops and grown under laboratory conditions.

Soil samples were taken after treatment, aging, simulated tillage and at harvest for analysis of the level of radioactivity (LSC) and for the nature of residue (HPLC). $^{14}CO_2$ was also estimated during the cultivation of rotational crop. Crops were sampled at harvest and analyzed for the level of radioactivity (LSC) and for the nature of residue (HPLC). Wheat samples were also taken at ear stage.

In soil, the level of radioactivity decreased to 80% of the applied radioactivity after 120 days and to 66% after 361 days. Dimethomorph comprised 92 – 95% of the total extracted residue just after treatment, reducing to about 64% after 29 days, 15.6% after 120 days and 1.6% after 361 days. $^{14}CO_2$ was found at levels of 7.4, 6.8 and 2.5% of applied radioactivity for 29, 120 and 361 days aging period, respectively.

Table 18. Extractability, recovery and composition of extractable residue in soil for the different aging periods after treatment with ^{14}C-[chlorophenyl]-dimethomorph.

Matrix		Residue				
Sampling stage (harvest days)	Days after treatment	Extracted (mg/kg)	Unextracted (mg/kg)	Recovery (%)	Composition ERR (%)	
					Dimethomorph	Unknown
Soil aged for 29 days						
Treated soil	0	13.15	0.15	100	92.4	6.5
Aged soil	29	9.3	4.75	105.6	63.8	6
Mixed soil (planting)	29	1.24	0.63	105.6	63.8	6
Lettuce harvest	29+36	0.35	1.22	88.6	17	3
Carrots harvest	29+109	0.2	1.4	90.6	8.9	2.6
Wheat at ear stage	29+54	0.24	1.35	89.5	9.9	3.4
Wheat at maturity	29+113	0.21	1.28	83.5	7.1	4.5
Soil aged for 120 days						
Treated soil	0	12.13	0.15	100	93.5	5.3
Aged soil	120	2.5	7.38	80.4	15.6	4.7
Mixed soil	120	0.33	0.98	80.4	15.6	4.7
Lettuce harvest	120+38	0.13	1.22	82.2	4.5	2.8
Carrots harvest	120+111	0.08	0.99	65.6	2.1	2.8
Wheat at ear stage	120+45	0.1	1.23	81.3	3.2	2.8
Wheat at maturity	120+96	0.095	1.22	80.1	2.5	3.3
Soil aged for 361 days						
Treated soil	0	12.06	0.05	100	94.6	4.9
Aged soil	361	0.34	7.66	66	1.6	1.2
Mixed soil	361	0.045	1.02	66	1.6	1.2
Lettuce harvest	361+36	0.051	1.12	72.4	0.7	2.5
Carrots harvest)	361+109	0.049	1.07	69.5	0.4	2.7
Wheat at ear stage	361+54	0.044	0.94	60.9	NQ	2.7
Wheat at maturity	361+113	0.051	1.03	67.1	0.8	2.4

Radioactivity in wheat kernels and washed lettuce plants (without roots), carrot leaves, carrot roots, wheat plants (without roots) and wheat straw was measured by liquid scintillation counting and identified using thin layer chromatography and HPLC.

Total radioactivity levels above 0.1 mg/kg were found in lettuce (0.2 mg/kg) and leaves of carrots (0.14 mg/kg) planted 29 days after treatment. In carrot roots the TRR was less than 0.03 mg/kg and less than 0.07 mg/kg in wheat kernels at all sampling times. In forage and straw from wheat planted 29 days after treatment the respective TRR levels were 1 mg/kg and 4.8 mg/kg. Between 67% and 83% of the total radioactivity residue could be extracted from lettuce, wheat forage and straw.

Lower extraction rates (35-51%) were measured in carrots leaves possibly attributed to the presence of soil particles containing unextractable residues. An examination of the thin-layer chromatograms indicated that the radioactive residues consisted mainly of compounds more polar than dimethomorph.

Table 19. Total radioactive residue (TRR) and extractability of residues in rotational crops grown in aged soil treated with ^{14}C-[chlorophenyl]-dimethomorph

Rotational crops	Aging period					
	29 days		120 days		361 days	
	TRR (mg/kg)	ERR (%TRR)	TRR (mg/kg)	ERR (%TRR)	TRR (mg/kg)	ERR (%TRR)
Lettuce	0.205	72.3	0.038		0.009	
Carrot leaves	0.143	50.8	0.069	34.8	0.055	47
Carrot roots						
Peelings	0.049		0.026		0.009[a]	
Peeled roots	0.016		0.014		0.005[a]	
Total roots	0.025		0.017		0.006[a]	
Wheat plants (ear stage)	1.007	74.3	0.243	75.8	0.028	
Wheat straw (maturity)	4.828	68.1	0.775	66.6	0.145	82.7
Wheat kernels (maturity)	0.057		0.062		0.014 [a]	

ERR extractable radioactive residue expressed as dimethomorph equivalents

a - mean data of less than twice background

In a rotational crop metabolism study reported by Afzal, 1999 [DK-790-028], ^{14}C-[chlorophenyl]-dimethomorph (50:50 E:Z isomer ratio, EC formulation) was applied to bare sandy loam soil (pH 5.5 and 0.9% organic matter) at a rate equivalent to 1.7 kg ai/ha (in 3 biweekly sprays of 0.76 kg ai/ha, 0.76 kg ai/ha and 0.22 kg ai/ha) and winter wheat, radish, lettuce, spring wheat and soya bean were planted in the treated soil at intervals from 30 to 394 days after the last treatment.

Soil samples (to 30 cm) were taken immediately after the first and third treatments and analysed to determine the initial soil residues and crop samples were collected at mid-maturity and at harvest to measure the total radioactive residue (TRR). The detection limit of the radioassay was approximately 0.01 mg/kg.

Residues in crop samples were also extracted with methanol:water (70:30) and partitioned with dichloromethane to separate the organo-soluble and water-soluble fractions for further HPLC analysis to characterise the nature of the residues.

In soil sampled after the last application, total radioactive residues (TRR) were found mostly in the top 10 cm, averaging 1.1 mg/kg dimethomorph equivalents in plots treated in July-August and 0.65 mg/kg in plots treated in June-July.

Table 20. Total radioactive residue (TRR), extractability and nature of residues in rotational crops grown in aged soil treated with ^{14}C-[chlorophenyl]-dimethomorph

Residues in wheat (mg/kg dimethomorph equivalents)												
Day after last treatment	30			60			181			394		
Crop portion	forage	straw	grain	forage	straw	grain	forage	straw	grain	forage	straw	grain
TRR	0.05	0.15	0.01	0.04	0.13	0.01	0.03	0.13	0.02	0.01	0.02	0.01
ERR	0.04	0.09		0.03	0.08		0.02	0.07				
Dimethomorph	< 0.01	< 0.01		< 0.01	< 0.01		< 0.01	< 0.01				
Z69	< 0.01	< 0.01		< 0.01	< 0.01		< 0.01	< 0.01				
CL411266	0.01	0.04		< 0.01	0.03		< 0.01	< 0.01				
Others	< 0.01	< 0.01		< 0.01	< 0.01		< 0.01	< 0.01				

Residues in lettuce (mg/kg dimethomorph equivalents)				
Day after last treatment	30	60	274	394
Crop portion	Whole plant	Whole plant	Whole plant	Whole plant
TRR	0.09	0.05	0.06	0.01
ERR	0.06	0.03	0.03	

Residues in wheat (mg/kg dimethomorph equivalents)								
Day after last treatment	30		60		181		394	
Dimethomorph	0.01		< 0.01		< 0.01			
Z69	< 0.01		< 0.01		< 0.01			
CL411266	< 0.01		0.02		< 0.01			
Others	< 0.01		< 0.01		< 0.01			
Residues in soya bean (mg/kg dimethomorph equivalents)								
Day after last treatment	30		60		181		274	
Crop portion							forage	straw	seed
TRR							0.05	0.05	0.03
ERR							0.03	0.02	< 0.01
Dimethomorph							< 0.01	< 0.01	
Z69							< 0.01	< 0.01	
CL411266							< 0.01	< 0.01	
Others							< 0.01	< 0.01	
Residues in radish (mg/kg dimethomorph equivalents)								
Day after last treatment	30		60		274		394	
Crop portion	Tops	Roots	Tops	Roots	Tops	Roots	Tops	Roots
TRR	0.07	0.02	0.04	0.03	0.04	0.06	0.02	0.01
ERR	0.04	< 0.01	0.02	0.01	0.03	0.03	0.01	
Dimethomorph	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Z69	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
CL411266	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Others	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

ERR: Extractable Radioactivity Residue

Total radioactive residues of 0.05 mg/kg were found in forage from wheat planted 30 days after treatment, with lower residues being found in later plantings. About 63 – 85% of the TRR was extracted and further analysis indicated that the principal components of the extractable residue in the water-soluble fraction was the glucose conjugate (CL 411266) of the desmethyl metabolite (Z69), accounting for 10.0 – 20.0% of the TRR at all planting intervals. In wheat straw, TRR levels of 0.15 mg/kg decreasing to 0.02 mg/kg were measured over the planting intervals, 25 – 62% of which were extracted, with the glucose conjugate (CL 411266) being the major metabolite identified. TRR in wheat grain was 0.01 mg/kg at all planting intervals

In lettuce, TRR levels decreased from 0.09 mg/kg to 0.01 mg/kg over the planting intervals, with 48 – 68% of these being extracted. CL 411266, the glucose conjugate of Z69 was the major identified residue (up to 36% TRR) with dimethomorph also being measured at 4 – 11% TRR.

In soya beans planted 274 days after treatment, TRR in forage, straw and seeds were 0.03 – 0.05 mg/kg, about 23 – 60% of which were extracted with no single residue component exceeding 0.01 mg/kg.

In radish tops, TRR decreased from 0.07 mg/kg to 0.02 mg/kg over the planting intervals and from 0.04 mg/kg to 0.01 mg/kg in radish roots. Extractable residues ranged from 55 – 72.5% (tops) and 41.7 to 46.7% (roots). Components of the residue included dimethomorph and Z69, both at levels < 0.01 mg/kg.

Rotational crop field studies

Four rotational crop field trials conducted in Germany in 1991 and 1992 have been reported by Bitz & Weitzel, 1994 [DK-790-010and DK-790-011]. In these trials, potato crops were treated with 3 foliar applications of 0.18 kg ai dimethomorph/400 litres water/ha and carrots, spinach and beans were planted as rotational crops immediately after the potato crop was harvested or ploughed, this being about 2 – 6 weeks after the last dimethomorph application.

Soil samples were taken at the last treatment and when the subsequent crops were planted and when sampled. Crops were sampled as soon as enough material was available for analysis and at harvest time and the samples were stored at -18 °C until analysed. Analysis was by HPLC with UV detection (method FAMS 006-01 for soil and FAMS 002-02 for crops). The limit of quantification was 0.01 mg/kg for crops and 0.005 mg/kg for soil with the limits of detection being 0.002 mg/kg for crops and 0.005 mg/kg for soil. Method recoveries ranged from 85% to 126% (average 107%) except for the 1992 analyses of beans where lower recovery rates of 59 – 71% were reported.

In soil, residue levels of dimethomorph were 0.1 – 0.14 mg/kg 13 days after application, at the time of planting the rotational crops (excluding the 1991 trial 1, spinach plots where soil residues were 0.03 mg/kg at planting, 44 days after treatment). At harvest, soil residues had decreased to 0.006 – 0.024 mg/kg (1991) and 0.02 – 0.03 mg/kg (1992).

In the succeeding crops, residue levels of dimethomorph at normal harvest time were at or below the limit of determination (0.01 mg/kg) in the 1991 trials and at or below the limit of detection (0.002 mg/kg) in the 1992 trials.

Table 21. Dimethomorph residues in soil and in crops grown in rotation with potatoes treated 3 times with dimethomorph (0.18 kg ai/ha). Germany, 1991

Day after last treatment	Dimethomorph residues (mg/kg)			
	Trial 1		Trial 2	
	Soil	Carrot (root)	Soil	Carrot (root)
0	0.052		0.123	
14 (planting)	0.143			
26			0.064	
74	0.03	0.01		
84			0.022	0.02
95-96		nd		nd
114-115	0.021	nd		
131			0.031	nd
	Soil	Spinach (leaves)	Soil	Spinach (leaves)
0	0.036		0.113	
14 (planting)	0.107			
26			0.046	
46		0.02		
47-50	0.057	nd		
57-58	0.067	nd		
76			0.015	0.21
84				nd
96			0.023	nd
	Soil	Beans (seed with pods)	Soil	Beans (seed with pods)
0	0.062		0.24	
14 (planting)	0.136			
26			0.046	
74	0.023	nd		
81		nd		
88-92	0.017	nd	0.03	0.02
100				nd
111			0.029	nd
131		nd [a]		

a - dried beans

Table 22. Dimethomorph residues in soil and in crops grown in rotation with potatoes treated 3 times with dimethomorph (0.18 kg ai/ha). Germany, 1992

Day after last treatment	Dimethomorph residues (mg/kg)			
	Trial 1		Trial 2	
	Soil	Carrot (root)	Soil	Carrot (root)
0	0.052		0.123	
14 (planting)	0.143			
26			0.064	
74	0.03	0.01		
84			0.022	0.02
95-96		nd		nd
114-115	0.021	nd		
131			0.031	nd
	Soil	Spinach (leaves)	Soil	Spinach (leaves)
0	0.036		0.113	
14 (planting)	0.107			
26			0.046	
46		0.02		
47-50	0.057	nd		
57-58	0.067	nd		
76			0.015	0.21
84				nd
96			0.023	nd
	Soil	Beans (seed with pods)	Soil	Beans (seed with pods)
0	0.062		0.24	
14 (planting)	0.136			
26			0.046	
74	0.023	nd		
81		nd		
88-92	0.017	nd	0.03	0.02
100				nd
111			0.029	nd
131		nd [a/]		

a - dried beans

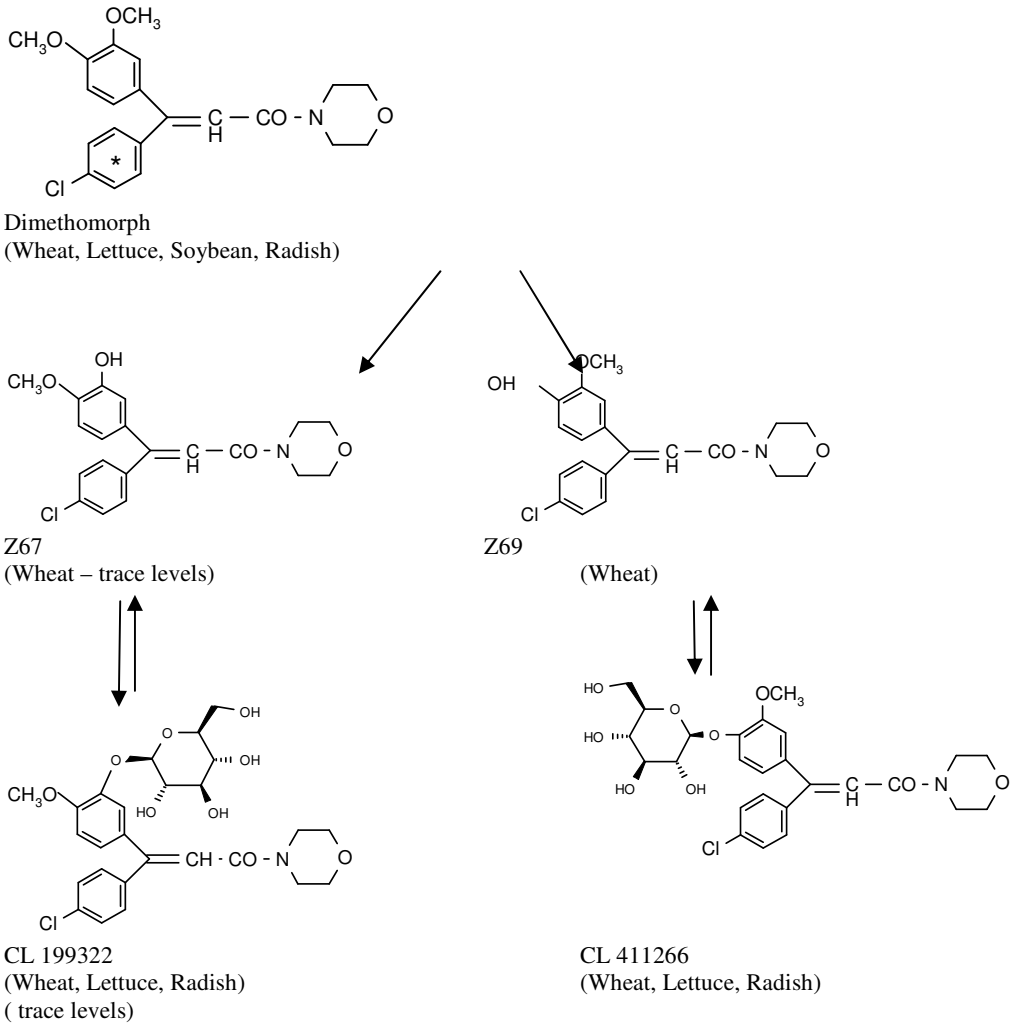


Figure 3. Proposed metabolic pathway in succeeding crops

METHODS OF RESIDUE ANALYSIS

Analytical methods

The meeting received analytical method descriptions and validation data for dimethomorph in raw agricultural commodities, processed commodities, animal tissues, milk and eggs.

The methods generally involved extraction with acetone, acetonitrile or methanol with residues being partitioned into dichloromethane, ethyl acetate or cyclohexane and cleaned-up by gel permeation chromatography prior to analysis. An additional silica gel column clean-up step was included in some methods, and for some matrices, an additional partition step with hexane (to remove fatty constituents) was included. Analysis was conducted by HPLC-UV, GC-NPD, GC-MS or HPLC-MS/MS.

A number of these methods are capable of determining the individual dimethomorph isomers, but to minimise isomerization reactions during preparation and analysis, the analytical work must be conducted in the absence of light. However these isomerization reactions do not influence the measurement of total residues.

Table 23. Dimethomorph Analytical Methods

Potatoes
Weitzel, 1995 [DK-724-026]

Analytes:	Dimethomorph	HPLC-UV	FAMS 002-02
LOQ:	0.02 mg/kg		

Description: Homogenised samples areextracted with acetone and partitioned (3X) with sodium chloride and dichloromethane. The organic phase is dried with sodium sulphate, evaporated to near dryness and the residue taken up in methanol for purification by gel permeation chromatography and silica gel column clean-up with acetone:hexane (20:80) elution before rotary evaporation and resuspension in methanol for analysis by HPLC with UV detection.

Grapes
Weitzel, 1995 [DK-244-015]

Analytes:	Dimethomorph	HPLC-UV	FAMS 002-04
LOQ:	0.02 mg/kg		

Description: Homogenised plant samples are extracted with acetone or acetone:water and partitioned with sodium chloride and dichloromethane. Juice and wine samples are either column-eluted with dichloromethane or partitioned directly with sodium chloride and dichloromethane. The organic phase is dried and evaporated to near dryness and the residue are taken up in methanol for purification by gel permeation chromatography and silica gel column clean-up before analysis by HPLC with UV detection. The method is a minor variation on FAMS 002-02 above.

Strawberries, citrus
Moreno, 2006 [2006/1015075]

Analytes:	Dimethomorph	HPLC-MS	PE 802/PE 804
LOQ:	0.01 mg/kg		

Description: Homogenised plant samples are shaken with acetone and with dichloromethane:petroleum ether, then centrifuged. The supernatant is evaporated to dryness and reconstituted in methanol, microfiltered and analysed by HPLC-MS. In method PE 804, analysis is by LC-MS/MS (Moreno, 2005) [Ref: 2005/1034175]

Potatoes
Memmesheimer, 1995 [DK-244-011]

Analytes:	Dimethomorph	HPLC-UV GC-NPD	or	FAMS 022-02
LOQ:	0.02 mg/kg (0.01 mg/kg for GC confirmation)			

Description: Similar to FAMS 002-02, with the same acetone extraction and dichloromethane partitioning steps. In addition, an aliquot of the initial acetone extract is mixed with water and after the acetone is evaporated, the aqueous phase is partitioned with hexane and the lower, aqueous phase then partitioned into dichloromethane. The dichloromethane phases are then evaporated to near dryness and the residue is taken up in acetone:hexane (20:80) for Florasil column clean-up before HPLC-UV or GC-NPD analysis.

Potatoes (tubers, processed fractions, wash water)
Zeng, 1997 [DK-244-023]

Analytes:	Dimethomorph	GC-NPD	M 2639
LOQ:	0.01 mg/kg (0.05 mg/kg in processed fractions)		

Description: Similar to FAMS 002-02, with the same acetone extraction and dichloromethane partitioning steps. For potato chips, an additional acetonitrile extraction step is included before partitioning. The dichloromethane phases are then evaporated to near dryness and the residue is taken up in acetone:hexane (20:80) for Florasil column clean-up before GC/MS analysis. Frying oil is extracted by multiple partitioning in hexane:acetonitrile with the acetonitrile phases evaporated and residue redissolved in methylene chloride for analysis.

Hops (dry)
Weeren & Pelz, 1997 [DK-244-020]

Analytes:	Dimethomorph	GC-NPD GC-M	or	FAMS 073-03
LOQ:	2.0 mg/kg			

Description: Similar to FAMS 002-02, with the same acetone extraction and dichloromethane partitioning steps. After evaporation of the organic phase the residue is redissolved in acetonitrile and partitioned with hexane. The acetonitrile phase is evaporated to near dryness and the residue dissolved in methanol for gel permeation chromatographic purification and silica gel column clean-up (acetone:hexane (20:80) elution) before rotary evaporation and dilution (1:5) with cyclohexanone for GC analysis (NPD or MS).

Tomatoes and processed tomato products
Zeng, 1997 [DK-123-114]

Analytes:	Dimethomorph	GC-NPD	M 2577
LOQ:	0.05 mg/kg (0.01 mg/kg for tomato juice)		

Description Homogenised samples are extracted in acetone and partitioned into dichloromethane. (Acetone extracts from tomato paste and juice are mixed with water and after the acetone is evaporated, the aqueous phase is partitioned with hexane and the lower, aqueous phase then partitioned into dichloromethane). Clean-up is by solid phase extraction with analysis using fused silica capillary gas chromatography with a nitrogen-phosphorous detector.

Oilseed rape
Weitzel, 1999 [DK-244-025]

Analytes:	Dimethomorph	GC-MS	FAMS 098-02
LOQ:	0.01 mg/kg		

Description Homogenised seeds are extracted with acetonitrile and partitioned with hexane (to remove fatty constituents), and the acetonitrile fraction then cleaned up by gel permeation and silica gel column before GC-MS analysis.

Potatoes, grapes, wine
Richardson, 2001 [DK-244-033]

Analytes:	Dimethomorph	GC-NPD	RLA 12654
LOQ:	0.05 mg/kg		

Description A minor modification of FAMS 022-02, with the same acetone extraction and dichloromethane partitioning steps but the hexane partitioning step (to remove fatty constituents) is indicated as optional. Clean-up is by Florasil column chromatography and analysis is by GC-NPD.

Broccoli, spinach, wheat
Stewart, 2002 [2002/5002982]

Analytes:	Dimethomorph	LC/MS/MS	M 3502
LOQ:	0.05 mg/kg		

Description Homogenised samples are extracted with acetone, mixed with dichloromethane (except wheat grain) filtered, and evaporated to dryness before dissolving in dichloromethane and clean-up by silica column (30:70 acetonitrile:dichloromethane) and C-18 solid phase extraction (10% water in methanol). Analysis is by LC/MS/MS.

Oilseed rape
Jones, 2004 [2003/5000425]

Analytes:	Dimethomorph	LC/MS/MS	M 3463
LOQ:	0.05 mg/kg		

Description A modification of M 3502, with acetone-extracted residues being partitioned with hexane and the acetonitrile phase evaporated to dryness before reconstitution in acetonitrile for C-18 SPE clean-up, evaporation and reconstitution in dichloromethane for further clean-up by silica column (30:70 acetonitrile:dichloromethane). Analysis is by LC/MS/MS.

Grapes
Lehmann & Mackenroth, 2005 [2005/1026082]

Analytes:	Dimethomorph	HPLC-MS/MS	BASF M 575/0
LOQ:	0.01 mg/kg		

Description Homogenised samples are extracted with methanol:water:2N HCl (70:25:5), centrifuged, partitioned under alkaline conditions into cyclohexane and evaporated to dryness before dissolving in 50:50 methanol:water for analysis by HPLC-MS/MS (transitions 388-301 for quantification and 388-165 for confirmation).

Cattle meat, liver, kidney
Weitzel, 1994 [DK-326-008]

Analytes:	Dimethomorph and metabolites	GC-NPD GC-MS	or FAMS 023-01
LOQ:	0.01 mg/kg		

Description Homogenised samples are extracted with acetonitrile, centrifuged and the supernatant partitioned with hexane (discarded). After drying with sodium sulphate and adding sodium chloride and water, the acetonitrile phase is partitioned into dichloromethane and evaporated to near dryness before dissolving in methanol and cleaned up by gel permeation chromatography (methanol:acetic acid elution) before concentration and redistribution in cyclohexane for CG analysis, using either N-P or MS detection. This method can measure the metabolite Z89 and the combined residues of Z67 and Z69.

Milk
Class, 1999 [DK-249-004]

Analytes:	Dimethomorph and metabolites	HPLC-UV	FAMS 024-01
LOQ:	0.01 mg/kg (0.02 mg/kg for Z 67 & Z 69)		

Description Whole milk is extracted with acetone, centrifuged and the supernatent evaporated to near dryness before partitioning with ethyl acetate (3X). After drying with sodium sulphate and evaporated to near dryness, the organic phase is dissolved in methanol, cleaned up by gel permeation chromatography for analysis by HPLC-UV. This method can measure the metabolite Z89 and the combined residues of Z67 and Z69.

Milk
Class, 1999 [DK-249-004]

Analytes:	Dimethomorph and metabolites	HPLC-UV	FAMS 024-02
LOQ:	0.01 mg/kg		

Description A modification of FAMS 024-01 with the same extraction procedure but where the concentrated organic phase (after partitioning with ethyl acetate) is redissolved in methanol:acetic acid and filtered (to remove residual fat) before the gel permeation chromatography clean-up step. This method also includes an additional clean-up step for cream, where samples are subjected to partitioning with hexane:acetonitrile (to remove fatty constituents) before the gel permeation chromatography. Analysis is by HPLC-UV. This method can measure the metabolite Z89 and the combined residues of Z67 and Z69.

Eggs
Lehmann & Mackenroth, 2005 [2005/1026082]

Analytes:	Dimethomorph	HPLC-UV	FAMS 054-01
LOQ:	0.01 mg/kg		

Description Homogenised eggs (without shells) are mixed with acetonitrile, centrifuged and the supernatant partitioned with hexane. The acetonitrile phase is then partitioned into dichloromethane which is then evaporated to near dryness before dissolving in methanol for clean-up by gel permeation chromatography and if necessary silica gel column clean-up before analysis by HPLC-UV.

The suitability of a multi-residue method for determining dimethomorph in grapes, onion, oilseed rape, hops, milk, meat, fat and soil was tested by Weeren & Pelz, 1999 [DK-244-026 and Ref: DK-249-005] and by Class, 1999 [DK-240-004]. This method, a modification of DFG Method S 19, involved acetone:water (2:1) extraction, ethyl acetate:cyclohexane (1:1) partitioning, gel permeation (DFG Cleanup Method 6) and mini silica gel column cleanups and GC-NPD analysis. The modification used in these studies was the use of ethyl acetate:cyclohexane rather than dichloromethane in the clean-up partitioning step. In the case of grapes, the mini silica gel column clean-up step was omitted. For fat, an alternative extraction procedure (DFG Method 5) was used, involving extraction with acetonitrile:acetone in the presence of calcium silicate, followed by filtration and concentration. The reported LOQs for dimethomorph were 0.01 mg/kg (milk, meat, fat), 0.02 mg/kg (grapes, onion, oilseed rape) and 0.2 mg/kg for hops.

Recovery data from the internal and independent laboratory validation (ILV) testing are summarised below.

Table 24. Analytical recoveries for spiked dimethomorph in various substrates.

Commodity	Analyte	Spike conc, mg/kg	n	Recovery%		Method	Reference
				mean	range		
Broccoli	dimethomorph	0.05-5.0	10	100	94-105	M 3502	2002/5002982
Eggs	dimethomorph	0.01-0.1	12	85	77-97	DFG Method S 19 [a]	DK-240-004
Cattle fat	dimethomorph	0.01-0.1	10	95	78-108	DFG Method S 19 [a]	DK-249-005
Cattle fat	dimethomorph	0.01-0.1	12	88	70-117	DFG Method S 19 [a]	DK-240-004
Grape juice	dimethomorph	0.2	10	100	96-105	FAMS 002-04	DK-326-022
Grape waste	dimethomorph	0.2	10	89	173-96	FAMS 002-04	DK-326-022
Grape	dimethomorph	0.05-0.5	10	91	83-100	FAMS 022-02	DK-244-032
Grape	dimethomorph	2.5	3	85	81-89	RLA 12654	DK-244-034
Grape	dimethomorph	0.01-0.1	10	79	76-82	M 575/0	2005/1026082
Grape	dimethomorph	0.02-0.2	10	79	75-85	DFG Method S 19 [a]	DK-244-026
Grape	dimethomorph	0.01-0.1	10	88	82-108	DFG Method S 19 [a]	DK-240-004
Strawberries	dimethomorph	0.015-0.3	66	94	75-106	PE 802	2006/1015075
Hops, green	dimethomorph	0.01-0.1	10	78	72-82	M 575/0	2005/1026082
Hops, green	dimethomorph	0.02-2.0	10	74	70-79	DFG Method S 19 [a]	DK-244-026

Commodity	Analyte	Spike conc, mg/kg	n	Recovery%		Method	Reference
				mean	range		
Hops, dry	dimethomorph	0.01-1.0	12	86	64-102	DFG Method S 19 [a]	DK-240-004
Hops, dry	dimethomorph	2-100	12	94	84-107	FAMS 073-03 (GC-NPD)	DK-244-020
Hops, dry	dimethomorph	0.2-20	2	91	87-93	FAMS 073-03 (GC-MS)	DK-244-020
Lettuce	dimethomorph	0.01-0.1	10	74	71-81	M 575/0	2005/1026082
Cattle meat	dimethomorph	0.01-0.1	10	81	73-99	DFG Method S 19 [a]	DK-249-005
Cattle meat	dimethomorph	0.01-0.1	11	82	75-95	DFG Method S 19 [a]	DK-240-004
Cattle milk	dimethomorph	0.01-0.1	10	79	71-93	DFG Method S 19 [a]	DK-249-005
Cattle milk	dimethomorph	0.01-0.1	11	84	72-97	DFG Method S 19 [a]	DK-240-004
Rapeseed	dimethomorph	0.01-0.2	15	100	79-131	FAMS 098-02	DK-244-025
Onion	dimethomorph	0.01-0.1	10	82	73-95	M 575/0	2005/1026082
Onion	dimethomorph	0.02-0.2	10	116	100-128	DFG Method S 19 [a]	DK-244-026
Onion	dimethomorph	0.01-0.1	10	94	86-106	DFG Method S 19 [a]	DK-240-004
Pea	dimethomorph	0.01-0.1	10	94	85-102	M 575/0	2005/1026082
Potato	dimethomorph	0.02-1.0	9	98	85-108	FAMS 022-02 (HPLC-UV)	DK-244-011
Potato	dimethomorph	0.01-1.0	9	95	85-99	FAMS 022-02 (GC-NPD)	DK-244-011
Potato	dimethomorph	0.01-0.1	6	87	80-94	M 2639	DK-244-023
Potato washed	dimethomorph	0.01-0.1	6	90	86-94	M 2639	DK-244-023
Potato peel	dimethomorph	0.05-0.5	6	82	72-91	M 2639	DK-244-023
Potato chips	dimethomorph	0.05-0.5	6	96	76-116	M 2639	DK-244-023
Potato granules	dimethomorph	0.05-0.5	6	97	92-102	M 2639	DK-244-023
Potato	dimethomorph	0.01-0.1	12	86	71-100	FAMS 002-02	DK-724-026
Potato	dimethomorph	0.05-0.5	10	88	76-95	FAMS 022-02	DK-244-032
Potato	dimethomorph	2.5	3	90	82-100	RLA 12654	DK-244-034
Potato	dimethomorph	0.01-0.1	10	80	76-84	M 575/0	2005/1026082
Raisins	dimethomorph	0.2	8	197	92-100	FAMS 002-04	DK-326-022
Rapeseed	dimethomorph	0.02-0.2	10	76	71-83	DFG Method S 19 [a]	DK-244-026
Rapeseed	dimethomorph	0.01-0.1	11	92	79-103	DFG Method S 19 [a]	DK-240-004
Rapeseed	dimethomorph	0.5	12	84	70-116	M 3463	2003/5000425
Soil	dimethomorph	0.01-0.1	10	100	93-111	DFG Method S 19 [a]	DK-249-005
Spinach	dimethomorph	0.05-5.0	10	99	89-104	M 3502	2002/5002982
Tomato	dimethomorph	0.05-1.0	10	79	75-90	FAMS 002-02	1998/1002634
Tomato	dimethomorph	0.05-0.5	6	86	64-104	M 2577	DK-244-022
Tomato	dimethomorph	0.01-0.1	10	73	71-78	M 575/0	2005/1026082
Tomato juice	dimethomorph	0.01-0.05	6	93	74-117	M 2577	DK-244-022
Tomato sauce	dimethomorph	0.05-0.5	6	100	82-106	M 2577	DK-244-022
Tomato paste	dimethomorph	0.05-0.5	6	83	68-100	M 2577	DK-244-022
Tomato pomace (dry)	dimethomorph	0.05-0.5	6	93	66-110	M 2577	DK-244-022
Tomato pomace (wet)	dimethomorph	0.05-0.5	6	95	76-130	M 2577	DK-244-022
Tomato puree	dimethomorph	0.05-0.5	6	95	76-105	M 2577	DK-244-022
Wheat grain	dimethomorph	0.05-5.0	10	102	90-108	M 3502	2002/5002982
Wheat straw	dimethomorph	0.05-5.0	10	89	82-94	M 3502	2002/5002982
Wine	dimethomorph	0.05-0.5	10	88	77-101	FAMS 022-02	DK-244-032
Wine	dimethomorph	2.5	2	93	86-100	RLA 12654	DK-244-034
Cattle milk	dimethomorph	0.01-0.1	2	78	72-84	FAMS 024-02	DK-249-004
Eggs	dimethomorph	0.01-0.1	2	84	81-86	FAMS 054-01	DK-249-004
Milk	dimethomorph Z89 Z 67 Z 69	0.1 0.1 0.2 0.2	8 8 8 8	89 88 85 86	86-91 77-108 78-90 82-92	FAMS 024-01	DK-326-008
Cattle meat	dimethomorph Z 67 Z 69	0.1 0.1 0.1	8 8 7	90 86 92	83-96 72-98 78-109	FAMS 023-01	DK-326-008
Cattle liver	dimethomorph Z 67 Z 69	0.1 0.1 0.1	8 8 8	95 100 98	83-107 85-111 84-116	FAMS 023-01	DK-326-008

Commodity	Analyte	Spike conc, mg/kg	n	Recovery%		Method	Reference
				mean	range		
Cattle kidney	dimethomorph Z 67 Z 69	0.1 0.1 0.1	8 8 8	101 104 104	88-110 94-118 87-123	FAMS 023-01	DK-326-008

a - multi-residue method DFG S 19 with modified clean-up partitioning step.

Stability of residues in stored analytical samples

The Meeting received information on the stability of residues of dimethomorph in a range of raw agricultural commodities, processed fractions, mik, animal tissues and soil, In these studies, untreated samples were spiked with dimethomorph at different concentrations or samples with incurred residues (from supervised field residue trials) were stored at or below -10 °C in sealed glass containers in the dark, and sub-samples taken for analysis at storage intervals ranging from 0 days to 24 months.

Table 25. Stability of dimethomorph residues in plant and soil matrices stored at or below -10 °C

Matrix (sample type)	Initial residue (mg/kg)	Storage		Procedural % recovery	Residues Remaining (mg/kg) [a]	Analytical method	Reference
		Temp	Duration (months)				
Beer (spiked)	0.5	-18 °C	0 3 6 12 18	 112 91 111 94	0.51 0.61 0.41 0.6 0.4465	DFG Method S 19 LOQ 0.05 mg/kg	DK-790-022
Brewers yeast (spiked)	0.5	-18 °C	0 3 6 12 18	 105 98 100 101	0.51 0.59 0.48 0.51 0.49	DFG Method S 19 LOQ 0.05 mg/kg	DK-790-022
Broccoli (spiked)	0.5	-10 °C	0 4 8 15 18 24	84 93 75 90 88 84	0.39 0.49 0.37 0.38 0.36 0.37	M 3502 LOQ 0.01 mg/kg	2003/5000425
Grape juice (incurred)	0.14	-18 °C	0 1 4 8 12 16	 96 [b] 104 [b] 96 [b] 104 [b] 101 [b]	0.13 0.14 0.14 0.12 0.15 0.13	FAMS 002-04 LOQ 0.01 mg/kg	DK-326-022
Grape waste (incurred)	1.37	-18 °C	0 1 4 8 12 16	 93 [b] 78 [b] 90 [b] 95 [b] 89 [b]	1.37 1.35 1.11 1.32 1.37 1.21	FAMS 002-04 LOQ 0.02 mg/kg	DK-326-022
Grapes (spiked)	0.2	-18 °C	0 3.5 6 14 24	 92 93 92 90	0.19 0.19 0.19 0.18 0.18	RU 151/32/10 (minor modification of FAMS 002-02) LOQ 0.01 mg/kg	DK-326-002 DK-326-003
Grapes (spiked)	2.0	-18 °C	0 3.5 6 14 24	 94 96 98 94	1.92 1.77 1.84 1.92 1.8	RU 151/32/10 (minor modification of FAMS 002-02) LOQ 0.01 mg/kg	DK-326-002 DK-326-003

Matrix (sample type)	Initial residue (mg/kg)	Storage		Procedural % recovery	Residues Remaining (mg/kg) [a]	Analytical method	Reference
		Temp	Duration (months)				
Hops, dry (incurred)	12.2	-18 °C	0 3 6 12 18	95 75 90 96 88	11.6 10.2 10.7 12.5 10.7	DFG Method S 19 LOQ 0.05 mg/kg	DK-790-022
Hops, green (incurred)	12.5	-18 °C	0 3 6 12 18	102 124 85 103 100	12.8 15.8 8.93 10.6 12	DFG Method S 19 LOQ 0.05 mg/kg	DK-790-022
Hops, spent (incurred)	2.24	-18 °C	0 3 6 12 18	88 96 94 103 104	1.97 2.37 2.27 2.56 2.24	DFG Method S 19 LOQ 0.05 mg/kg	DK-790-022
Oilseed rape (incurred)	0.025	-18 °C	0 4 8 12	85 85 [b] 117 [b] 97 [b]	0.021 0.023 0.035 0.021	FAMS 098-02 LOQ 0.01 mg/kg	DK-326-032
Oilseed rape (spiked)	0.5	-10 °C	0 4 8 15 18 24	78 82 113 74 76 83	0.32 0.35 0.51 0.27 0.27 0.3	M 3463 LOQ 0.01 mg/kg	2003/5000425
Potato chips (spiked)	0.5	Frozen	0 1 3 6	90 89 91 85	0.39 0.43 0.41 0.4	M 2639 LOQ 0.05 mg/kg	DK-724-039
Potato frying oil (spiked)	0.5	Frozen	0 1 3 6	102 100 88 103	0.47 0.47 0.42 0.44	M 2639 LOQ 0.05 mg/kg	DK-724-039
Potato granules (spiked)	0.5	Frozen	0 1 3 6	92 95 96 86	0.5 0.48 0.46 0.44	M 2639 LOQ 0.05 mg/kg	DK-724-039
Potato tubers (spiked)	0.1	Frozen	0 1 3 6	87 96 83 77	0.077 0.08 0.067 0.07	M 2639 LOQ 0.01 mg/kg	DK-724-039
Potato wash water (spiked)	0.01	Frozen	0 1 3 6	107 95 95 105	0.01 0.0095 0.009 0.01	M 2639 LOQ 0.001 mg/kg	DK-724-039
Raisins (spiked)	0.02	-18°C	0 2 6 10 14	100 96 95 98	0.019 0.018 0.018 0.02	FAMS 002-04 LOQ 0.02 mg/kg	DK-326-022
Tomato juice (spiked)	0.25	-10 °C	6 21	80 88	0.23 0.23	M 2577 LOQ 0.01 mg/kg)	DK-723-040
Tomato paste (spiked)	0.25	-10 °C	6 21	107 106	0.26 0.24	M 2577 LOQ 0.05 mg/kg)	DK-723-040
Tomato pomace, dry (spiked)	0.25	-10 °C	6 21	92 90	0.24 0.21	M 2577 LOQ 0.05 mg/kg)	DK-723-040
Tomato puree (spiked)	0.25	-10 °C	6 21	103 99	0.25 0.26	M 2577 LOQ 0.05 mg/kg)	DK-723-040

Matrix (sample type)	Initial residue (mg/kg)	Storage		Procedural % recovery	Residues Remaining (mg/kg) [a]	Analytical method	Reference
		Temp	Duration (months)				
Tomato (spiked)	0.25	-10 °C	6 12 18 24	80 98 97 84	0.23 0.28 0.22 0.23	M 2577 LOQ 0.05 mg/kg)	DK-723-040

a - Not corrected for procedural recovery

b - Average of two injections

Storage stability studies were also conducted by Weitzel, R 1994 [DK-326-008] on cattle milk, meat, liver and kidney.

Dimethomorph was added to untreated milk, muscle, liver and kidney samples at a level of 0.1 mg/kg. Metabolites Z 67 and Z 69 were added to milk at 0.2 mg/kg and to tissues at 0.1 mg/kg. Metabolite Z89 was only added to milk at a level of 0.1 mg/kg. The samples were stored at or below -18 °C in sealed glass containers in the dark, and sub-samples were taken for analysis at storage intervals ranging from 0 days to 16 months. Residues in milk were analysed by HPLC-UV using method FAMS 024-01 and meat, kidney and liver samples were analysed by GC-NPD or GC-MS (method FAMS 023-01). The results of this study are summarised below.

Table 26. Stability of residues of dimethomorph and its major metabolites in animal matrices stored at or below -18 °C

Matrix	Analyte	Fortification level (mg/kg)	Storage (Months)	Procedural recovery	Residues Remaining (mg/kg) [a]	Analytical method
Cattle milk	Dimethomorph	0.1	0 4 8 12 16	 90 88 91 88	0.084 0.086 0.085 0.092 0.084	FAMS 024-01
	Metabolite Z89	0.1	0 4 8 12 16	 78 83 90 103	0.085 0.078 0.08 0.088 0.094	
	Metabolite Z67	0.2	0 4 8 12 16	 80 86 91 84	0.168 0.14 0.144 0.178 0.17	
	Metabolite Z69	0.2	0 4 8 12 16	 85 82 89 89	0.16 0.166 0.15 0.16 0.172	
Cattle meat	Dimethomorph	0.1	0 4 8 12 16	 96 90 88 85	0.086 0.088 0.082 0.094 0.089	FAMS 023-01
	Metabolite Z67	0.1	0 4 8 12 16	 97 88 80 81	0.094 0.092 0.081 0.101 0.087	
	Metabolite Z69	0.1	0 4 8 12 16	 109 91 78 82	0.1 0.088 0.076 0.082 0.085	

Matrix	Analyte	Fortification level (mg/kg)	Storage (Months)	Procedural recovery	Residues Remaining (mg/kg) [a]	Analytical method
Cattle liver	Dimethomorph	0.1	0		0.089	FAMS 023-01
			4	99	0.088	
			8	87	0.082	
			12	101	0.086	
			16	95	0.092	
	Metabolite Z67	0.1	0		0.106	
			4	110	0.114	
			8	90	0.084	
			12	105	0.095	
			16	96	0.097	
	Metabolite Z69	0.1	0		0.116	
			4	114	0.098	
			8	89	0.076	
			12	98	0.078	
			16	92	0.09	
Cattle kidney	Dimethomorph	0.1	0		0.084	FAMS 023-01
			4	105	0.094	
			8	89	0.094	
			12	110	0.089	
			16	103	0.092	
	Metabolite Z67	0.1	0		0.089	
			4	104	0.104	
			8	92	0.092	
			12	118	0.096	
			16	103	0.086	
	Metabolite Z69	0.1	0		0.086	
			4	103	0.087	
			8	90	0.076	
			12	122	0.098	
			16	101	0.083	

a - Not corrected for procedural recovery

USE PATTERN

Information on registered uses of dimethomorph was provided to the meeting by Australia and the manufacturers, together with labels for representative uses. These representative uses relating to the crops under consideration are summarised in the following tables.

In general, label recommendations are for use as foliar protectant treatments at regular intervals (5 to 14 days depending on infection pressure), with limited number of applications per season (for resistance management). Most labels also recommend mixing or alternating with fungicides having a different mode of action. In the following tables, application rates have been rounded to 2 significant figures.

Table 27. Representative uses of dimethomorph on fruit crops (from labels provided)

Crop	Country	Form [a]	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Citrus	Thailand	90 WP + mc		0.81 - 1.1		NA	Stem paint
Citrus	Vietnam	90 WP + mc		0.18-0.27		NA	Stem paint
Strawberry	Belgium	50 WP	1		0.05 g ai/plant		Apply just after planting, 1 month later, and when growth recommences in spring
Strawberry (protected)	The Netherlands	50 WP	1	0.05	0.05 g ai/plant	35	Added to nutrient feed solution

Crop	Country	Form [a]	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Strawberry (outdoor)	The Netherlands	50 WP	1		1.5		Apply just after planting
Grapes	Albania	90 WP + mc		0.023		20	
Grapes	Algeria	90 WP + mc			0.23	28	
Grapes	Argentina	90 WP + mc			0.23-0.27	60	PHI for table grapes
Grapes	Australia	90 WP + mc	3+3	0.018	0.18	28	not dried grapes
Grapes	Australia	500 WP	3+3	0.018		28	not dried grapes
Grapes	Austria	150 DC	4	0.018	0.11-0.29	35	
Grapes	Azerbaijan	90 WP + mc	3	0.036-0.045	0.18	40	
Grapes	Belgium	150 DC	3		0.3	28	
Grapes	Bulgaria	60 WG + cu	6	0.015	0.15	14	
Grapes	Bulgaria	90 WP + mc	6	0.018		28	
Grapes	China	500 WP	4	0.017-0.025			
Grapes	China	90 WP + mc	4		0.18-0.23		
Grapes	Colombia	90 WP + mc			0.16-0.2		
Grapes	Colombia	500 WP	4		0.3-0.4	19	
Grapes	Cyprus	75 WP + mc	3	0.015	0.15	14	
Grapes	Cyprus	60 WP + cu	3	0.018-0.02		14	
Grapes	Czech Rep.	90 WP + mc			0.18-0.23	35	
Grapes	France	113 WG + fp	3		0.23	28	
Grapes	France	90 WG +mc	3		0.23	28	
Grapes	France	150 DC	3		0.23	28	
Grapes	Georgia	90 WP + mc	3	0.036-0.045	0.18	40	
Grapes	Germany	150 DC	6	0.018	0.072-0.29	28	wine grapes PHI 35d
Grapes	Germany	113 WG + fp	6	0.014	0.054-0.22	56	
Grapes	Greece	75 WP + mc	3	0.015-0.019		21	
Grapes	Greece	60 WG +cu	3	0.018-0.021		21	
Grapes	Hungary	90 WP + mc	3		0.18-0.23	35	
Grapes	India	500 WP		0.067	0.5	25	
Grapes	Iraq	90 WP + mc			0.18-0.23	28	
Grapes	Israel	90 WG + mc		0.018-0.027		14	
Grapes	Italy	113 WG +fp	3	0.02-0.023	0.2-0.23	10	wine grapes PHI 40d
Grapes	Italy	150 DC		0.02-0.024	0.2-0.24	10	
Grapes	Italy	500 WP		0.02-0.025	0.2-0.25	10	
Grapes	Italy	60 WG +cu		0.021	0.21	20	
Grapes	Italy	90 WG + mc		0.018-0.02	0.18-0.2	28	
Grapes	Italy	150 WG + dt	3	0.019-0.023	0.19-0.23	40	
Grapes	Japan	500 WP	2	0.025		30	PHI 60d for small berries
Grapes	Japan	120 WP + mc	2	0.012-0.016		60	'Pre-flower' use for indoor grapes
Grapes	Japan	150 WP + cu	2	0.025		60	
Grapes	Kazakhstan	90 WP + mc	3	0.036-0.045	0.18	20	
Grapes	Korea	80 WG + dt	3	0.008		30	
Grapes	Korea	75 WP + mc	3	0.015		30	
Grapes	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	28	
Grapes	Luxembourg	150 DC	3		0.3	28	
Grapes	Morocco	90 WP + mc			0.23	40	
Grapes	New Zealand	90 WG + mc	2+2	0.018	0.18	14	
Grapes	Pakistan	75 WP + mc	2	0.019-0.025		14-21	
Grapes	Portugal	60 WG + cu	4	0.015-0.018	0.15-0.18	28	
Grapes	Portugal	113 WG + fp	4	0.01525-0.01808	0.15-0.18	28	wine grapes PHI 42d

Crop	Country	Form [a]	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Grapes	Portugal	75 WG + mc	4	0.015-0.018	0.15-0.18	28	wine grapes PHI 56d
Grapes	Portugal	75 WP + mc	4	0.015-0.018	0.15-0.18	28	wine grapes PHI 56d
Grapes	Romania	90 WP + mc			0.18	12-14	
Grapes	Russia	90 WP + mc	3	0.036-0.045	0.18	40	
Grapes	Slovakia	113 WG + fp		0.018	0.18	14	wine grapes PHI 35d
Grapes	Slovenia	90 WP + mc		0.023	0.23	28	wine grapes PHI 42d
Grapes	South Africa	90 WG + mc		0.018		14	wine grapes PHI 56d
Grapes	Spain	60 WG + cu		0.015-0.018		28	
Grapes	Spain	113 WG + fp		0.0150.018		28	
Grapes	Spain	75 WG + mc		0.015-0.019	0.19	28	
Grapes	Spain	75 WP + mc		0.015-0.019	0.19	28	
Grapes	Spain	150 DC		0.023-0.03		28	
Grapes	Switzerland	150 DC	4	0.01	0.15	28	
Grapes	Taiwan	500 WP	4	0.013	0.15	15	
Grapes	Thailand	500 WP		0.025		7-14	
Grapes	Thailand	90 WP + mc		0.014-0.027		7-14	
Grapes	Tunisia	90 WP + mc		0.018		28	
Grapes	Turkey	60 WG + cu		0.018		10	
Grapes	Turkey	90 WP + mc		0.018		25	
Grapes	Ukraine	90 WP + mc	3		0.18	30	
Grapes	Uruguay	90 WP + mc	3	0.027-0.032	0.18-0.23	28	
Pineapple	Philippines	500 WP	3	0.094	1.76	NS	4,7, 10 month interv
Pineapple	Philippines	500 WP		0.19	380-760 litres/28000 seed pieces	NS	Seed dip

a - Co-formulation abbreviations: mc = mancozeb, cu = copper, fp = folpet, dt = dithianon, ch = chlorothalonil

Table 28. Representative uses of dimethomorph on vegetable and other crops (from labels provided)

Crop	Country [a]	Form	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Vegetables	Cuba	90 WP + mc			0.2-0.23	7	
Bulb vegetables	USA	500 SC 500 WP	5		0.22	0	Notes b, g
Bulb vegetables	Germany	150 DC	4		0.3	14	
Garlic	Chile	90 WP + mc		0.027-0.036	0.14-0.18	7	
Leek	Germany	90 WG + mc	3		0.18	21	
Onion	Australia	500 WP	2+2		0.18	7	
Onion	Australia	90 WP + mc	2+2		0.18	7	
Onion	Azerbaijan	90 WP + mc	3	0.036-0.045	0.18	15	
Onion	Belgium	75 WG + mc	8		0.19	28	
Onion	Bulgaria	90 WP + mc	6		0.18	14	
Onion	Chile	500 SC	3	0.025-0.045	0.18	7	
Onion	Chile	90 WP + mc		0.027-0.036	0.135-0.18	7	
Onion	Colombia	90 WP + mc			0.16-0.2	NS	
Onion	Colombia	500 WP	4		0.3-0.4	7	
Onion	Cyprus	75 WP + mc	3	0.015	0.15	7	
Onion	Czech Rep.	90 WP + mc			0.18-0.23	14	
Onion	Denmark	75 WG + mc	4		0.15	14	
Onion	Ecuador	90 WP + mc		0.034		7	
Onion	Georgia	90 WP + mc	3	0.036-0.045	0.18	15	
Onion	Germany	90 WG + mc	8		0.18	14	
Onion	Hungary	90 WP + mc	3		0.18	21	
Onion	Iraq	90 WP + mc			0.18-0.23	NS	

Crop	Country [a]	Form	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Onion	Japan	120 WP + mc	3	0.012	0.12-0.36	1	
Onion	Japan	150 WP + cu	3	0.019-0.025		7	
Onion	Kazakhstan	90 WP + mc	3	0.036-0.045	0.18	20	
Onion	Korea	75 WP + mc	6	0.015		7	
Onion	Korea	80 WG + dt	3	0.008		7	
Onion	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	3	
Onion	Lithuania	90 WG + mc	2		0.18-0.23	20	
Onion	Luxembourg	75 WG + mc	8		0.19	28	
Onion	Mexico	100 SC + ch	4		0.25	7	
Onion	The Netherlands	75 WG + mc			0.19	14	
Onion	The Netherlands	75 WG + mc			0.19	14	
Onion	New Zealand	90 WG + mc	2+2		0.18	14	
Onion	Poland	90 WP + mc			0.18-0.23	14	
Onion	Romania	90 WP + mc			0.18	12 to 14	
Onion	Slovakia	90 WG + mc		0.023	0.23	14	Incl Welsh, spring onion
Onion	Switzerland	150 DC	4		0.15	21	
Onion	Turkey	90 WP + mc		0.018		5	
Onion	Ukraine	90 WP + mc	3		0.18	30	
Onion	Uruguay	90 WP + mc	3		0.18-0.23	7	
Onion (Welsh)	Japan	150 WP + cu	3	0.015		14	
Onion (Welsh)	Japan	120 WP + mc	3	0.012		30	
Shallot	Belgium	75 WG + mc	8		0.19	28	
Shallot	Luxembourg	75 WG + mc	8		0.19	28	
Shallot	The Netherlands	75 WG + mc			0.19	14	
Broccoli	Germany	150 DC	3		0.18	14	
Cabbage	Japan	150 WP + cu	3	0.015	0.15-0.45	1	
Cauliflower	Germany	150 DC	3		0.18	14	
Kohlrabi	Germany	150 DC	2		0.3	14	
Cucurbits	USA	500 WP 500 SC	5		0.22	0	Notes c, g
Cucumber	Albania	90 WP + mc		0.023		20	
Cucumber	Azerbaijan	90 WP + mc	3	0.036-0.045	0.18	15	
Cucumber	Belarus	90 WP + mc	5		0.18		Seedling use
Cucumber	China	90 WP + mc	4		0.12-0.18		900-1200L/ha
Cucumber	China	500 WP	4		0.23-0.3		675-1200 L/ha
Cucumber	Cyprus	75 WP + mc	3	0.015	0.15	7	
Cucumber	Cyprus	60 WP + cu	3	0.018-0.021	0.18-0.21	7	
Cucumber	Czech Rep.	90 WP + mc			0.18-0.23	7	incl gherkins
Cucumber	Georgia	90 WP + mc	3	0.036-0.045	0.18	15	
Cucumber	Germany	150 DC	3	0.05	0.3-0.6	3	
Cucumber	Greece	75 WP + mc	4	0.015-0.019		7	Field crops: 14d PHI
Cucumber	Guatemala	150 DC		0.034		NS	
Cucumber	Honduras	150 DC		0.034		5	
Cucumber	Hungary	90 WP + mc	3		0.18	5	
Cucumber	Iraq	90 WP + mc			0.18-0.23	NS	
Cucumber	Israel	90 WG + mc			0.18	3	
Cucumber	Japan	150 WP + cu	3	0.019-0.025		1	
Cucumber	Japan	120 WP + mc	3	0.012-0.016		1	
Cucumber	Japan	500 WP	3	0.025		1	
Cucumber	Kazakhstan	90 WP + mc	3	0.036-0.045	0.18	20	
Cucumber	Korea	80 WG + dt	3	0.008		7	
Cucumber	Korea	75 WP + mc	2	0.015		7	
Cucumber	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	7	
Cucumber	Mexico	100 SC + ch	4		0.25	7	

Crop	Country [a]	Form	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Cucumber	Pakistan	75 WP + mc		0.019-0.025		14 to 21	
Cucumber	Poland	90 WP + mc			0.18-0.27	3	
Cucumber	Poland	90 WP + mc		0.018-0.027		3	
Cucumber	Romania	90 WP + mc			0.18	12 to 14	
Cucumber	Russia	90 WP + mc	3	0.036-0.045	0.18	15	
Cucumber	Slovakia	90 WG + mc	3	0.023	0.23	8	
Cucumber	Switzerland	150 DC	4	0.015	0.15	3	
Cucumber	Taiwan	500 WP	3	0.017	2	6	Soil drench
Cucumber	Thailand	90 WP + mc		0.027-0.04		7 to 14	
Cucumber	Turkey	90 WP + mc		0.018		5	
Cucumber	Ukraine	90 WP + mc	3		0.18	30	
Cucurbits	Australia	90 WP + mc	2+2		0.18	7	
Cucurbits	Australia	500 WP	2+2		0.18	7	
Melon	Colombia	90 WP + mc			0.16-0.2		
Melon	Colombia	500 WP	4		0.3-0.4	7	
Melon	Costa Rica	90 WP + mc		0.034		5	
Melon	Costa Rica	100 SC + ch	3	0.038		15	
Melon	Cyprus	75 WP + mc	3	0.015	0.15	7	
Melon	Cyprus	60 WP + cu	3	0.018-0.021	0.18-0.21	7	
Melon	El Salvador	100 SC + ch	3	0.038		15	
Melon	Guatemala	150 DC		0.034		5	
Melon	Guatemala	100 SC + ch	3	0.038		15	
Melon	Honduras	150 DC		0.034		5	
Melon	Honduras	100 SC + ch	3	0.038		15	
Melon	Israel	90 WG + mc			0.18	3	
Melon	Italy	60 WG + cu		0.018-0.021	0.18-0.21	20	
Melon	Italy	113 WG + fp	3	0.018-0.023	0.18-0.23	21	
Melon	Japan	150 WP + cu	3	0.015		1	
Melon	Malaysia	90 WP + mc	4	0.017	0.16	14	Honey dew
Melon	Mexico	100 SC + ch	4		0.25	7	
Melon	Nicaragua	100 SC + ch	3	0.038		15	
Melon	Panama	100 SC + ch	3	0.038		15	
Melon	Spain	75 WG + mc		0.019-0.023		14	
Melon	Spain	75 WP + mc		0.019-0.023		14	
Melon	Taiwan	500 WP	3	0.017	0.17	12	Cantaloupe
Squash	Cyprus	60 WP + cu	3	0.018-0.021	0.18-0.21	7	'Courgettes'
Squash	Germany	150 DC	3	0.05	0.3	7	
Squash	Mexico	100 SC + ch	4		0.25	7	
Watermelon	Costa Rica	100 SC + ch	3	0.038		15	
Watermelon	Guatemala	150 DC		0.038		5	
Watermelon	Honduras	150 DC		0.038		5	
Watermelon	Japan	120 WP + mc	3	0.012		7	
Watermelon	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	14	
Watermelon	Panama	100 SC + ch	3	0.038		15	
Watermelon	Vietnam	90 WP + mc	5	0.028-0.034		14	
Zucchini	Germany	150 DC	3	0.05	0.3	7	
Zucchini	Israel	90 WG + mc			0.18	3	
Zucchini	Mexico	100 SC + ch	4		0.25	7	
Fruiting vegetables	USA	500 SC 500 WP	5		0.22	0	Ex tomatoes Notes d, g
Pepper	Bangladesh	90 WP + mc		0.018		NS	
Pepper	Chile	500 SC	3	0.025-0.045	0.18	7	
Pepper	Chile	90 WP + mc	3		0.14-0.18	7	
Pepper (Sweet)	China	500 WP	4		0.3-0.45		
Pepper	Cyprus	75 WP + mc	3	0.015	0.15	7	
Pepper	Indonesia	500 WP		0.1-0.2			
Pepper	Iraq	90 WP + mc			0.18-0.23	NS	
Pepper	Korea	25 WP + mc	4	0.025		3	
Pepper	Korea	80 WG + dt	4	0.016		7	

Crop	Country [a]	Form	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Pepper	Korea	75 WP + mc	3	0.015		14	
Pepper	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	7	
Pepper	Spain	75 WG + mc		0.019-0.023		3	
Pepper	Spain	75 WP + mc		0.019-0.023		3	
Pepper (sweet)	China	90 WP + mc	4		0.18-0.23		900-1200L/ha
Pepper (sweet)	Guatemala	150 DC		0.034		NS	
Pepper (sweet)	Honduras	150 DC		0.034		7	
Tomato	Albania	90 WP + mc		0.023		20	
Tomato	Algeria	90 WP + mc			0.18	28	
Tomato	Azerbaijan	90 WP + mc	3	0.036-0.045	0.18	40	
Tomato	Bangladesh	90 WP + mc	3	0.018		NS	
Tomato	Belarus	90 WP + mc	3		0.14	40	
Tomato	Belise	90 WP + mc		0.034		7	
Tomato	Bolivia	90 WP + mc		0.034	0.16-0.23	7	
Tomato	Brazil	100 SC + ch	4	0.03	0.3	7	
Tomato	Brazil	90 WP + mc	3	0.036		7	
Tomato	Brazil	500 WP	4	0.075		7	
Tomato	Bulgaria	60 WG + cu	6	0.015	0.15	14	
Tomato	Bulgaria	90 WP + mc	6	0.018		14	
Tomato	Chile	500 SC	3	0.025-0.045	0.18	7	
Tomato	Chile	90 WP + mc		0.027-0.036	0.14-0.18	7	
Tomato	Colombia	90 WP + mc			0.16-0.22		
Tomato	Colombia	500 WP	4		0.3-0.4	16	
Tomato	Costa Rica	100 SC + ch		0.035		7	
Tomato	Costa Rica	90 WP + mc		0.034		7	
Tomato	Cyprus	75 WP + mc	3	0.015	0.15	7	
Tomato	Cyprus	60 WP + cu	3	0.018-0.021	0.18-0.21	7	
Tomato	Czech Rep.	90 WP + mc			0.18-0.23	21	
Tomato	Dominica	90 WP + mc		0.034		7	
Tomato	Ecuador	90 WP + mc		0.034		7	
Tomato	El Salvador	100 SC + ch		0.038		7	
Tomato	El Salvador	90 WP + mc		0.034		7	
Tomato	Georgia	90 WP + mc	3	0.036-0.045	0.18	40	
Tomato	Guatemala	100 SC + ch		0.038		7	
Tomato	Guatemala	90 WP + mc		0.034		7	
Tomato	Guatemala	150 DC		0.034		7	
Tomato	Honduras	100 SC + ch		0.038		7	
Tomato	Honduras	90 WP + mc		0.034		7	
Tomato	Honduras	150 DC		0.034		7	
Tomato	Hungary	90 WP + mc	3		0.18	7	
Tomato	Indonesia	500 WP		0.025-0.05			
Tomato	Italy	90 WG + mc		0.018-0.02	0.18-0.2		To 1st flowers
Tomato	Italy	113 WG + fp	3	0.018-0.023	0.18-0.23	7	
Tomato	Italy	60 WG + cu		0.018-0.021	0.18-0.21	20	
Tomato	Japan	150 WP + cu	3	0.019-0.025		1	
Tomato	Japan	120 WP + mc	2	0.016		1	
Tomato	Japan	500 WP	3	0.025		1	
Tomato	Kazakhstan	90 WP + mc	3	0.036-0.045	0.18	20	
Tomato	Kenya	90 WP + mc		0.023	0.18	7	
Tomato	Korea	80 WG + dt	4	0.016		3	
Tomato	Korea	75 WP + mc	4	0.015		3	
Tomato	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	7	
Tomato	Malaysia	90 WP + mc	4	0.015	0.14	14	
Tomato	Malaysia	500 WP	4	0.02	0.16	14	
Tomato	Mexico	100 SC + ch	4		0.25	14	
Tomato	Nicaragua	100 SC + ch		0.038		7	
Tomato	Nicaragua	90 WP + mc		0.034		7	
Tomato	Nicaragua	150 DC		0.034		7	
Tomato	Pakistan	75 WP + mc		0.019-0.025		14 to 21	

Crop	Country [a]	Form	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Tomato	Panama	100 SC + ch		0.035		7	
Tomato	Panama	90 WP + mc		0.034		7	
Tomato	Philippines	90 WP + mc		0.031-0.037	0.15-0.18	7	
Tomato	Philippines	500 WP		0.016-0.0313		7	
Tomato	Poland	90 WP + mc			0.18-0.23	7	
Tomato	Poland	90 WP + mc		0.009-0.014		7	
Tomato	Portugal	75 WP + mc	3	0.018	0.18	3	Process crops: 28d PHI
Tomato	Portugal	75 WG + mc	3	0.018	0.18	7	
Tomato	Romania	90 WP + mc			0.18	12 to 14	
Tomato	Russia	90 WP + mc	3	0.036-0.045	0.18	40	
Tomato	Slovakia	90 WG + mc		0.018-0.023	0.18-0.23	21	
Tomato	Spain	75 WG + mc		0.015-0.019		14	
Tomato	Spain	75 WP + mc		0.015-0.019		14	
Tomato	Switzerland	150 DC	4		0.15	3	
Tomato	Taiwan	500 WP	4	0.013	0.13	6	
Tomato	Tunisia	90 WP + mc		0.018		3	
Tomato	Turkey	90 WP + mc		0.023		5	
Tomato	Turkey	60 WG + cu		0.018		7	
Tomato	Ukraine	90 WP + mc	3		0.18	20	
Tomato	Uruguay	90 WP + mc	3	0.027-0.032	0.18-0.23	7	
Tomato	USA	500 WP 500 SC	5		0.22	4	Note g
Brassica leafy greens	USA	500 SC 500 WP	5		0.224	0	Notes e, g
Brassica head & stem vegetables	USA	500 SC 500 WP	5		0.224	7	Notes f, g
Cabbage chinese	Japan	120 WP + mc	1	0.012		30	
Cabbage chinese	Japan	150 WP + cu	3	0.015		14	
Lettuce	Belgium	50 WP	2		0.36	14	Outdoor crops
Lettuce	Germany	90 WG + mc	3		0.18	21	incl endive & similar
Lettuce	Iraq	90 WP + mc			0.18-0.23		
Lettuce	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	7	
Lettuce	New Zealand	90 WG + mc	2+2		0.18	14	
Lettuce	Spain	75 WP + mc		0.023-0.026	0.23	7	
Lettuce	Spain	75 WG + mc		0.023-0.026		7	
Lettuce	Switzerland	150 DC	4		0.15	21	
Lettuce	USA	500 SC 500 WP	5		0.22	0	Note g
Lettuce (head)	Australia	90 WP + mc	2+2		0.18	14	
Lettuce (head)	Australia	500 WP	2+2		0.18	14	
Spinach	Germany	150 DC	2		0.3	14	
Spinach	Switzerland	150 DC	4		0.15	14	Winter spinach: 21d PHI
Potato	Albania	90 WP + mc		0.023	0.18	20	
Potato	Algeria	90 WP + mc			0.18	28	
Potato	Argentina	90 WP + mc	3		0.18-0.23	7	
Potato	Australia	500 WP	2+2		0.18	14	
Potato	Australia	90 WP + mc	2+2		0.18	49	
Potato	Azerbaijan	90 WP + mc	3	0.036-0.045	0.18	20	
Potato	Bangladesh	90 WP + mc	3	0.018		NS	
Potato	Belarus	90 WP + mc	3	0.045	0.18	20	
Potato	Belgium	75 WG + mc	12		0.15-0.19	14	
Potato	Belise	90 WP + mc		0.034		7	
Potato	Bolivia	90 WP + mc		0.034	0.16-0.23	14	
Potato	Brazil	500 WP	4		0.4	14	

Crop	Country [a]	Form	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Potato	Brazil	90 WP + mc	3		0.23	14	
Potato	Bulgaria	90 WP + mc	6		0.18	14	
Potato	Bulgaria	60 WG + cu	6	0.015	0.15	14	
Potato	Canada	500 WP	3		0.23	4	
Potato	Chile	500 SC	3	0.025-0.045	0.18	7	
Potato	Chile	90 WP + mc		0.027-0.036	0.14-0.18	7	
Potato	Colombia	90 WP + mc			0.16-0.22		
Potato	Colombia	500 WP	4		0.3-0.4	16	
Potato	Costa Rica	100 SC + ch		0.035		7	
Potato	Costa Rica	90 WP + mc		0.034		7	
Potato	Cuba	90 WP + mc			0.23	10	
Potato	Cyprus	60 WP + cu	3	0.018-0.021	0.18-0.21	7	
Potato	Cyprus	75 WP + mc	3	0.015	0.15	7	
Potato	Czech Rep.	90 WP + mc			0.18	14	
Potato	Denmark	75 WG + mc	8		0.075-0.15	14	
Potato	Dominica	90 WP + mc		0.034		7	
Potato	Ecuador	90 WP + mc		0.034	0.16-0.22	7	
Potato	El Salvador	100 SC + ch		0.038		7	
Potato	El Salvador	90 WP + mc		0.034		7	
Potato	Estonia	90 WG + mc	3		0.18	20	
Potato	France	90 WG + mc	4		0.18	7	
Potato	Georgia	90 WP + mc	3	0.036-0.045	0.18	20	
Potato	Germany	90 WG + mc	5		0.14-0.18	14	
Potato	Greece	75 WP + mc	3		0.15-0.19	14	
Potato	Greece	60 WG + cu	3		0.18-0.21	15	
Potato	Guatemala	100 SC + ch		0.038		7	
Potato	Guatemala	150 DC		0.034		7	
Potato	Guatemala	90 WP + mc		0.034		7	
Potato	Honduras	100 SC + ch		0.038		7	
Potato	Honduras	150 DC		0.034		7	
Potato	Honduras	90 WP + mc		0.034		7	
Potato	Hungary	90 WP + mc	3		0.18	21	
Potato	India	500 WP	3	0.067	0.5	16	
Potato	Indonesia	500 WP		0.025	0.3		
Potato	Iraq	90 WP + mc			0.18-0.23	7	
Potato	Ireland	75 WG + mc	8		0.18	7	
Potato	Israel	90 WG + mc			0.18	3	
Potato	Italy	60 WG + cu		0.018-0.021	0.18-0.21	20	
Potato	Japan	120 WP + mc	3	0.016-0.024		14	
Potato	Japan	150 WP + cu	3	0.025-0.038		14	
Potato	Japan	500 WP	3	0.013-0.025		14	
Potato	Kazakhstan	90 WP + mc	3	0.036-0.045	0.18	20	
Potato	Kenya	90 WP + mc		0.0225	0.18	7	
Potato	Korea	80 WG + dt	5	0.016		10	
Potato	Korea	75 WP + mc	3	0.015		14	
Potato	Latvia	90 WG + mc	4		0.18	20	
Potato	Lebanon	90 WP + mc		0.018-0.023	0.18-0.23	7	
Potato	Lithuania	90 WG + mc	4		0.18	20	
Potato	Luxembourg	75 WG + mc	12		0.15-0.19	14	
Potato	Mexico	100 SC + ch	4		0.25	14	
Potato	Morocco	90 WP + mc			0.18	30	
Potato	The Netherlands	75 WG + mc			0.15	NS	
Potato	The Netherlands	75 WG + mc			0.15	14	
Potato	New Zealand	90 WG + mc	2+2		0.18	14	
Potato	Nicaragua	100 SC + ch		0.038		7	
Potato	Nicaragua	150 DC		0.034		7	
Potato	Nicaragua	90 WP + mc		0.034		7	

Crop	Country [a]	Form	Application			PHI (days)	Notes
			Max No	Conc kg ai/hL	Rate kg ai/ha		
Potato	Pakistan	75 WP + mc		0.019-0.025		14-21	
Potato	Panama	100 SC + ch		0.035		7	
Potato	Panama	90 WP + mc		0.034		7	
Potato	Philippines	90 WP + mc		0.031-0.037	0.15-0.18	14	
Potato	Philippines	500 WP		0.016-0.031		14	
Potato	Poland	90 WP + mc			0.18	14	
Potato	Portugal	75 WG + mc	3	0.018	0.18	7	
Potato	Portugal	75 WP + mc	3	0.018	0.18	7	
Potato	Romania	90 WP + mc			0.18	12 to 14	
Potato	Russia	90 WP + mc	3	0.036-0.045	0.18	Nil	
Potato	Slovakia	90 WG + mc			0.18	14	
Potato	Slovenia	90 WP + mc		0.018-0.023	0.18-0.23	14	
Potato	South Africa	90 WG + mc			0.18	3	
Potato	Spain	75 WG + mc		0.015-0.019		21	
Potato	Spain	75 WP + mc		0.015-0.019		21	
Potato	Switzerland	150 DC	4		0.15	14	
Potato	Taiwan	500 WP	4	0.013	0.13	7	
Potato	Thailand	500 WP		0.05-0.075		7-14	
Potato	Tunisia	90 WP + mc		0.018		3	
Potato	Turkey	90 WP + mc			0.23	5	
Potato	Turkey	60 WG + cu		0.018		7	
Potato	UK	75 WG + mc	8	0.075	0.15	7	
Potato	Ukraine	90 WP + mc	3		0.18	20	
Potato	Uruguay	90 WP + mc	3		0.18-0.23	14	
Potato	USA	500 SC 500 WP	8		0.14-0.22	4	Note g
Potato	Zimbabwe	90 WP + mc			0.18	3	
Radish	Austria	150 DC	2		0.2	14	
Radish	Germany	150 DC	2		0.2	14	
Radish	Germany	90 WG + mc	2		0.18	14	
Sugarbeet	Ukraine	90 WP + mc	3		0.18	50	
Taro	USA	500 SC 500 WP	5		0.22	7 (tops) 30 (corms)	Note g
Rape seed	Germany	500 WP	1		5 g ai/kg seed		Seed treatment
Hops	Austria	150 DC	6	0.015		10	
Hops	Germany	150 DC	6	0.015	0.15-0.6	10	
Hops	Romania	90 WP + mc			0.18	12 to 14	
Hops	Switzerland	150 DC	6	0.015	0.15	14	
Hops	USA	500 SC 500 WP	3		0.22	7	Max 0.67 kg ai/ha/year
Pepper (black)	Vietnam	90 WP + mc	5	0.025-0.028		14	

a - Co-formulation abbreviations: mc = mancozeb, cu = copper, fp = folpet, dt = dithianon, ch = chlorothalonil

b - Bulb vegetables = garlic, garlic (great-headed), leek, onion (dry), onion (green), onion (welch), shallots

c - Cucurbits = cantaloupe, chayote, chinese wax gourd, citron melon, cucumber, gherkin, gourd (edible), melon, Momordica spp, muskmelon, pumpkin, squash (summer), squash (winter), watermelon

d - Fruiting vegetables (except tomatoes) = eggplant, ground cherry, pepino, peppers, tomatillo

e - Brassica leafy greens = broccoli raab, kale, chinese cabbage, collards, mizuna, mustard greens, mustard spinach, rape greens.

f - Brassica head & stem vegetables = broccoli, chinese broccoli, Brussels sprouts, cabbage, chinese cabbage (Napa), chinese mustard, cauliflower, cavalo, broccoli, kohlrabi (Label pending, MRL established).

g - Maximum 1.12 kg ai/ha/season

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting received information on supervised field trials involving dimethomorph for the following crops and commodities.

Commodity	Crop	Countries	Table
whole fruit, pulp, peel	orange	Spain	29
whole fruit	strawberries	Belgium, The Netherlands, Spain	30-31
bunches	grapes	France, Germany, Italy, Greece, Spain	32-33
bunches	grapes	Australia, Brazil, New Zealand	34
flesh, peel	pineapple	Philippines	35
dry bulb	onions	Australia, Brazil, France, Germany	36
bulbs and tops	green onions	Australia	37
heads	cabbage	USA	38
heads and stalks	broccoli	USA	39
kohlrabi (stem-base)	kohlrabi [a/]	Germany	40-41
fruit	cucumbers [a/]	France, Hungary, Germany, Greece, Italy, Spain	42-43
fruit	courgettes (protected)	Greece, Italy, Spain	44
fruit	zucchini	Australia	45
pulp, peel, whole fruit	melons	Australia, Brazil, France, Italy, Spain	46
whole fruit	tomato [a/]	Brazil, France, Germany, Greece, Italy, Korea, Spain, USA	47-49
whole fruit	peppers, sweet [a/]	Greece, Italy, Korea, Spain	50-51
heads	lettuce [a/]	Australia, France, Germany, Greece, Italy, Spain	52-53
whole plants (without roots)	corn salad [a/]	Italy, Spain	54
leaves and stalks	spinach	USA	55
tubers	potatoes	Argentina, Australia, Belgium, Brazil, Canada, Denmark, France, Greece, Germany, France, Italy, New Zealand, Spain, UK, USA	56-57
oil seed	rape seed	Germany	58
green and dry cones	hops	Germany	59

a - Included outdoor and protected crops

Trials were well documented with laboratory and field reports. Laboratory reports included procedural recoveries with spiking at residue levels similar to those occurring in samples from the supervised trials. Dates of analyses or duration of residue sample storage were also provided. Although trials included control plots, no control data are recorded in the tables unless residues in control samples exceeded the LOQ. Where residues are reported in samples from control plots, these are recorded as "(c=n.nn)" in the tables. Residue data are reported unadjusted for recovery.

In most trials treated plots were not replicated but where results were reported from replicate plots, these are presented as individual values. Average residues are reported from the analysis of replicate field samples and replicate laboratory samples. When residues were not detected they are shown as below the LOQ (e.g., < 0.01 mg/kg). Residues and application rates have generally been rounded to two significant figures or, for residues near the LOQ, to one significant figure. Where trials have involved two or more applications, the mean or target application rate has been recorded unless the individual rates differ by more than 10%.

In trials involving more than one application, and where samples were taken immediately before the last application, residues from these samples are recorded as being applied at '-0' days.

Residue values from the trials conducted according to maximum GAP have been used for the estimation of maximum residue levels, STMRs and HRs. These results are double underlined.

Intervals of freezer storage between sampling and analysis were recorded for most trials and were covered by the conditions of the freezer storage stability studies in most cases. Where extended storage periods were reported, these have been noted.

Orange

In trials on oranges in Spain, 2 foliar applications of dimethomorph (DC formulation) were made at 15 day intervals to unreplicated plots, using motorised knapsack sprayers and hand lances to apply about 3000 litres of spray mix/ha. Mature fruit (2 – 3 kg or at least 24 fruit) were sampled, frozen within 5 hours and stored at or below -18 °C for up to 12 months before analysis. Both the whole fruit and the pulp were analysed seperately, using Method PE 804 to measure residues of dimethomorph. The limit of quantification of this method was 0.01 mg/kg for all analytes and the mean recovery rates were 80 – 103% (whole fruit), 73 – 95% (peel) and 93 – 105% (pulp) at fortification levels of 0.05 – 0.4 mg/kg.

Table 29. Residues in orange from foliar applications of dimethomorph in supervised trials in Spain

ORANGE Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)			Reference & Comments
		kg ai/ha	kg ai/hL	no		Pulp	Peel	Whole fruit	
Spain, 2004 (Valencia Late)	DC 150	0.4	0.013	2	0 7 14 21 28	 < 0.01 < 0.01 < 0.01	 0.22 0.17 0.11	0.15 0.07 0.04 0.04 0.02	2005/1034175 (04/S/05)
Spain, 2004 (Valencia Late)	DC 150	0.4	0.013	2	0 7 14 21 28	 < 0.01 < 0.01 < 0.01	 0.13 0.08 0.03	0.06 0.06 0.04 0.02 < 0.01	2005/1034175 (04/S/06)
Spain, 2005 (Clemenules)	DC 150	0.4	0.013	2	7 14	< 0.01 < 0.01	0.14 0.14	0.09 0.05	2006/1015076 (05/S/41)
Spain, 2005 (Clemenules)	DC 150	0.4	0.013	2	7 14	< 0.01 < 0.01	0.27 0.2	0.24 0.14	2006/1015076 (05/S/42)
Spain, 2005 (Lane Late)	DC 150	0.4	0.013	2	0 7 14 21 28	 < 0.01 < 0.01 < 0.01	 1.35 0.93 0.96	0.31 0.19 0.17 0.2 0.08	2006/1015077 (05/S/03)
Spain, 2005 (Salustiana)	DC 150	0.4	0.013	2	0 7 14 21 28	 < 0.01 < 0.01 < 0.01	 0.87 0.58 0.52	0.37 0.17 0.23 0.11 0.08	2006/1015077 (05/S/01)
Spain, 2005 (Salustiana)	DC 150	0.4	0.013	2	0 7 14 21 28	 < 0.01 < 0.01 < 0.01	 1.24 1.22 0.64	0.61 0.39 0.6 0.33 0.18	2006/1015077 (05/S/02)
Spain, 2005 (Valencia Late)	DC 150	0.4	0.013	2	0 7 14 21 28	 < 0.01 < 0.01 < 0.01	 0.62 0.44 0.45	0.15 0.18 0.07 0.08 0.04	2006/1015077 (05/S/04)

Strawberries

In trials on strawberries in Belgium and The Netherlands, dimethomorph (WP or DC formulations) were applied as a root drench (applying 0.05 g ai in 0.1 – 0.25 litres/plant), just after planting (The Netherlands) or at plaqnting, one month later and at the start of spring growth (Belgium). In trials in Spain dimethomorph was added to the drip irrigation system to apply 0.75 kg ai/ha. Treatment plots in the Netherlands trials were either 50 plants or 6 square metres and where multiple applications were involved, these were made 1 and 6 months apart. Plot sizes in the trials in Spain were 36 square metres with two applications, 15 days apart, involving 0.017 kg ai/hL of irrigation water, applied at a rate of about 4400 litres/ha (5 litres/hour/metre of perforated drip tape).

In trials in The Netherlands dimethomorph (WP formulation) was applied as a foliar spray using a small plot boom sprayer to apply about 1000 litres of spray mix/ha just after planting. Plot sizes in these trials were 6 square metres.

Mature fruit (1 kg or more) were sampled, frozen within 6 hours and stored at or below -18 °C for up to 12 months before analysis. Analytical methods used in the trials in The Netherlands and Spain to measure dimethomorph residues were FAMS 002-02 and PE 802 respectively. Method MR 029 was used in the trials in Belgium, this being a modification of Method PE 802 with analysis by HPLC-UV. The limit of quantification for these method was 0.01 mg/kg and the mean recovery rates were 90 – 105% at fortification levels of 0.01 – 0.3 mg/kg.

Table 30. Residues in strawberries from applications of dimethomorph as a root drench or in irrigation water in supervised trials in Belgium, The Netherlands and Spain

STRAWBERRY Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		Whole fruit	
Belgium, 1992 (NE) (Elsanta)	WP 500g	0.05g ai/ 250ml/plant	0.02	3	58 64	< 0.01 (2), 0.01 (2) < 0.01 (2), 0.01 (2)	DK-713-039
Belgium, 1994 (NE) (Elsanta)	WP 500g	0.05 g ai/ 100ml/plant	0.05	3	64	< 0.01, 0.01	DK-713-040
Belgium, 1994 (NE) (Elsanta)	WP 500g	0.05 g ai/ 100ml/plant	0.05	3	64	0.02, 0.02	DK-713-041
Belgium, 1994 (NE) (Valeta)	WP 500g	0.05 g ai/ 100ml/plant	0.05	3	76	0.01, 0.02	DK-713-042
Netherlands, 1994 (NE) (Elsanta)	WP 500g	0.05 g ai/ 100ml/plant	0.05	1	45	0.02	DK-713-018 (CYNF94143)
Netherlands, 1994 (NE) (Elsanta)	WP 500g	0.05 g ai/ 100ml/plant	0.05	1	55	0.01	DK-713-018 (CYNF94320)
Netherlands, 1994 (NE) (Elsanta)	WP 500g	0.05 g ai/ 100ml/plant	0.05	1	41	0.01	DK-713-018 (CYNF94323)
Netherlands, 1994 (NE) (Elsanta)	WP 500g	0.05 g ai/ 100ml/plant	0.05	1	39	0.01	DK-713-018 (CYNF94324)
Spain, 2004 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.017	2	1 3 7 21 29	0.02 0.03 0.06 0.05 0.04	2006/1015075 (04/S/01)
Spain, 2004 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.017	2	1 3 7 21 29	< 0.01 < 0.01 0.02 0.02 < 0.01	2006/1015075 (04/S/02)
Spain, 2004 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.017	2	1 3 7 21	< 0.01 0.01 0.02 0.06	2006/1015075 (04/S/03)

STRAWBERRY Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		Whole fruit	
					28	0.03	
Spain, 2004 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.017	2	1 4 7 20 27	0.13 0.06 0.18 0.04 0.03	2006/1015075 (04/S/04)
Spain, 2005 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.018	2	1 3 7 22 28	0.03 0.12 0.1 0.03 0.05	2006/1015079 (04/S/05)
Spain, 2005 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.018	2	1 3 7 22 28	0.03 0.07 0.05 0.03 0.02	2006/1015075 (04/S/06)
Spain, 2005 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.018	2	1 2 6 21 27	0.02 0.03 0.03 0.03 0.03	2006/1015075 (04/S/07)
Spain, 2005 (SE) (Camarosa)	DC 150g	0.75 in drip irrigation	0.018	2	1 2 6 21 27	0.06 0.11 0.12 0.07 0.04	2006/1015075 (04/S/08)

Table 31. Residues in strawberries from foliar applications of dimethomorph in supervised trials in The Netherlands

STRAWBERRY Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) Whole fruit	Reference & Comments
		kg ai/ha	kg ai/hL	no			
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	1.5	0.15	1	45	< 0.01	DK-713-018 (CYNF94143)
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	3.0	0.3	1	45	< 0.01	DK-713-018 (CYNF94143)
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	1.5	0.15	1	55	< 0.01	DK-713-018 (CYNF94320)
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	3.0	0.3	1	55	< 0.01	DK-713-018 (CYNF94320)
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	1.5	0.15	1	41	< 0.01	DK-713-018 (CYNF94323)
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	3.0	0.3	1	41	< 0.01	DK-713-018 (CYNF94323)
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	1.5	0.15	1	39	< 0.01	DK-713-018 (CYNF94324)
The Netherlands, 1994 (NE) (Elsanta)	WP 500g	3.0	0.3	1	39	< 0.01	DK-713-018 (CYNF94324)

Grapes

In trials on grapes in France, Germany, Greece, Italy and Spain, and also from Australia, Brazil and New Zealand, dimethomorph in a range of formulated products, with and without other fungicide active ingredients was applied as foliar sprays at intervals of between 8 and 20 days (but commonly 10 – 14 days), with between 3 and 10 applications per season. Water rates in these trials ranged from 200 L/ha up to 1800 L/ha and in many of the trials in Germany and Italy, water rates increased during the season to achieve full coverage while retaining a constant spray concentration. Application equipment ranged from small backpack plot sprayers to motorised mistblowers and specialised recycling plot tunnel-sprayers.

Mature grapes (generally 12 bunches or 2 kg) were sampled, frozen within 2 – 24 hours and stored at or below -18 °C for up to 16 months before analysis using either Method FAMS 002-02, FAMS 002-04, FAMS 022-02, M 3502, RLA 12654 or a modification of the DFG S 19 multiresidue method. Limits of quantification for the various methods were 0.02 mg/kg or 0.05 mg/kg (for methods M 3502 and RLA 12654). Average recovery rates were 76 – 108% at fortification levels of 0.01 – 10 mg/kg.

In a number of trials, additional samples of mature grapes were taken for further processing to measure dimethomorph residues in must, pomace and wine. In two trials in Spain, Moscatel grapes were also analysed after being sun-dried for 30 days to produce raisins.The results of these studies are summarized in the section on Processing below.

Table 32. Residues in grapes from foliar applications of dimethomorph in supervised trials in France, Germany, Greece, Italy and Spain

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Germany, 1997 (Dornfelder)	WG 113g+ folpet	0.08 up to 0.22	0.014	6	-0 0 14 21 28 35 42 49	0.4 0.74 0.32 0.21 0.24 0.21 0.19 0.19	DK-713-035 (CYD 04-02)
Germany, 1997 (Reisling)	WG 113g+ folpet	0.08 up to 0.21	0.014	6	-0 0 14 21 28 35 42 49	0.22 0.49 0.47 0.37 0.38 0.42 0.33 0.29	DK-713-035 (CYD 04-06)
Germany, 1996 (Dornfelder)	WG 113g+ folpet	0.05 up to 0.25	0.014	8	-0 0 7 14 22 28 35	3.4 7.2 5.5 5.2 5.8 4.0 5.7	DK-713-033 (CYD 01-02)
Germany, 1996 (Mulller Thurgau)	WG 113g+ folpet	0.05 up to 0.25	0.014	8	-0 0 7 14 21 28 34	0.34 0.64 0.39 0.39 0.29 0.3 0.27	DK-713-033 (CYD 01-04)

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Germany, 1996 (Portugieser)	WG 113g+ folpet	0.05 up to 0.25	0.014	8	-0 0 7 14 21 28 35	0.69 1.0 0.72 0.65 0.59 0.57 0.65	DK-713-033 (CYD 01-03)
Germany, 1996 (Reisling)	WG 113g+ folpet	0.06 up to 0.24	0.014	8	-0 0 7 15 21 28 35	0.66 0.89 0.97 0.99 1.1 0.87 0.78	DK-713-033 (CYD 01-01)
Germany, 1997 (Dornfelder)	WG 113g+ folpet	0.08 up to 0.22	0.014	8	-0 0 14 21 28 35 42 49	0.65 1.26 0.65 0.56 0.42 0.37 0.44 0.41	DK-713-035 (CYD 04-01)
Germany, 1997 (Reisling)	WG 113g+ folpet	0.08 up to 0.22	0.014	8	-0 0 14 21 28 35 42 49	0.87 0.98 0.75 0.86 0.79 0.91 0.63 0.47	DK-713-035 (CYD 04-05)
Germany, 1993 (Kerner)	WP 90g	0.2	0.015	4	0 1 7 14 21 28	0.13 0.17 0.12 0.1 0.09 0.09	DK-713-019 (BE042)
Germany, 1993 (Kerner)	WP 90g+ mczb	0.2	0.015	4	28	0.11	DK-713-019 (BE031
Germany, 1995 (Portugieser)	WG 150+ dthnn	0.1 up to 0.27	0.015	8	-0 0 7 14 28 35 42	0.66 0.76 0.63 0.36 0.5 0.32 0.32	DK-713-032 (95-115-01)
Germany, 1995 (Scheurebe)	WG 150+ dthnn	0.1 up to 0.27	0.015	8	-0 0 7 14 28 35 42	0.72 1.0 0.58 0.32 0.25 0.13 0.13	DK-713-032 (95-115-02)
Italy, 1998 (Lambrusco)	WG 60g+ mnczb+fstyl	0.16 up to 0.23	0.018	6	39	0.02	DK-713-038 (T6) 2 month interval to last spray
Germany, 1993 (Faber)	DC 150g	0.13 up to 0.26	0.018	8	0 14 28 35 42	2.0 1.9 1.7 0.8 1.0	DK-713-020 + DK-713-026 (9301-03)

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Germany, 1993 (Faber)	DC 150g	0.16 up to 0.27	0.018	8	0 14 28	1.5 1.0 0.76	DK-713-024 DK-713-025 (9401-03)
Germany, 1993 (Muller Thurgau)	DC 150g	0.12 up to 0.27	0.018	8	0 15 28 35 42	2.6 1.5 0.7 0.7 0.7	DK-713-020 DK-713-026 (9301-02)
Germany, 1993 (Portugieser)	DC 150g	0.125 up to 0.28	0.018	8	0 14 28 35 42	1.6 1.1 0.8 0.8 0.7	DK-713-020 DK-713-026 (9301-01)
Germany, 1994 (Portugieser)	DC 150g	0.16 up to 0.27	0.018	8	0 14 28 35 43	1.6 0.8 0.6 0.9 0.7	DK-713-024 DK-713-025 (9401-01)
Germany, 1994 (Reisling)	DC 150g	0.17 up to 0.27	0.018	8	0 14 28 35 42	1.3 1.0 0.98 1.0 0.67	DK-713-024 DK-713-025 (9401-02)
Italy, 1999 (Chardonnay)	WG 60g+ copper	0.16 up to 0.19	0.02	4	20	0.06	DK-713-078 (99-4-03) 9 week interval to last spray
Italy, 1999 (Chardonnay)	WP 60g+ copper	0.18 up to 0.19	0.02	4	20	0.08	DK-713-078 (99-4-04) 9 week interval to last spray
Italy, 1999 (Trebbiano)	WG 60+ copper	0.22 up to 0.25	0.02	4	-0 0 7 14 20 27	< 0.02 0.23 0.18 0.17 0.1 0.07	DK-713-077 (99-3-003) 12 week interval to last spray
Italy, 1999 (Trebbiano)	WG 60+ copper	0.2 up to 0.24	0.02	4	-0 0 7 14 20 27	< 0.02 0.21 0.02 0.09 < 0.02 < 0.02	DK-713-077 (99-3-004) 12 week interval to last spray
Italy, 1998 (Lambrusco)	WG 90g+ mnczb	0.17 up to 0.27	0.02	6	27	0.03	DK-713-038 (T2) 2 month interval to last spray
Italy, 1998 (Lambrusco)	WP 90g+ mnczb	0.14 up to 0.22	0.02	6	27	0.04	DK-713-038 (T3) 2 month interval to last spray
Italy, 1999 (Chardonnay)	WG 90g+ mnczb	0.09 up to 0.18	0.02	6	27	0.07	DK-713-078 (99-4-01) 3 week interval to last spray
Italy, 1999 (Chardonnay)	WP 90g+ mnczb	0.09 up to 0.17	0.02	6	27	0.07	DK-713-078 (99-4-02) 3 week interval to last spray

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Italy, 1999 (Trebbiano)	WG 90+ mnczb	0.16 up to 0.23	0.02	6	-0 0 7 14 21 27	0.08 0.19 0.16 0.12 0.08 0.07	DK-713-077 (99-3-001) 6 week interval to last spray
Italy, 1999 (Trebbiano)	WP 90+ mnczb	0.15 up to 0.23	0.02	6	-0 0 7 14 21 27	0.09 0.19 0.15 0.1 0.09 0.08	DK-713-077 (99-3-002) 6 week interval to last spray
France, 1989 (Gamay)	SC 53g/l+ mncz	0.2	0.02	9	21	0.18	DK-713-005 DK-713-011 (W/FR/F/89/275)
France, 1989 (Gamay)	WP 100g+ mncz	0.2	0.02	9	21	0.17	DK-713-005 DK-713-011 (W/FR/F/89/275)
Italy, 1998 (Lambrusco)	WG 60g+ copper	0.18 up to 0.25	0.021	4	19	0.04	DK-713-038 (T4) 2 month interval to last spray
Italy, 1998 (Lambrusco)	WP 60g+ copper	0.17 up to 0.24	0.021	4	19	< 0.02	DK-713-038 (T5) 3 month interval to last spray
Spain, 1996 (Moscatel)	WP 90g+ mnczb	0.12 up to 0.23	0.023	6	28 28+30 drying	0.09 0.19 raisins	DK-713-031 (96-214-003)
Spain, 1996 (Moscatel)	WP 90g+ mnczb	0.17 up to 0.24	0.023	6	28 28+30 drying	0.11 0.16 raisins	DK-713-031 (96-21436)
France, 2003 (NE) (Cabernet Sauvignon)	WG 150g+ dithnn	0.23	0.028	3	0 21 29 35 43	0.6 0.72 0.46 0.42 0.45	2004/1000746 (FBM/16/03)
France, 2003 (NE) (Pinot Noir)	WG 150g+ dithnn	0.23	0.028	3	0 21 28 35 42	1.6 0.93 0.51 0.57 0.61	2004/1000746 (FAN/22/03)
France, 2003 (SE) (Negrette)	WG 150g+ dithnn	0.23	0.028	3	0 21 28 35	4.0 1.5 1.2 1.2	2004/1000746 (FTL/17/03) Drought conditions, small berries
France, 2003 (SE) (Syrah)	WG 150g+ dithnn	0.23	0.028	3	0 21 27 35 41	2.6 0.91 0.45 0.45 0.51	2004/1000746 (FBD/14/03)
Germany, 2003 (Dornfelder)	WG 150g+ dithnn	0.23	0.028	3	0 21 27 35 42	1.9 0.51 0.41 0.66 0.43	2004/1000746 (AGR/24/03)

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Germany, 2003 (Muller Thurgau)	WG 150g+ dithnn	0.23	0.028	3	0 21 27 35 42	1.9 0.54 0.63 0.64 0.4	2004/1000746 (AGR/23/03)
Italy, 2003 (Dolcetto)	WG 150g+ dithnn	0.23	0.028	3	0 21 29	1.1 0.85 0.29	2004/1000746 (ITA/13/03)
Spain, 2003 (Cardinal)	WG 150g+ dithnn	0.23	0.028	3	0 21 28 35 42	1.8 0.19 0.22 0.25 0.13	2004/1000746 (ALO/19/03)
France, 2001 (NE) (Auxerrois)	DC 150g	0.3	0.03	5	0 14 21 28 35	4.3 2.7 1.8 1.7 1.4	DK-713-089 (FAN/22/01) 41d interval to last spray
France, 2001 (NE) (Grolleau)	DC 150g	0.3	0.03	5	0 15 21 29 35	0.87 0.77 0.69 0.38 0.32	DK-713-089 (FBM/08/01) 28d interval to last spray
France, 2001 (NE) (Sylvaner)	DC 150g	0.3	0.03	5	0 14 21 28	1.4 1.1 0.65 0.62	DK-713-089 (FAN/11/01)
France, 2001 (SE) (Syrah-Red)	DC 150g	0.3	0.03	5	0 14 22 29 35	2.0 0.75 0.66 0.38 0.35	DK-713-089 (FBD/09/01) 41d interval to last spray
France, 2001 (Gamay)	DC 150g	0.3	0.03	5	0 15 21 27 35	0.82 0.65 0.64 0.51 0.39	DK-713-089 (FBM/09/01)
Germany, 2001 (Portugieser)	DC 150g	0.3	0.03	5	0 14 21 28 35	2.4 1.3 1.6 1.3 0.97	DK-713-089 (DU2/04/01) 0.19, 0.38 mg/kg in control plots (oversprayed)
Germany, 2001 (Scheurebe)	DC 150g	0.3	0.03	5	0 14 21 28 35	1.9 1.5 1.2 1.1 0.81	DK-713-089 (DU4/11/01)
Greece, 2000 (Razaki)	DC 150g	0.3	0.03	5	10 28	0.66 0.36	DK-713-088 (ALO/43/01)
Greece, 2001 (Mosxato)	DC 150g	0.3	0.03	5	0 14	0.87 0.44	DK-713-089 (HEL/05/01)
Italy, 2000 (Sangiovese)	DC 150g	0.3	0.03	5	-0 0 7 9 15 21 28	0.29 0.57 0.61 0.83 0.44 0.53 0.42	DK-713-084

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Italy, 2001 (Cortese)	DC 150g	0.3	0.03	5	0 16 22 29 35	0.82 0.39 0.32 0.21 0.19	DK-713-089 (ITA/22/01)
Spain, 2000 (Monastrell)	DC 150g	0.3	0.03	5	-0 0 7 9 15 21 28	6.1 12.0 5.7 7.3 4.0 5.7 4.6	DK-713-085 Drought conditions, small berries
Spain, 2001 (Airen)	DC 150g	0.3	0.03	5	0 14 21 27 34	1.1 0.38 0.3 0.24 0.24	DK-713-089 (ALO/43/01)
France, 1989 (Cabernet Sauvignon)	SC 53g+ mncz	0.2	0.035	4	71	0.17	DK-713-005 + DK-713-011 (W/FR/ER/89/481)
France, 1989 (Cabernet Sauvignon)	WP 100g+ mncz	0.2	0.035	4	71	0.05	DK-713-005 DK-713-011 (W/FR/ER/89/481)
France, 1989 (Cabernet Sauvignon)	SC 53g+ mncz	0.2	0.035	7	40	0.34	DK-713-005 DK-713-011 (W/FR/ER/89/481)
France, 1989 (Cabernet Sauvignon)	WP 100g+ mncz	0.2	0.035	7	40	0.08	DK-713-005 DK-713-011 (W/FR/ER/89/481)
France, 2001 (NE) (Chardonnay)	WG 120g+ pyracl	0.29	0.036	3	0 15 22 29 35	0.54 0.25 0.19 0.17 0.2	2002/1010480 (FAN/03/01 a)
Germany, 2001 (Dornfelder)	WG 120g+ pyracl	0.29	0.036	3	0 14 21 28 34	1.9 0.79 0.75 0.6 0.75	2002/1010480 (AGR/33/01 a) 0.31, 0.34 mg/kg in control plots (oversprayed)
Germany, 2001 (Muller Thurgau)	WG 120g+ pyracl	0.29	0.036	3	0 14 21 28 34	1.6 0.9 0.76 0.71 0.82	2002/1010480 (AGR/34/01 a)
Italy, 2001 (Barbera)	WG 120g+ pyracl	0.29	0.036	3	0 14 22 29 35	0.36 0.14 0.1 0.09 0.1	2002/1010480 (ITA/33/01 a)
Italy, 2001 (Cortese)	WG 120g+ pyracl	0.29	0.036	3	0 14 21 28 35	1.3 0.77 0.37 1.2 0.57	2002/1010480 (ITA/34/01 a)
France, 2001 (NE) (Chardonnay)	WG 150g	0.3	0.038	3	0 15 22 29 35	1.0 0.56 0.36 0.47 0.35	2002/1010480 (FAN/03/01 b)

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Germany, 2001 (Dornfelder)	WG 150g	0.3	0.038	3	0 14 21 28 34	3.2 1.3 1.6 1.3 1.1	2002/1010480 (AGR/33/01 b) 0.31, 0.34 mg/kg in control plots (oversprayed)
Germany, 2001 (Muller Thurgau)	WG 150g	0.3	0.038	3	0 14 21 28 34	2.4 1.6 1.4 1.2 0.81	2002/1010480 (AGR/34/01 b)
Italy, 2001 (Barbera)	WG 150g	0.3	0.038	3	0 14 22 29 35	0.6 0.33 0.21 0.16 0.19	2002/1010480 (ITA/33/01 b)
Italy, 2001 (Cortese)	WG 150g	0.3	0.038	3	0 14 21 28 35	1.5 1.2 1.6 0.94 0.81	2002/1010480 (ITA/34/01 b)
France, 1993 (Merlot)	WP 90g+ mczb	0.2	0.04	4	-0 1 8 15 20	0.95 2.0 1.4 0.49 0.47	DK-713-022 (GFRR93455)
Spain, 2000 (Airen)	DC 150g	0.3	0.04	5	10 28	3.27 2.28	DK-713-087
Germany, 1997 (Regent)	WG 113g+ folpet	0.08 up to 0.22	0.041	6	-0 0 14 21 28 35 42 49	0.33 0.97 0.57 0.62 0.54 0.4 0.38 0.46	DK-713-035 (CYD 04-04)
Germany, 1997 (Reisling)	WG 113g+ folpet	0.1 up to 0.23	0.041	6	-0 0 14 21 28 35 42 49	0.25 0.62 0.79 0.34 0.31 0.29 0.2 0.19	DK-713-035 (CYD 04-08)
Germany, 1996 (Dornfelder)	WG 113g+ folpet	0.05 up to 0.24	0.041	8	-0 0 7 14 22 28 35	0.52 1.0 0.65 0.53 0.65 0.68 0.43	DK-713-033 (CYD 01-06)
Germany, 1996 (Mulller Thurgau)	WG 113g+ folpet	0.06 up to 0.21	0.041	8	-0 0 7 14 21 28 34	0.22 0.46 0.26 0.27 0.29 0.21 0.15	DK-713-033 (CYD 01-08)

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Germany, 1996 (Portugieser)	WG 113g+ folpet	0.05 up to 0.24	0.041	8	-0 0 7 14 21 28 35	0.62 0.96 0.78 0.82 0.61 0.64 0.7	DK-713-033 (CYD 01-07)
Germany, 1996 (Reisling)	WG 113g+ folpet	0.06 up to 0.25	0.041	8	-0 0 7 15 21 28 35	0.61 1.0 0.93 1.1 0.84 0.99 0.69	DK-713-033 (CYD 01-05)
Germany, 1997 (Regent)	WG 113g+ folpet	0.08 up to 0.22	0.041	8	-0 0 14 21 28 35 42 49	0.87 1.3 0.86 0.81 0.69 0.79 0.7 0.7	DK-713-035 (CYD 04-03)
Germany, 1997 (Reisling)	WG 113g+ folpet	0.08 up to 0.22	0.041	8	-0 0 14 21 28 35 42 49	0.77 1.03 0.78 0.92 0.87 0.69 0.62 0.59	DK-713-035 (CYD 04-07)
France, 1989 (Carignsn)	SC 53g/l+ mncz	0.2	0.05	4	90	0.12	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignsn)	WP 100g+ mncz	0.2	0.05	4	90	0.08	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1993 (Gamay Viola)	WP 90g+ mczb	0.2	0.05	4	27	0.12	DK-713-022 (GFRR93283)
France, 1989 (Carignsn)	SC 53g/l+ mncz	0.2	0.05	6	69	0.21	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignsn)	WP 100g+ mncz	0.2	0.05	6	69	0.29	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignan)	SC 53gl+ mncz	0.2	0.05	9	46	0.15	DK-713-005 DK-713-011 (W/FR/F/89/059)
France, 1989 (Carignan)	WP 100g+ mncz	0.2	0.05	9	46	0.16	DK-713-005 DK-713-011 (W/FR/F/89/059)
France, 1989 (Carignsn)	SC 53g/l+ mncz	0.2	0.05	9	37	0.54	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignsn)	WP 100g+ mncz	0.2	0.05	9	37	0.15	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 2000 (NE) (Pineau meunier)	DC 150g	0.31	0.06	5	28	0.38	DK-713-082

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
France, 2000 (NE) (Pineau meunier)	DC 150g	0.3	0.06	5	-0 0 7 10 14 21 28	0.81 0.8 0.6 0.56 0.55 0.53 0.5	DK-713-083
Germany, 1995 (Portugieser)	WG 150+ dthnn	0.1 up to 0.27	0.06	8	-0 0 8 15 29 35 43	0.5 0.56 0.28 0.33 0.23 0.18 0.29	DK-713-032 (95-115-03)
Germany, 1995 (Silvaner)	WG 150+ dthnn	0.1 up to 0.27	0.06	8	-0 0 6 13 27 35 41	0.48 0.61 0.53 0.75 0.42 0.29 0.36	DK-713-032 (95-115-04)
Germany, 1993 (Faber)	DC 150g	0.13 up to 0.28	0.07	8	0 14 28 35 42	2.3 1.9 1.4 1.4 1.1	DK-713-020 DK-713-026 (9301-03)
Germany, 1993 (Faber)	DC 150g	0.16 up to 0.27	0.07	8	0 14 28	1.4 1.1 0.69	DK-713-024 DK-713-025 (9401-03)
Germany, 1993 (Muller Thurgau)	DC 150g	0.13 up to 0.26	0.07	8	0 15 28 35 42	2.0 1.3 1.0 0.9 0.6	DK-713-020 DK-713-026 (9301-02)
Germany, 1993 (Portugieser)	DC 150g	0.144 up to 0.28	0.07	8	0 14 28 35 42	1.7 1.5 1.0 1.1 0.7	DK-713-020 DK-713-026 (9301-01)
Germany, 1994 (Portugieser)	DC 150g	0.16 up to 0.27	0.07	8	0 14 28 35 43	1.3 0.9 1.1 0.5 1.0	DK-713-024 DK-713-025 (9401-01)
Germany, 1994 (Reisling)	DC 150g	0.18 up to 0.27	0.07	8	0 14 29 35 42	1.2 0.92 0.91 0.55 0.96	DK-713-024 DK-713-025 (9401-02)
France, 1992 (Cabernet Sauvignon)	DC 150g	0.3	0.07	9	38	1.6	DK-713-017 (GFRR92479)
France, 1992 (Gamay Vicella)	DC 150g	0.3	0.07	10	31	0.55	DK-713-017 (GFRR92292)
France, 1991 (Gamay Viallat)	DC 150g	0.3	0.1	9	44	0.35	DK-713-013 (WFRRF91277)
France, 1992 (Cabernet Sauvignon)	WP 500g	0.4	0.1	9	38	1.2	DK-713-017 (GFRR92479)

GRAPES Country, year (variety)	Form	Application			PHI, (days	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
France, 1992 (Cabernet Sauvignon)	SC 600g	0.4	0.1	9	38	1.5	DK-713-017 (GFRR92479)
France, 1992 (Cinsault)	DC 150g	0.3	0.1	9	45	0.6	DK-713-017 (GFRR92087)
France, 1991 (Carignan)	DC 150g	0.3	0.1	10	38	0.5	DK-713-013 (WFRRF91065)
France, 1992 (Gamay Vicella)	WP 500g	0.4	0.1	10	31	0.46	DK-713-017 (GFRR92292)
France, 1992 (Gamay Vicella)	SC 600g	0.4	0.1	10	31	0.61	DK-713-017 (GFRR92292)
France, 1992 (Cinsault)	WP 500g	0.4	0.13	9	45	0.6	DK-713-017 (GFRR92087)
France, 1992 (Cinsault)	SC 600g	0.4	0.13	9	45	0.36	DK-713-017 (GFRR92087)
France, 1995 (NE) Pinot Noir)	WG 113g+ folpet	0.2+ 0.22 0.22	0.05+ 0.03+ 0.11	1+ 1+7	-0 0 7 14 22 30	0.21 0.35 0.38 0.3 0.26 0.19	DK-713-034

Table 33. Residues in grapes from foliar applications of dimethomorph in supervised trials in France, Germany, Greece, Italy and Spain

GRAPES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)			Reference & Comments
		kg ai/ha	kg ai/hL	no		E-isomer	Z-isomer	Total	
France, 2004 (NE) (Auxerrois)	WG 150g+ dithnn	0.23	0.028	3	0 21 28 35 42	0.59 0.16 0.15 0.11 0.09	0.86 0.22 0.24 0.25 0.17	1.4 0.37 <u>0.39</u> 0.36 0.26	2005/1004963 (FAN/18/04)
France, 2004 (NE) (Chenin)	WG 150g+ dithnn	0.23	0.028	3	0 20 28 35 42	0.28 0.17 0.1 0.16 0.06	0.43 0.21 0.18 0.23 0.12	0.7 0.37 0.28 <u>0.39</u> 0.18	2005/1004963 (FBM/11/04)
France, 2004 (SE) (Negrette)	WG 150g+ dithnn	0.23	0.028	3	0 21 29 36 43	0.14 0.09 0.08 0.09 0.1	0.21 0.18 0.15 0.18 0.18	0.35 0.27 0.23 <u>0.27</u> 0.27	2005/1004963 (FTL/18/04)
France, 2004 (SE) (Syrah)	WG 150g+ dithnn	0.23	0.028	3	0 21 29 35 42	0.39 0.04 0.04 0.04 0.04	0.63 0.1 0.08 0.12 0.11	1.0 0.13 0.11 <u>0.16</u> 0.15	2005/1004963 (FBD/19/04)
Germany, 2004 (Portugieser)	WG 150g+ dithnn	0.23	0.028	3	0 21 28 35 42	0.14 0.07 0.05 0.07 0.08	0.23 0.15 0.11 0.15 0.17	0.37 0.21 0.17 0.22 0.26	2005/1004963 (DU4/11/04)
Germany, 2004 (Reisling)	WG 150g+ dithnn	0.23	0.028	3	0 20 28 35 42	0.4 0.1 0.14 0.12 0.09	0.63 0.19 0.22 0.19 0.14	1.1 0.29 0.36 0.31 0.24	2005/1004963 (DU2/11/04)

GRAPES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)			Reference & Comments
		kg ai/ha	kg ai/hL	no		E-isomer	Z-isomer	Total	
Greece, 2004 (Xinomavro)	WG 150g+ dithnn	0.23	0.028	3	0 21 28 35 42	0.3 0.22 0.12 0.16 < 0.004	0.4 0.37 0.25 0.23 < 0.006	0.69 0.59 0.37 0.39 < 0.01	2005/1004963 (GRE/20/04)
Italy, 2004 (Croatina)	WG 150g+ dithnn	0.23	0.028	3	0 20 28 34 42	0.03 0.09 0.06 0.07 0.05	0.24 0.16 0.1 0.11 0.08	0.27 0.25 0.15 0.18 0.13	2005/1004963 (ITA/19/04)
Spain, 2004 (Airen)	WG 150g+ dithnn	0.23	0.028	3	0 21 28 35 42	0.24 0.05 0.05 0.04 0.02	0.43 0.09 0.09 0.08 0.04	0.67 0.14 0.14 0.12 0.06	2005/1004963 (ALO/29/04)

Table 34. Residues in grapes from foliar applications of dimethomorph in supervised trials in Australia, New Zealand and Brazil

GRAPES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
Brazil, 2002 (Niagara)	WP 90g+ mnczb	2.76		3	7	0.06	2002/306305
Brazil, 2002 (Niagara)	WP 90g+ mnczb	5.5		3	7	0.22	2002/306305
Brazil, 2000 (Niagara)	WP 500g	0.4		4	21	0.24	2002/304414
Brazil, 2000 (Niagara)	WP 500g	0.8		4	21	0.5	2002/304414
Australia, 1995 (Cabernet Sauvignon)	WP 90g+ mnczb	0.18	0.018	3	14 21 28	0.26 0.41 0.16	DK-713-030
New Zealand, 1993 (Blauberger)	WP 75g+ mncz		0.019	8	7 14 21 28	0.12 0.13 0.05 0.05	DK-713-027 (507A-1)
New Zealand, 1993 (Blauberger)	EC 150g		0.019	8	7 14 21 28	0.15 0.14 0.12 0.15	DK-713-027 (507B-1)
New Zealand, 1993 (Blauberger)	WP 500g		0.019	8	7 14 21 28	0.43 0.11 0.12 0.15	DK-713-027 (507C-1)
New Zealand, 1993 (Chardonnay)	WP 75g+ mncz		0.019	8	7 14 21 28	0.13 0.12 0.08 0.07	DK-713-080 (508A-1)
New Zealand, 1993 (Chardonnay)	EC 150g		0.019	8	7 14 21 28	0.14 0.14 0.12 0.13	DK-713-080 (508B-1)

GRAPES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		bunches	
New Zealand, 1993 (Chardonnay)	WP 500g		0.019	8	7 14 21 28	0.31 0.24 0.27 0.26	DK-713-080 (508C-1)
Australia, 1995 (Cabernet Sauvignon)	WP 90g+ mnczb	0.25	0.025	3	1 3 6 9	6.7 4.0 2.6 5.5	DK-713-029
Australia, 1992 (Pinot Noir)	WP 500g	0.25	0.025	10	2 7 14 21	0.46 0.48 0.3 0.48	DK-713-028
Australia, 1995 (Cabernet Sauvignon)	WP 90g+ mnczb	0.36	0.036	3	14 21 28	0.68 0.62 0.6	DK-713-030
New Zealand, 1993 (Blauberger)	WP 75g+ mncz		0.038	8	7 14 21 28	0.27 0.23 0.18 0.18	DK-713-027 (507A-2)
New Zealand, 1993 (Blauberger)	EC 150g		0.038	8	7 14 21 28	0.29 0.21 0.19 0.15	DK-713-027 (507B-2)
New Zealand, 1993 (Chardonnay)	WP 75g+ mncz		0.038	8	7 14 21 28	0.21 0.2 0.21 0.26	DK-713-080 (508A-2)
New Zealand, 1993 (Chardonnay)	EC 150g		0.038	8	7 14 21 28	0.31 0.30 0.29 0.18	DK-713-080 (508B-2)
Australia, 1995 (Cabernet Sauvignon)	WP 90g+ mnczb	0.5	0.05	3	1 3 6 9	10.0 9.0 8.8 7.1	DK-713-029
Australia, 1992 (Pinot Noir)	WP 500g	0.5	0.05	10	2 7 14 21	0.97 0.96 0.98 0.95	DK-713-028
Brazil, 2000 (Niagara)	WP 500g	0.4	0.08	4	0 7 14 21 28	1.5 1.0 0.88 0.28 0.31	2002/304412
Brazil, 2000 (Niagara)	WP 500g	0.4	0.08	4	21	1.1	2002/304413
Brazil, 2000 (Niagara)	WP 500g	0.4	0.08	4	21	0.99	2002/304415
Brazil, 2000 (Niagara)	WP 500g	0.8	0.16	4	21	1.7	2002/304413
Brazil, 2000 (Niagara)	WP 500g	0.8	0.16	4	21	1.6	2002/304415

Pineapple

In trials on pineapples in the Philippines, seed pieces were dipped in a solution of dimethomorph four days before planting and in some plots this was combined with three subsequent foliar sprays, 4, 7 and 10 months after planting, with mature pineapples harvested about 6 months after the last treatment. The foliar sprays were applied by knapsack sprayer using about 190 litres water/ha.

Mature fruit samples were stored at ambient temperature for 3 days and then frozen to at or below -18 °C for up to 6 weeks before analysis using method FAMS 002-02. Pulp and skin were analysed seperately. The limit of quantification of this method was 0.01 mg/kg and the mean recovery rates were 91% (skin) and 92% (pulp) at fortification levels of 0.01 – 1.0 mg/kg.

Table 35. Residues in pineapples from applications of dimethomorph as a pre-plant dip (with and without subsequent foliar applications) in supervised trials in the Philippines

PINEAPPLES Country, year (variety)	Application				PHI, (days)	Dimethomorph Residues (mg/kg)		Reference & Comments
	Type	kg ai/ha	kg ai/hL	no		Flesh	Peel	
Philippines, 1993	Dip		0.4 dip	1	506	< 0.01	< 0.01	DK-714-001 (Treatment B)
Philippines, 1993	Dip		0.8 dip	1	506	< 0.01	< 0.01	DK-714-001 (Treatment D)
Philippines, 1993	Dip+ Foliar	1.7	0.4 dip+ 0.9 spray	1+3	196	≤ 0.01	≤ 0.01	DK-714-001 (Treatment F)
Philippines, 1993	Dip+ Foliar	1.7	0.8 dip+ 0.9 spray	1+3	196	≤ 0.01	≤ 0.01	DK-714-001 (Treatment H)
Philippines, 1993	Dip+ Foliar	3.4	0.4 dip+ 1.8 spray	1+3	196	≤ 0.01	≤ 0.01	DK-714-001 (Treatment J)
Philippines, 1993	Dip+ Foliar	3.4	0.4 dip+ 1.8 spray	1+3	196	≤ 0.01	≤ 0.01	DK-714-001 (Treatment J)

Onions

In trials on bulb onions in Europe (France and Germany), 2 – 4 foliar applications of dimethomorph (DC or WP formulations) were made to unreplicated 10 – 30 square metre plots at 9 – 11 day intervals using knapsack sprayers and hand lances or mini-booms to apply 400 – 500 litres of spray mix/ha, although in several trials in Germany (involving 2 applications/season) a longer treatment interval of 20 days was reported. Mature bulbs were sampled (1 – 2 kg) at harvest and stored at or below -18 °C for up to 11 months before analysis using Method FAMS 002-02, with limits of quantification of 0.01 mg/kg or 0.015 mg/kg and average recovery rates of 77 – 92% at fortification levels of 0.01 – 1.0 mg/kg.

In trials on bulb onions in Australia and Brazil, 2 – 15 square metre unreplicated plots were treated with 5 – 7 applications of dimethomorph (EC, SC or WP formulations) at 6 – 14 day intervals using small plot sprayers and mini-booms to apply 400 – 800 litres of spray mix/ha. In the 1988 trials in Australia, samples of bulb onions were stored for up to 3.5 years at -18 °C before analysis using Method FAMS 002-02 (LOQ 0.01 mg/kg) while the samples from the 1992 Australian trials were stored at or below -15 °C for up to 2 months before analysis using Method FAMS 026-01 (LOQ 0.02 mg/kg). Samples (about 1 kg) from the Brazilian trials were stored at or below -20 °C for up to 28 months before analysis using Method FAMS 022-01. Average recovery rates were 82 – 86% at fortification levels of 0.01 – 1.0 mg/kg (0.05 – 0.5 mg/kg in the Brazilian studies).

Table 36. Residues in onion bulbs from foliar applications of dimethomorph in supervised trials in Australia, Brazil, France and Germany

ONIONS Country, year (variety)	Application				PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
	Form	kg ai/ha	kg ai/hL	no		dry bulbs	
Australia, 1988 (Early Lockyer White)	EC 100g	0.1	0.03	5	21	< 0.01	DK-722-001
Australia, 1992 (Golden Brown)	WP 90g+ mnczb	0.18	0.046	7	1 7	< 0.02 < 0.02	DK-722-010

ONIONS Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) dry bulbs	Reference & Comments
Brazil, 1999 (IPA-10)	SC 100g+ chthnl	0.2	0.04	4	0 7 14 21 28	0.16 < 0.05 < 0.05 < 0.05 < 0.05	2001/304500
Brazil, 2000	SC 100g+ chthnl	0.2		4	14	< 0.05	2001/304498
Germany, 1993 (Bronze "Age")	WP 75g+ mnczb	0.23	0.056	3	-0 1 5 9 14	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	DK-722-008 (BE 062)
Germany, 1993 (Kobra)	WP 75g+ mnczb	0.23	0.056	4	14	< 0.01	DK-722-008 (BE 031)
Brazil, 1999 (Baia Dura)	SC 100g+ chthnl	0.25	0.03	3	14	0.07	2001/304506
Brazil, 1999 (Baia Piriforme)	SC 100g+ chthnl	0.25	0.03	3	1 3 7 14 21	< 0.05 0.07 < 0.05 < 0.05 < 0.05	2001/304504
France, 1992 (SE) (Blanc Premier)	DC 150g	0.3	0.06	2	19	0.06	DK-713-006 DK-713-003
Germany, 1992 (Argo)	DC 150g	0.3	0.08	2	48	< 0.015	DK-722-005 DK-722-004 (BE 302)
Germany, 1992 (Stuttgarter Riesen)	DC 150g	0.3	0.08	2	48	< 0.015	DK-722-005 DK-722-004 (BE 61)
France, 1992 (SE) (Blanc Premier)	DC 150g	0.3	0.06	4	10	0.02	DK-713-006 DK-713-003
Germany, 1992 (Argo)	DC 150g	0.3	0.08	4	38	< 0.015	DK-722-005 DK-722-004 (BE 302)
Germany, 1992 (Stuttgarter Riesen)	DC 150g	0.3	0.08	4	38	< 0.015	DK-722-005 DK-722-004 (BE 61)
Australia, 1988 (Early Lockyer White)	EC 100g	0.3	0.08	5	21	0.02	DK-722-001
Australia, 1992 (Golden Brown)	WP 90g+ mnczb	0.36	0.046	7	1 7	< 0.02 < 0.02	DK-722-010
Brazil, 2000	SC 100g+ chthnl	0.4		4	14	0.05	2001/304498
Brazil, 1999 (Baia Dura)	SC 100g+ chthnl	0.5	0.06	3	14	< 0.05	2001/304506
Brazil, 1999 (Baia Piriforme)	SC 100g+ chthnl	0.5	0.06	3	1 3	< 0.05 < 0.05	2001/304504
France, 1992 (SE) (Blanc Premier)	DC 150g	0.6	0.12	2	19	0.04	DK-713-006 DK-713-003
Germany, 1992 (Argo)	DC 150g	0.6	0.15	2	48	< 0.015	DK-722-005 DK-722-004 (BE 302)
Germany, 1992 (Stuttgarter Riesen)	DC 150g	0.6	0.15	2	48	< 0.015	DK-722-005 DK-722-004

ONIONS Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) dry bulbs	Reference & Comments
							(BE 61)
France, 1992 (SE) (Blanc Premier)	DC 150g	0.6	0.12	4	10	0.22	DK-713-006 DK-713-003
Germany, 1992 (Argo)	DC 150g	0.6	0.15	4	38	< 0.015	DK-722-005 DK-722-004 (BE 302)
Germany, 1992 (Stuttgarter Riesen)	DC 150g	0.6	0.15	4	38	< 0.015	DK-722-005 DK-722-004 (BE 61)
Australia, 1988 (Early Lockyer White)	EC 100g	0.9	0.23	5	21	0.03	DK-722-001

Green onions

In trials on green onions (spring onions) in Australia, 4 – 12 square metre unreplicated plots were treated with 7 – 8 applications of dimethomorph (EC or WP formulations) at 5 – 15 day intervals using small plot sprayers and mini-booms to apply 420 – 520 litres of spray mix/ha. In the 1988 trials samples were washed, trimmed (roots and tops) and stored for up to 3.5 years at -18 °C before analysis using Method FAMS 002-02 (LOQ 0.01 mg/kg). In the 1992 trials, samples (bulbs plus leaves) were stored at or below -15 °C for up to 22 months before analysis using Method FAMS 026-01 (LOQ 0.02 mg/kg). Average recovery rates were 81 – 97% at fortification levels of 0.01 – 1.0 mg/kg.

Table 37. Residues in green onion bulbs and leaves from foliar applications of dimethomorph in supervised trials in Australia.

GREEN ONIONS Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) bulbs & tops	Reference & Comments
Australia, 1988 (Savage Flat White)	EC 100g	0.1	0.02	7	0 3 7	0.01 0.01 < 0.01	DK-722-002
Australia, 1988 (Savage Flat White)	EC 100g	0.3	0.07	7	0 3 7	0.08 0.05 0.01	DK-722-002
Australia, 1988 (Savage Flat White)	EC 100g	0.9	0.22	7	0 3 7	0.34 0.22 0.11	DK-722-002
Australia, 1991 (White Salad)	WP 500g	0.24	0.046	8	15	< 0.02	DK-722-009
Australia, 1991 (White Salad)	WP 500g	0.48	0.09	8	15	< 0.02	DK-722-009

Cabbage

In trials on cabbages in USA, 7 foliar applications of dimethomorph (WP formulations) were made at 7 day intervals to unreplicated 80 – 370 square metre plots, using either plot sprayers with 1.5 – 3 metre mini booms or tractor-mounted 3.6 metre booms to apply 230 – 470 litres of spray mix/ha. Mature cabbages (including wrapper leaves) were sampled and frozen within 4 – 5 hours and analysed for dimethomorph residues using Method M 3502 within 11 months of sampling. In the trials

conducted in 2000, cabbage samples without wrapper leaves were also analysed. Average recovery rates were 90 – 93% at fortification levels of 0.05 – 5.0 mg/kg and the limit of quantification was 0.05 mg/kg.

Table 38. Residues in cabbage (with and without wrapper leaves) from foliar applications of dimethomorph in supervised trials in USA

CABBAGE Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)		Reference & Comments
		kg ai/ha	kg ai/hL	no		With wrapper leaves	Without wrapper leaves	
USA, 2001 (NY) (Early Jersey Wakefield)	WP 500g	0.22	0.08	7	7	0.14	< 0.05	2003/5000256 (2001858)
USA, 2001 (NY) (Early Jersey Wakefield)	WP 500g	0.22	0.09	7	7	0.25	< 0.05	2003/5000256 (2001859)
USA, 2001 (FL) (Stonehead)	WP 500g	0.22	0.08	7	7	0.4	< 0.05	2003/5000256 (2002217)
USA, 2001 (WI) (Gourmet)	WP 500g	0.22	0.09	7	7	< 0.05	< 0.05	2003/5000256 (2001860)
USA, 2001 (TX) (Early Dutch Round)	WP 500g	0.22	0.09	7	7	0.69	< 0.05	2003/5000256 (2001861)
USA, 2000 (GA) (Early Round Dutch)	WP 90+ mnczb	0.22	0.08	7	0 7	2.9 1.4		DK-721-001
USA, 2000 (CA) (Copenhagen Market)	WP 90+ mnczb	0.22	0.04	7	0 1 3 7 14 21	1.3 0.89 1.1 1.1 0.96 0.33		DK 721-002

Broccoli

In trials on broccoli in USA, 7 foliar applications of dimethomorph (WP formulation) were made at 7 day intervals to unreplicated 50 – 140 square metre plots, using either plot sprayers with 1.5 – 3 metre mini booms or tractor-mounted 2 – 2.5 metre booms to apply 230 – 510 litres of spray mix/ha. Mature broccoli heads and stalks were frozen within 5 hours of sampling and analysed within 32 weeks using Method M 3502. The average recovery rate was 90% at fortification levels of 0.05 – 5.0 mg/kg and the limit of quantification was 0.05 mg/kg.

Table 39. Residues in broccoli (heads and stems) from foliar applications of dimethomorph in supervised trials in USA

BROCCOLI Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) heads & stalks	Reference & Comments
		kg ai/ha	kg ai/hL	no			
USA, 2001 (TX) (Baccus)	WP 500g	0.22	0.09	7	7	0.2	2003/5000256 (2001862)
USA, 2001 (CA) (Marathon)	WP 500g	0.22	0.08	7	7	0.17	2003/5000256 (2001863)
USA, 2001 (CA) (Pak-Boy Hybrid)	WP 500g	0.22	0.08	7	7	0.25	2003/5000256 (2001864)
USA, 2001 (CA) (Pak-Boy Hybrid)	WP 500g	0.22	0.08	7	7	0.52	2003/5000256 (2001865)
USA, 2001 (CA) (Marathon)	WP 500g	0.22	0.04	7	0 3 7 13 21	0.53 0.45 0.12 0.07 < 0.05	2003/5000256 (2001866)

BROCCOLI Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) heads & stalks	Reference & Comments
		kg ai/ha	kg ai/hL	no			
USA, 2001 (OR) (Arcadia)	WP 500g	0.22	0.09	7	7	≤ 0.05	2003/5000256 (2001867)

Kohlrabi

In trials on outdoor and protected kohlrabi in Germany, 2 foliar applications of dimethomorph (DC formulation) were made at 7 – 10 day intervals to unreplicated 10 – 50 square metre plots, using small-plot sprayers and minibooms to apply 400 – 600 litres of spray mix/ha. Mature kohlrabi (1 – 4 kg or 12 units) were sampled and stored at or below -20 °C for up to 10 months before analysis for dimethomorph using Method FAMS 002-4. The limit of quantification was 0.02 mg/kg and the mean recovery rates were 94 – 101% at fortification levels of 0.02 – 2.0 mg/kg.

Table 40. Residues in kohlrabi from foliar applications of dimethomorph in outdoor supervised trials in Germany

KOHLRABI Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Germany, 2003 (Sorte Lahn)	DC 150g	0.3	0.05	2	0 7 10 14 21	0.61 < 0.02 < 0.02 ≤ 0.02 < 0.02	2005/1025857 (RPMZ 1/1)
Germany, 2003 (Sorte Lahn)	DC 150g	0.3	0.08	2	0 7 10 14 21	0.38 0.03 < 0.02 ≤ 0.02 < 0.02	2005/1025857 (RPNW 1/1)

Table 41. Residues in kohlrabi from foliar applications of dimethomorph in indoor supervised trials in Germany

KOHLRABI Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) tubers	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Germany, 2003 (Avanti)	DC 150g	0.3	0.08	2	0 7 10 14 21	0.04 0.03 0.03 ≤ 0.02 < 0.02	2005/1025857 (BYFS 2/1)
Germany, 2003 (Avanti)	DC 150g	0.3	0.08	2	14 21	≤ 0.02 < 0.02	2005/1025857 (BYFS 2/2)
Germany, 2004 (Express Forcer)	DC 150g	0.3	0.08	2	14	≤ 0.02	2005/1025858 (RPNW 2/1)
Germany, 2004 (Express Forcer)	DC 150g	0.01	0.002	2	14	< 0.02	2005/1025858 (BWS 2/1)

Cucumber

In trials on outdoor cucumbers in Germany, 4 foliar applications of dimethomorph (DC or WP formulations) were made to unreplicated 10 – 20 square metre plots at 10 – 20 day intervals, using small-plot sprayers and mini-booms to apply 400 – 600 litres of spray mix/ha. In one trial in Hungary, 2 applications of dimethomorph (WP formulation) were applied 4 days apart. Samples of mature

cucumbers (minimum 12 units or 2 kg) were frozen within 24 hours of sampling and stored at or below -18 °C for up to 7 months before analysis.

In trials on protected cucumbers (greenhouse or polythene tunnel houses) in Europe (France, Greece, Italy and Spain), 1-4 applications of dimethomorph (DC, WP or WG formulations) were applied using knapsack sprayers and hand lances or mini-booms to apply 600 – 3300 litres of spray mix/ha. Samples were frozen (generally within 24 hours of sampling) and stored at or below -18 °C for up to 12 months before analysis.

Analytical methods used in these studies were Method M 575/0, FAMS 002-02 or FAMS 026-01. Limits of quantification were 0.01 mg/kg (M 575/0 and FAMS 026-01) and 0.01 – 0.015 mg/kg (FAMS 002-02). Average recovery rates were 79 – 104% at fortification levels of 0.01 – 1.0 mg/kg.

Table 42. Residues in outdoor cucumbers from foliar applications of dimethomorph in supervised trials in Hungary and Germany

CUCUMBER Country, year (variety)		Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
	Form	kg ai/ha	kg ai/hL	no			
Hungary, 1994 (not specified)	WP 90g+ mnczb	0.18		2	3 5	0.06 0.06	DK-723-055
Germany, 1993	WP 75g+ mnczb	0.23	0.06	4	-0 1 5 9 14	< 0.01 0.02 < 0.01 < 0.01 < 0.01	DK-723-019 (BE062)
Germany, 1993	WP 75g+ mnczb	0.23	0.06	4	14	< 0.01	DK-723-019 (BE071)
Germany, 1992 (Profi)	DC 150g	0.3	0.08	4	0 7 14 21 28	0.07 < 0.02 < 0.02 < 0.02 < 0.02	DK-723-008 DK-723-010 (BE61)
Germany, 1992 (Moneta)	DC 150g	0.3+ 0.3	0.08+ 0.05	3+ 1	0 7 14 21 28	< 0.02 < 0.02 0.04 < 0.02 < 0.02	DK-723-008 DK-723-010 (BE701)
Germany, 1992 (Moneta)	DC 150g	0.6	0.15+ 0.1	3+ 1	0 7 14 21 28	0.04 < 0.02 0.02 < 0.02 < 0.02	DK-723-008 DK-723-010 (BE701)
Germany, 1992 (Profi)	DC 150g	0.6	0.15	4	0 7 14 21 28	0.1 0.02 < 0.02 < 0.02 < 0.02	DK-723-008 DK-723-010 (BE61)

Table 43. Residues in protected cucumbers from foliar applications of dimethomorph in supervised trials in France, Greece, Italy and Spain

CUCUMBER Country, year (variety)	Form	Application kg ai/ha	Application kg ai/hL	Application no	PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
Greece, 1997 (Var 722)	WP 90g+ mnczb		0.02	4	0 3 7 14	0.15 0.09 0.03 < 0.01	DK-723-054
Greece, 2005 (Skotino F1)	WG 120+ pyracl	0.18	0.03	3	0 1 3 7	0.07 0.06 0.04 0.02	2005/1027639 (05GR/011R)
Greece, 2005 (Skotino F1)	WG 72+ pyracl	0.18	0.03	3	0 1 3 7	0.07 0.04 0.03 0.01	2005/1027639 (05GR/011R)
Italy, 2004 (Darina)	WG 120+ pyracl	0.18	0.03	3	0 1 4 7	0.05 0.02 0.01 < 0.01	2005/1016642 (04IT/011R)
Spain, 2004 (Suso)	WG 120+ pyracl	0.18	0.03	3	0 1 3 7	0.02 0.02 0.02 < 0.01	2005/1016642 (04ES/009R)
Spain, 2005 (Suso)	WG 120+ pyracl	0.18	0.03	3	0 1 4 7	0.08 0.04 0.03 0.02	2005/1027639 (05ES/009R)
Spain, 2005 (Suso)	WG 72+ pyracl	0.18	0.03	3	0 1 4 7	0.05 0.03 0.01 0.01	2005/1027639 (05ES/009R)
France, 1993 (Aurelia)	WP 90g+ mnczb	0.23	0.05	4	14	< 0.01	DK-723-018 (GFRR93277)
France, 1993 (Aurelia)	WP 90g+ mnczb	0.23	0.05	4	-0 1 5 9 14	< 0.01 0.03 < 0.01 < 0.01 < 0.01	DK-723-018 (GFRR93276)
Spain, 1994 (Marumbo)	WP 75g+ mnczb	0.28	0.02	2	5	0.06	DK-723-022 (T94.335)
France, 1992 (Girola)	DC 150g	0.3	0.03	1	0 7 14 21 28	0.11 < 0.02 < 0.02 < 0.02 < 0.02	DK-723-005 DK-723-012 (GFRR92076)
France, 1992 (Girola)	DC 150g	0.3	0.03	1	14 21 27 35 42	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02	DK-723-005 DK-723-012 (GFRR92077)
France, 1992 (Girola)	DC 150g	0.3	0.03	2	0 7 14 21 28	0.12 0.02 < 0.02 < 0.02 < 0.02	DK-723-005 DK-723-012 (GFRR92076)
France, 1992 (Girola)	DC 150g	0.3	0.03	2	0 7 13 21	0.06 < 0.02 0.02 < 0.02	DK-723-005 DK-723-012 (GFRR92077)

CUCUMBER Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
					28	< 0.02	
Spain, 1993 (Holandes-Nevada)	DC 150g	0.46	0.023	3	1 6 10	0.26 0.13 0.09	DK-723-015 (SSPM/92/173)
Spain, 1993 (Holandes-Nevada)	DC 150g	0.25+ 0.32	0.023	1+ 2	1 3 17	0.23 0.2 0.04	DK-723-015 (SSPM/92/174)
France, 1992 (Girola)	DC 150g	0.6	0.06	1	0 7 14 21 28	0.2 0.08 0.02 0.02 < 0.02	DK-723-005 DK-723-012 (GFRR92076)
France, 1992 (Girola)	DC 150g	0.6	0.06	1	14 21 27 35 42	0.02 < 0.02 < 0.02 < 0.02 < 0.02	DK-723-005 DK-723-012 (GFRR92077)
France, 1992 (Girola)	DC 150g	0.6	0.06	2	0 7 14 21 28	0.14 0.1 0.28 0.03 < 0.02	DK-723-005 DK-723-012 (GFRR92076)
France, 1992 (Girola)	DC 150g	0.6	0.06	2	0 7 13 21 28	0.23 0.02 < 0.02 < 0.02 < 0.02	DK-723-005 DK-723-012 (GFRR92077)
Spain, 1993 (Holandes-Nevada)	DC 150g	0.61	0.03	3	1 6 10	0.49 0.16 0.12	DK-723-015 (SSPM/92/173)
Spain, 1994 (Alaska)	WP 75g+ mnczb	0.3+ 0.34	0.02+ 0.02	1+1	5	0.08	DK-723-022 (T94.334)
Spain, 1993 (Holandes-Nevada)	DC 150g	0.73	0.023	3	1 5 11	0.21 0.15 0.09	DK-723-015 (SSPM/92/171)
Spain, 1993 (Holandes-Nevada)	WP 75g+ mnczb	0.73	0.023	3	1 5 11	0.29 0.24 0.12	DK-723-015 (SSPM/92/171)
Spain, 1993 (Holandes-Nevada)	WP 75g+ mnczb	0.73	0.023	3	1 5 11	0.26 0.22 0.15	DK-723-015 (SSPM/92/172)
Spain, 1993 (Holandes-Nevada)	WP 75g+ mnczb	0.73	0.023	3	1 6 10	0.28 0.23 0.11	DK-723-015 (SSPM/92/173)
Spain, 1994 (Multipik)	WP 75g+ mnczb	0.37+ 0.42	0.02+ 0.02	1+ 1	5	0.07	DK-723-022 (T94.332)
Spain, 1994 (Aniko)	WP 75g+ mnczb	0.41+ 0.45	0.02+ 0.02	1+ 1	5	0.1	DK-723-022 (T94.336)
Spain, 1993 (Holandes-Nevada)	WP 75g+ mnczb	0.25+ 0.32+ 0.37	0.023	1+ 1+ 1	1 3 17	0.33 0.25 0.04	DK-723-015 (SSPM/92/174)
Spain, 1993 (Holandes-Nevada)	DC 150g	0.98	0.03	3	1 5 11	0.27 0.26 0.08	DK-723-015 (SSPM/92/171)
Spain, 1993 (Holandes-Nevada)	DC 150g	0.33+ 0.43+ 0.49	0.03	1+ 1+ 1	1 3 17	0.42 0.39 0.07	DK-723-015 (SSPM/92/174)

CUCUMBER Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Spain, 1993 (Holandes-Nevada)	DC 150g	0.62+ 0.73	0.023	2+ 1	1 5 11	0.37 0.2 0.12	DK-723-015 (SSPM/92/172)
Spain, 1993 (Holandes-Nevada)	DC 150g	0.9+ 0.98	0.03	1+ 2	1 5 11	0.34 0.29 0.11	DK-723-015 (SSPM/92/172)

Summer squash (Courgettes)

In trials on protected courgettes (greenhouse or polythene tunnel houses) in Europe (Greece, Italy and Spain), 3 applications of dimethomorph (WG formulations) were made using knapsack sprayers and hand lances to apply 600 litres of spray mix/ha at 7 day intervals. Courgettes (minimum 12 units or 2 kg) were frozen within 24 hours of sampling and stored at or below -18 °C for up to 23 weeks before anaysis for dimethomorph using Method M 575/0. The limit of quantification was 0.01 mg/kg and average recovery rates were 82 – 88% at fortification levels of 0.01 – 0.1 mg/kg.

Table 44. Residues in protected courgettes from foliar applications of dimethomorph in supervised trials in Greece, Italy and Spain

COURGETTES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Spain, 2004 (Hojara)	WG 120+ pyracl	0.18	0.03	3	0 1 3 7	0.02 0.02 0.01 < 0.01	2005/1016642 (04ES/010R)
Italy, 2004 (Greyzini)	WG 120+ pyracl	0.18	0.03	3	0 1 3 7	0.17 0.27 0.06 0.02	2005/1016642 (04IT/012R)
Italy, 2005 (President)	WG 120+ pyracl	0.18	0.03	3	0 1 3 7	0.07 0.09 0.06 < 0.01	2005/1027639 (05IT/010R)
Greece, 2005 (Arrow)	WG 120+ pyracl	0.18	0.03	3	0 1 3 7	0.24 0.14 0.05 0.01	2005/1027639 (05GR/012R)
Italy, 2005 (President)	WG 72+ pyracl	0.18	0.03	3	0 1 3 7	0.13 0.06 0.03 < 0.01	2005/1027639 (05IT/010R)
Greece, 2005 (Arrow)	WG 72+ pyracl	0.18	0.03	3	0 1 3 7	0.2 0.16 0.05 0.01	2005/1027639 (05GR/012R)

In trials on outdoor summer squash (zucchini) in Australia, 4 applications of dimethomorph (WP formulation) were made using a small-plot sprayers at 7 – 14 day intervals to apply from 140 litres of spray mix/ha up to 500 litres/ha as plants matured. Samples were stored at or below -15 °C until analysis using Method FAMS 026-01. The limit of quantification was 0.02 mg/kg and the average recovery rate were 92% at fortification levels of 0.1 – 0.1 mg/kg.

Table 45. Residues in outdoor zucchini from foliar applications of dimethomorph in supervised trials in Australia

ZUCCHINI Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		whole fruit	
Australia, 1995 (Regal Black)	WP 90g+ mnczb	0.18	0.13 decreasing to 0.04	4	0 7 14 21	0.04 < 0.02 < 0.02 < 0.02	DK-723-023
Australia, 1995 (Regal Black)	WP 90g+ mnczb	0.36	0.26 decreasing to 0.08	4	0 7 14 21	0.16 < 0.02 < 0.02 < 0.02	DK-723-023

Melons (except watermelons)

In trials on melons in Europe (France, Italy, Spain), Australia and Brazil, 3 – 5 foliar applications of dimethomorph (DC, EC, WP, WG or SC formulations) were to 13 – 160 square metre unreplicated plots at 7 – 13 day intervals using mistblowers, knapsack or motorised sprayers and hand lances or mini-booms to apply 100 – 400 litres of spray mix/ha or 800 L/ha increasing to 1220 L/ha as plants matured. Samples of between 6 fruit and 12 × ¼-fruit or $^1/_8$ -fruit were frozen within 24 hours of sampling and stored at or below -15 °C for up to 10 months before anaysis for dimethomorph.

In some of the trials in Spain, melon pulp and peel were analysed seperately and the whole fruit residues calculated as the sum of (flesh weight x flesh residue) and (peel weight × peel residue) divided by the total fruit weight. Analytical methods used in these studies included FAMS 002-02 (LOQ 0.015 mg/kg), FAMS 002-04 (LOQ 0.02 mg/kg), M 575/0 (LOQ 0.01 mg/kg), FAMS 026-01 (LOQ 0.02 mg/kg) and FAMS 022-01 (LOQ 0.1 mg/kg). Average recovery rates were 86 – 95% in whole fruit at fortification levels of 0.01-1.0 mg/kg. Average recovery rates in melon pulp were 85 – 97% and 93 – 95% in the peel at fortification levels of 0.02 – 2.0 mg/kg.

Table 46. Residues in melons from foliar applications of dimethomorph in supervised trials in France, Italy, Spain, Australia and Brazil

MELONS Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)[a/]			Reference & Comments
		kg ai/ha	kg ai/hL	no		pulp	peel	whole fruit	
Spain, 1997 (Sancho)	WP 75g	0.03+ 0.12 up to 0.2	0.02+ 0.02	1+ 4	14	< 0.02	0.15	0.09	DK-723-039 (97-102-14)
France, 2006 (SE) (Behugo)	WG 90g+ mnczb	0.18	0.05	3	0 3 7			0.09 0.04 0.02	2006/1035428 (05FR/096R)
France, 2006 (SE) (Behugo)	EC 72g+ pyracl	0.18	0.05	3	0 3 7			0.12 0.03 0.01	2006/1035428 (05FR/096R)
Italy, 2006 (Baggio)	WG 90g+ mnczb	0.18	0.05	3	0 3 7			0.04 0.04 0.05	2006/1035428 (05IT/097R)
Italy, 2006 (Baggio)	EC 72g+ pyracl	0.18	0.05	3	0 3 7			0.07 0.11 0.04	2006/1035428 (05IT/097R)
Spain, 2006 (Makdimon)	WG 90g+ mnczb	0.18	0.05	3	0 3 6			0.03 0.02 0.03	2006/1035428 (05ES/094R)
Spain, 2006	EC	0.18	0.05	3	0			0.02	2006/1035428

MELONS Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg)[a/] pulp	peel	whole fruit	Reference & Comments
(Makdimon)	72g+ pyracl				3 6			0.02 0.02	(05ES/094R)
Spain, 2006 (Pinonate)	WG 90g+ mnczb	0.18	0.05	3	0 3 7			0.26 0.24 0.17	2006/1035428 (05ES/095R)
Spain, 2006 (Pinonate)	EC 72g+ pyracl	0.18	0.05	3	0 3 7			0.48 0.2 0.29	2006/1035428 (05ES/095R)
Australia, 1994 (Eastern Star) Rock melon	WP 90g+ mnczb	0.18	0.18	4	0 7 14 21			0.18 0.24 0.05 0.13	DK-723-024
Spain, 1997 (Sancho)	WP 75g	0.18	0.02	5	14	< 0.02	0.05	0.02	DK-723-039 (97-102-10)
Brazil, 1998 (New Kodama)	SC 100g+ chlrth	0.2	0.04	3	14			< 0.1	DK-790-050
Spain, 1996 (Ajax)	WP 75g	0.23	0.02	5	-0 0 3 7 14	< 0.02 < 0.02 ≤ 0.02 < 0.02 < 0.02	0.26	0.1	DK-723-038 (96-213-07)
Australia, 1994 (Eastern Star) Rock melon	WP 90g+ mnczb	0.27	0.27	4	0 7 14 21			0.18 0.39 0.09 0.31	DK-723-024
Spain, 1996 (Daimiel)	WP 75g	0.16 up to 0.2	0.02	5	-0 0 3 7 14	< 0.02 < 0.02 ≤ 0.02 < 0.02 < 0.02	0.08	0.04	DK-723-037 (96-211-05)
Spain, 1996 (Sancho)	WP 75g	0.17 up to 0.19	0.02	5	-0 0 3 7 14	< 0.02 < 0.02 ≤ 0.02 < 0.02 < 0.02	0.03	0.01	DK-723-037 (96-211-04)
Spain, 1997 (Doral)	WP 75g	0.16 up to 0.22	0.02	5	14	< 0.02	0.02	< 0.02	DK-723-039 (97-102-13)
Spain, 1996 (Doral)	WP 75g	0.16 up to 0.23	0.02	5	-0 0 3 7 14	0.02 0.08 0.05 0.04 < 0.02	0.14	0.06	DK-723-038 (96-213-06)
Spain, 1997 (Ayat)	WP 75g	0.16 up to 0.23	0.02	5	14	< 0.02	0.06	0.03	DK-723-039 (97-102-12)
Brazil, 1998 (New Kodama)	SC 100g+ chlrth	0.4	0.08	3	14			< 0.1	DK-790-050
Spain, 1991 (Piel de Sapa)	DC 150g	0.22+ 0.27	0.023+ 0.023	2+ 1	4 12 21			0.05 < 0.02 < 0.02	DK-723-002 (S/SP/E/91/942
Spain, 1991 (Roxet)	DC 150g	0.27+ 0.3	0.023+ 0.023	2+ 1	5 11 21			0.02 < 0.02 < 0.02	DK-723-002 (S/SP/E/91/941
Spain, 1991 (Piel de Sapa)	DC 150g	0.29+ 0.36	0.03+ 0.03	2+ 1	4 12 21			0.03 < 0.02 0.02	DK-723-002 (S/SP/E/91/942
Spain, 1991 (Roxet)	DC 150g	0.36+ 0.4	0.03+ 0.03	2+ 1	5 11 21			0.02 < 0.02 < 0.02	DK-723-002 (S/SP/E/91/941

a - Where pulp and skin residues reported, total fruit residues have been calculated as the sum of (flesh weight × flesh residue) and (peel weight × peel residue), divided by total fruit weight

Tomato

In trials on protected tomatoes in Europe (France, Germany, Greece, Italy, Spain), 3 – 4 foliar applications of dimethomorph (DC, EC, WP, WG or SC formulations) were made using mistblowers, knapsack or motorised sprayers and hand lances to apply 600-1500 litres of spray mix/ha at 7 – 11 day intervals. In a reverse decline trial in Korea, dimethomorph was applied from 3 to 7 times to different plots on different application dates using 2000 litres spray mix/ha.

Samples (2 kg or more) of mature fruit were in most cases frozen within 24 hours of sampling and stored at or below -18 °C for up to 15 months before anaysis for dimethomorph. Analytical methods used in these studies included M 575/0 (LOQ 0.01 mg/kg) and FAMS 002-02, FAMS 002-04 (LOQ 0.02 mg/kg). Average recovery rates were 77 – 106% at fortification levels of 0.01 – 2.0 mg/kg.

Table 47. Residues in protected tomatoes from foliar applications of dimethomorph in supervised trials in Europe (France, Germany, Greece, Italy, Spain) and Korea.

TOMATO Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
France, 1992 (Rondello)	DC 150g	0.3		3	14 21 28 35 42	0.18 0.13 0.09 < 0.02 < 0.02	DK-723-006 (GFRR 92074)
France, 1992 (Rondello)	DC 150g	0.6		3	14 21 28 35 42	0.22 0.22 0.16 0.06 0.02	DK-723-006 (GFRR 92074)
France, 1991 (Rondello)	WP 500g	0.3	0.03	3	1 7 14 21 28	0.16 0.13 0.08 0.07 0.04	DK-723-014 (WFRFR91082)
France, 1991 (Rondello)	DC 150g	0.3	0.03	3	1 7 14 21 28	0.11 0.08 0.05 0.04 0.02	DK-723-014 (WFRFR91082)
Greece, 2005 (Beladona F1)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.1 0.1 0.07	2005/1027637 (05GR/003R)
Greece, 2005 (Beladona F1)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.16 0.05 0.1	2005/1027637 (05GR/003R)
Greece, 2005 (Formula F1)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.03 0.02 0.03	2005/1027637 (05GR/004R)
Greece, 2005 (Formula F1)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.05 0.03 0.04	2005/1027637 (05GR/004R)
Italy, 2004 (Optima)	EC 72g+ pyracl	0.18	0.03	3	0 4 7	0.07 0.07 0.07	2005/1016640 (04IT/003R)
Italy, 2004 (Secolo)	EC 72g+ pyracl	0.18	0.03	3	0 3 6	0.11 0.13 0.1	2005/1016640 (04IT/003R)

TOMATO Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
Italy, 2005 (Optima)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.26 0.15 0.15	2005/1027637 (05IT/002R)
Italy, 2005 (Optima)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.12 0.14 0.19	2005/1027637 (05IT/002R)
Korea, 1995 (SeoKwang)	WP 25g	0.5	0.03	3	3 7	0.3 0.29	DK-723-026
Spain, 2004 (Antilla)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.06 0.06 0.04	2005/1016640 (04ES/002R)
Spain, 2004 (Caro)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.1 0.08 0.06	2005/1016640 (04ES/001R)
Spain, 2005 (Bond)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.11 0.06 0.07	2005/1027637 (05ES/001R)
Spain, 2005 (Bond)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.1 0.09 0.07	2005/1027637 (05ES/001R)
France, 1991 (Rondello)	DC 150g	0.3	0.03	4	3 7 14 21 28	0.2 0.16 0.13 0.14 0.06	DK-723-014 (WFRFR91067)
Korea, 1995 (SeoKwang)	WP 25g	0.5	0.03	4	21	0.13	DK-723-026
Korea, 1995 (SeoKwang)	WP 25g	0.5	0.03	5	14	0.2	DK-723-026
Korea, 1995 (SeoKwang)	WP 25g	0.5	0.03	6	7	0.32	DK-723-026
Korea, 1995 (SeoKwang)	WP 25g	0.5	0.03	7	3	0.58	DK-723-026
Germany, 2003 (Pannovy)	DC 150g	0.6	0.04	3	3 5	0.27 0.12	2005/1028930 (BW S1/1)
Germany, 2003 (Culina)	DC 150g	0.6	0.05	3	0 3 5 7	0.69 0.42 0.61 0.39	2005/1028930 (HH HH1/1)
Germany, 2003 (Rougella)	DC 150g	0.6	0.05	3	0 3 5 7	0.44 0.33 0.74 0.17	2005/1028930 (HH HH 1/2)
Germany, 2003 (Vanessa)	DC 150g	0.6	0.05	3	3 5	0.73 0.59	2005/1028930 (HE WE 1/1)
France, 1991 (Rondello)	WP 500g	0.6	0.06	3	1 7 14 21 28	0.28 0.32 0.17 0.17 0.09	DK-723-014 (WFRFR91082)
France, 1991 (Rondello)	DC 150g	0.6	0.06	3	1 7 14 21 28	0.19 0.15 0.09 0.06 0.04	DK-723-014 (WFRFR91082)
Germany, 2003 (Harzfeuer)	DC 150g	0.6+ 0.6+ 0.6	0.1+ 0.07+ 0.05	1+ 1+ 1	3 5	0.17 0.17	2005/1028930 (BY FS1/1)

In trials on outdoor tomatoes in France, Germany, Italy and Spain, 2 – 7 foliar applications of dimethomorph (DC, WP or WG formulations) were made using knapsack or motorised sprayers and hand lances to apply 400 – 1400 litres of spray mix/ha at 7 – 11 day intervals. Samples (1 kg or more) of mature fruit were frozen within 24 hours of sampling and stored at or below -18 °C for up to 15 months before anaysis for dimethomorph using Method FAMS 002-02. Average recovery rates were 85 – 93% at fortification levels of 0.01 – 2.0 mg/kg and the limit of quantification was 0.02 mg/kg (except in the Italian trials where a higher limit of 0.04 mg/kg was reported.

Table 48. Residues in outdoor tomatoes from foliar applications of dimethomorph in supervised trials in France, Germany, Italy and Spain

TOMATO Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		whole fruit	
Spain, 1991 (Rio Grande)	DC 150g	0.21	0.02	3	3 14 21	0.14 0.13 0.05	DK-723-001 (S/SP/E/91/932)
Spain, 1991 (Acor)	DC 150g	0.23	0.02	3	3 13 21	0.04 0.02 0.02	DK-723-001 (S/SP/E/91/931)
Italy, 1998 (Red Setter)	WG 60g+ copper	0.11 up to 0.17	0.02	6	19	< 0.04	DK723-049
Italy, 1998 (Red Setter)	WP 60g+ copper	0.11 up to 0.17	0.02	6	19	< 0.04	DK723-049
Spain, 1991 (Rio Grande)	DC 150g	0.29	0.03	3	3 14 21	0.21 0.15 0.11	DK-723-001 (S/SP/E/91/932)
France, 1992 (Toledo)	DC 150g	0.3		3	0 7 14 21 28	0.26 0.04 0.02 < 0.02 < 0.02	DK-723-006 (GFRR 92075)
Spain, 1991 (Acor)	DC 150g	0.3	0.03	3	3 13 21	0.03 0.02 < 0.02	DK-723-001 (S/SP/E/91/931)
Spain, 1994 (Virginia)	WP 75+ mnczb	0.18+ 0.2	0.02+ 0.02	1+ 1	14	0.11	DK-723-021 (T94.329)
Spain, 1994 (Royesta)	WP 75+ mnczb	0.2+ 0.22	0.02+ 0.02	1+ 1	14	0.06	DK-723-021 (T94.327)
Spain, 1994 (Radya)	WP 75+ mnczb	0.24+ 0.26	0.02+ 0.02	2	14	0.17	DK-723-021 (T94.330)
Spain, 1994 (Muchamiel)	WP 75+ mnczb	0.25+ 0.27	0.02+ 0.02	1+ 1	14	0.07	DK-723-021 (T94.328)
France, 1992 (Toledo)	DC 150g	0.6		3	0 7 14 21 28	0.35 0.11 0.03 0.02 < 0.02	DK-723-006 (GFRR 92075)
Germany, 1992 (Moneymaker)	DC 150g	0.3+ 0.3	0.08+ 0.05	2+ 5	0 7 14 21 28	0.34 0.05 0.07 0.07 0.04	DK-723-007 DK-723-009 (BE 61)
Germany, 1992 (Rentita)	DC 150g	0.3+ 0.3	0.08+ 0.05	5+ 3	0 7 14 21	1.15 < 0.02 < 0.02 < 0.02	DK-723-007 DK-723-009 (BE 701)

TOMATO Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		whole fruit	
					28	0.04	
Germany, 1992 (Moneymaker)	DC 150g	0.6+ 0.6	0.15+ 0.1	2+ 5	0 7 14 21 28	0.37 1.02 0.1 0.06 0.06	DK-723-007 DK-723-009 (BE 61)
Germany, 1992 (Rentita)	DC 150g	0.6+ 0.6	0.15+ 0.1	5+ 3	0 7 14 21 28	0.16 0.43 < 0.02 < 0.02 0.05	DK-723-007 DK-723-009 (BE 701)

In trials on outdoor tomatoes in USA, 6 – 7 foliar applications of dimethomorph (WP formulations) were made to 30 – 300 square metre unreplicated plots using knapsack or tractor-mounted boom sprayers to apply 220 – 800 litres of spray mix/ha at 5 – 9 day intervals. Samples (2 kg or more) of mature fruit were frozen within 5 hours of sampling and stored at or below -10 °C for up to 18 months before anaysis for dimethomorph using Method M 2577. Average recovery rates were 80 – 108% at fortification levels of 0.05 – 1.0 mg/kg and the limit of quantification was 0.05 mg/kg.

In two trials in Brazil, 3 applications of dimethomorph (WP) were made using a small-plot sprayer and mini-boom to apply 700 litres of spray mix/ha at 7 – 8 day intervals. Tomatoes (2kg or more) were strored for up to 21 months before analysis using Method FAMS 002-02 (average recovery rate of 85% at forthification levels of 0.02 – 0.04 mg/kg).

Table 49. Residues in outdoor tomatoes from foliar applications of dimethomorph in supervised trials in USA and Brazil

TOMATO Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Brazil, 1996 (Debora Plus)	WP 100g+ chlthal	0.21	0.03	3	3 7	0.06 < 0.02	DK-723-041
USA (CA), 1995 (Flaver Saver Calgene)	WP 500g	0.22	0.05	6	0 3 7 14 21	0.07 < 0.05 0.06 < 0.05 < 0.05	DK-723-028
USA (CA), 1995 (Heinz 8892)	WP 500g	0.22	0.05	6	0 3 7	0.2 0.41 0.22	DK-723-031
USA (CA), 1995 (Peel Mech)	WP 500g	0.22	0.09	6	0 3 7	0.38 0.26 0.16	DK-723-030 processing study
USA (CA), 1995 (Shady Lady)	WP 500g	0.22	0.06	6	0 3 7 14 21	0.11 0.08 0.06 0.05 < 0.05	DK-723-029
USA (TE), 1995 (Better Boy)	WP 500g	0.22	0. 1	6	0 3 7 14 21	0.14 0.21 0.17 < 0.05 < 0.05	DK-723-027
USA (CA), 1996 (Rio Grande)	WP 90g+ mnczb	0.22	0.05	7	0 3 7	0.06 0.05 < 0.05	DK-723-034

TOMATO Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
USA (CA), 1998 (Celebrity)	WP 90g+ mnczb	0.22	0.08	7	0 3 7	0.35 0.51 0.35	DK-723-043
USA (CA), 1998 (Roma Hybrid 882)	WP 90g+ mnczb	0.22	0.08	7	0 3 7	0.13 0.14 0.1	DK-123-249
USA (CA), 1998 (Sun 6200)	WP 90g+ mnczb	0.22	0.08	7	0 3 7	0.3 0.14 0.09	DK-723-048
USA (FL), 1996 (Agriset)	WP 90g+ mnczb	0.22	0.03	7	0 3 7	< 0.05 ≤ 0.05 < 0.05	DK-723-032
USA (PE), 1996 (La Roma)	WP 90g+ mnczb	0.22	0.08	7	0 3 7	< 0.05 ≤ 0.05 < 0.05	DK-723-036
USA (SC), 1996 (Celebrity)	WP 90g+ mnczb	0.22	0.08	7	0 3 7	0.06 ≤ 0.05 < 0.05	DK-723-035
Brazil, 1996 (Debora Plus)	WP 100g+ chlthal	0.42	0.06	3	3 7	0.09 < 0.02	DK-723-041

Peppers, sweet

In trials on protected sweet peppers in Greece, Italy and Spain, 3 foliar applications of dimethomorph (EC or WG formulations) were made using knapsack and 1 – 2 nozzle hand lances to apply 600 litres of spray mix/ha at 7 day intervals. Samples (minimum 12 units or 2 kg) were frozen within 24 hours of sampling and stored at or below -18 °C for up to 6 months before anaysis for dimethomorph using Method M 575/0. Average recovery rates were 72 – 97% at fortification levels of 0.01 – 0.1 mg/kg and the limit of quantification was 0.01 mg/kg.

Table 50. Residues in protected sweet peppers from foliar applications of dimethomorph in supervised trials in Greece, Italy and Spain

PEPPERS, SWEET Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Spain, 2004 (Palermo)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.21 0.18 0.07	2005/1016641 (04ES/005R)
Spain, 2004 (Palermo)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.13 0.11 0.06	2005/1016641 (04ES/006R)
Italy, 2004 (Eolo)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.26 0.18 0.16	2005/1016641 (04IT/007R)
Italy, 2004 (Ranner)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.16 0.04 0.03	2005/1016641 (04IT/008R)
Spain, 2005 (Italico)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.56 0.37 0.28	2005/1027638 (05ES/005R)
Italy, 2005 (Barocco)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.38 0.33 0.33	2005/1027638 (05IT/006R)

PEPPERS, SWEET Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Greece, 2005 (Julia F1)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.13 0.11 0.05	2005/1027638 (05GR/007R)
Greece, 2005 (Dona F1)	WG 120g+ pyracl	0.18	0.03	3	0 3 7	0.21 0.2 0.08	2005/1027638 (05GR/008R)
Spain, 2005 (Italico)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.48 0.25 0.26	2005/1027638 (05ES/005R)
Italy, 2005 (Barocco)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.31 0.2 0.15	2005/1027638 (05IT/006R)
Greece, 2005 (Julia F1)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.18 0.14 0.09	2005/1027638 (05GR/007R)
Greece, 2005 (Dona F1)	EC 72g+ pyracl	0.18	0.03	3	0 3 7	0.17 0.09 0.05	2005/1027638 (05GR/008R)

Peppers, chili

In a reverse decline trial in Korea on outdoor chili peppers, dimethomorph was applied from 2 to 6 times to different plots on different application dates (10 days apart) using 2000 litres spray mix/ha and samples analysed for dimethomorph using method FAMS 002-02. The average recovery rate was 89% (0.5 – 1.25 mg/kg fortification) and the limit of quantification was 0.03 mg/kg.

Table 51. Residues in outdoor chili peppers from foliar applications of dimethomorph in supervised trials in Korea

PEPPERS, CHILI Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Korea, 1992 (Poong Mi)	WP 250g	0.5	0.03	2	20	< 0.03	DK-723-003
Korea, 1992 (Poong Mi)	WP 250g	0.5	0.03	3	1 3 7 15	0.36 0.22 0.14 0.05	DK-723-003
Korea, 1992 (Poong Mi)	WP 250g	0.5	0.03	4	1 3 7	0.46 0.31 0.15	DK-723-003
Korea, 1992 (Poong Mi)	WP 250g	0.5	0.03	5	1 3	0.6 0.53	DK-723-003
Korea, 1992 (Poong Mi)	WP 250g	0.5	0.03	6	1	0.71	DK-723-003

Lettuce, head

In trials on protected head lettuce in Europe (Germany, Greece, Italy, Spain), 2-3 foliar applications of dimethomorph (WG formulations) were made to unreplicated 8 – 20 square metre plots using knapsack sprayers and hand lances or mini-booms to apply 400 – 900 litres of spray mix/ha at 7 – 12 day intervals.

Samples (12 units or more) of lettuce heads were frozen within 24 hours of sampling and stored at or below -18 °C for up to 6 months before anaysis for dimethomorph. Analytical methods used in these studies included M 575/0 (LOQ 0.01 mg/kg) and a modified version of the DFG S 19 multi-residue method (LOQ 0.02 mg/kg). Average recovery rates were 65 – 88% at fortification levels of 0.01 – 0.2 mg/kg.

Table 52. Residues in protected lettuce from foliar applications of dimethomorph in supervised trials in Germany, Greece, Italy, Spain

LETTUCE Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) lettuce heads	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Germany, 2001 (Eichblatt Kendai) head lettuce	WG 90g+ mnczb	0.18	0.02	2	14 21	0.78 0.6	1997/1004021 (01/063)
Germany, 2001 (Eichblatt NUN 9672) head lettuce	WG 90g+ mnczb	0.18	0.02	2	14 21	0.31 0.21	1997/1004021 (01/065)
Germany, 2001 (Kopfsalat Roderick) head lettuce	WG 90g+ mnczb	0.18	0.02	2	14	0.74	1997/1004020 (BWS 1/6)
Germany, 2001 (Kopfsalat Roderick) head lettuce	WG 90g+ mnczb	0.18	0.03	2	0 7 14 21 29	2.2 0.31 0.17 0.07 < 0.02 < 0.02	1997/1004020 (BW RE 1/1)
Germany, 2001 (Kopfsalat Roderick) head lettuce	WG 90g+ mnczb	0.18	0.03	2	14	< 0.02	1997/1004020 (RE 1/2)
Germany, 2001 (Lollo Rossa Armandine) head lettuce	WG 90g+ mnczb	0.18	0.02	2	0 7 14 21 28	3.9 0.58 0.28 0.16 0.09	1997/1004021 (01/062)
Germany, 2001 (Novita Yorvik) head lettuce	WG 90g+ mnczb	0.18	0.02	2	0 7 14 21 28	5.3 7.2 0.37 0.31 0.14	1997/1004021 (01/061)
Greece, 2005 (Romain Paris Island)	WG 120g+ pyracl	0.18	0.05	3	0 3 7	2.2 2.1 0.88	2005/1027640 (05GR/016R)
Greece, 2005 (Romain Paris Island)	WG 72g+ pyracl	0.18	0.05	3	0 3 7	2.9 2.8 1.1	2005/1027640 (05GR/016R)

LETTUCE Country, year (variety)	Form	Application kg ai/ha	 kg ai/hL	 no	PHI, (days)	Dimethomorph Residues (mg/kg) lettuce heads	Reference & Comments
Greece, 2005 Black-seeded Simpson)	WG 120g+ pyracl	0.18	0.05	3	0 3 7	4.2 2.3 1.3	2005/1027640 (05GR/015R)
Greece, 2005 Black-seeded Simpson)	WG 72g+ pyracl	0.18	0.05	3	0 3 7	2.7 3.3 0.86	2005/1027640 (05GR/015R)
Italy, 2004 (Cassiopea) head lettuce	WG 120g+ pyracl	0.18	0.05	3	0 3 7	3.6 0.79 0.31	2005/1016643 (04IT/016R)
Italy, 2004 (Ramora) head lettuce	WG 120g+ pyracl	0.18	0.05	3	0 4 7	7.1 6.9 7.1	2005/1016643 (04IT/015R)
Italy, 2005 (Romana)	WG 120g+ pyracl	0.18	0.05	3	0 3 7	1.5 1.4 1.2	2005/1027640 (05IT/014R)
Italy, 2005 (Romana)	WG 72g+ pyracl	0.18	0.05	3	0 3 7	2.3 1.9 1.7	2005/1027640 (05IT/014R)
Spain, 2004 (Caralu) head lettuce	WG 120g+ pyracl	0.18	0.05	3	0 3 7	4.6 4.5 2.3	2005/1016643 (04ES/014R)
Spain, 2004 (Filipus) head lettuce	WG 120g+ pyracl	0.18	0.05	3	0 3 7	4.3 4.0 1.3	2005/1016643 (04ES/013R)
Spain, 2005 (Carolu)	WG 120g+ pyracl	0.18	0.05	3	0 3 7	2.7 2.2 0.13	2005/1027640 (05ES/013R)
Spain, 2005 Carolu)	WG 72g+ pyracl	0.18	0.05	3	0 3 7	3.1 2.8 0.77	2005/1027640 (05ES/013R)
Germany, 2001 (Kopfsalat Roderick) head lettuce	WG 90g+ mnczb	0.18+ 0.18	0.03+ 0.02	1+ 1	0 7 14 21 28	3.9 0.8 0.46 0.17 0.05	1997/1004021 (01/066)

In trials on outdoor head lettuce in Europe (Germany, France, Spain), 2 – 4 foliar applications of dimethomorph (WG formulations) were made to unreplicated 3 – 60 square metre plots using small plot or motorised knapsack sprayers and hand lances or mini-booms to apply 400 – 1200 litres of spray mix/ha at 6 – 14 day intervals. Similar trials were conducted in Australia, involving 2 applications of dimethomorph at 5 – 10 day intervals, applying about 200 – 450 litres spray mix/ha.

Samples (12 units or more) of lettuce heads were frozen within 24 hours of sampling and stored at or below -15 °C for up to 6 months before anaysis for dimethomorph. Analytical methods used in the European studies were FAMS 002-02 (LOQ of 0.015 mg/kg) or a modified version of the DFG S 19 multi-residue method (LOQ of 0.02 mg/kg). Average recovery rates were 80 – 98% at fortification levels of 0.015 – 1.0 mg/kg. The analytical method used in the Australian studies was

FAMS 026-01, with a limit of quantification of 0.02 mg/kg and average recovery rates of 82 – 95% at fortification levels of 0.1 – 1.0 mg/kg.

Table 53. Residues in outdoor lettuce from foliar applications of dimethomorph in supervised trials in Australia, France, Germany and Spain

LETTUCE Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.18	0.09	2	28	< 0.02	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.18	0.09	2	21	< 0.02	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.18	0.09	2	14	0.09	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.18	0.09	2	7	1.2	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.18	0.09	2	0	3.8	DK-726-008
Australia, 1995 (Target)	WP 90g+ mnczb	0.18	0.04	2	26	0.04	DK-726-007
Australia, 1995 (Target)	WP 90g+ mnczb	0.18	0.04	2	21	0.04	DK-726-007
Australia, 1995 (Target)	WP 90g+ mnczb	0.18	0.04	2	14	0.06	DK-726-007
Australia, 1995 (Target)	WP 90g+ mnczb	0.18	0.04	2	7	0.88	DK-726-007
Australia, 1995 (Target)	WP 90g+ mnczb	0.18	0.04	2	0	2.0	DK-726-007
Germany, 1997 (Lollo Bionda)	WG 90G+ mnczb	0.18	0.05	3	17	< 0.02	DK-726-012 DK-701-015 (BF/FG 96/97
Germany, 1997 (Mirian) head lettuce	WG 90G+ mnczb	0.18	0.03	3	0 7 10 14 21	8.3 0.19 0.07 < 0.02 < 0.02	DK-724-057 DK-701-015 (RU-CY-03 97 MZ)
Spain, 1999 (Cati) head lettuce	WG 75g+ mnczb	0.27+ 0.2+ 0.23+ 0.19	0.02+ 0.02+ 0.02+ 0.02	4	-0 0 4 7 11 15	0.03 0.19 0.06 0.05 0.03 0.03	DK-726-014 (99-214-21)
Spain, 1999 (Salen) iceberg lettuce	WG 75g+ mnczb	0.2+ 0.24	0.02+ 0.02	1+ 3	7	0.07	DK-726-015 (99-213-18)
Spain, 1999 (Cati) iceberg lettuce	WG 75g+ mnczb	0.28+ 0.24	0.02+ 0.02	1+ 3	7	0.06	DK-726-015 (99-213-17)
Spain, 1999 (Astral)	WG 75g+ mnczb	0.22+ 0.18+ 0.21	0.02+ 0.02+ 0.02	1+ 1+ 2	7	0.39	DK-726-015 (99-213-20)

LETTUCE Country, year (variety)	Form	Application kg ai/ha	 kg ai/hL	 no	PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
iceberg lettuce							
Spain, 1999 (Yucaipa) iceberg lettuce	WG 75g+ mnczb	0.24+ 0.21+ 0.22	0.02+ 0.02+ 0.02	!+ 2+ 1	7	0.38	DK-726-015 (99-213-19)
Spain, 1998 (Astral) head lettuce	WG 75g+ mnczb	0.22+ 0.21+ 0.23+ 0.2	0.02+ 0.02+ 0.02+ 0.02	1+ 1+ 1+ 1	-0 0 4 7 11 14	0.12 0.98 0.4 0.16 0.08 0.09	DK-726-009 (98-112-45)
Spain, 1999 (Astral) head lettuce	WG 75g+ mnczb	0.17+ 0.23+ 0.24+ 0.23	0.02+ 0.02+ 0.02+ 0.02	4	-0 0 4 7 11 13	0.36 1.5 0.55 0.43 0.29 0.09	DK-726-014 (99-214-22)
Spain, 1998 (Astral) head lettuce	WG 75g+ mnczb	0.23+ 0.21+ 0.25+ 0.22	0.02+ 0.02+ 0.02+ 0.02	1+ 1+ 1+ 1	-0 0 4 7 11 14	0.1 0.27 0.08 0.1 0.04 0.03	DK-726-009 (98-112-46)
France, 1992 (Balisto) head lettuce	DC 150g	0.3	0.05	2	17	0.02	DK-726-006 DK-726-003 (GFRR922080) 14day intervals
France, 1992 (Rouge Rosso) head lettuce	DC 150g	0.3	0.06	2	27	< 0.02	DK-726-006 DK-726-003 (GFRR92203) 14day intervals
France, 1992 (Balisto) head lettuce	DC 150g	0.3	0.05	4	9	0.29	DK-726-006 DK-726-003 (GFRR92080) 7day intervals
France, 1992 (Rouge Rosso) head lettuce	DC 150g	0.3	0.06	4	20	0.08	DK-726-006 DK-726-003 (GFRR92203) 7day intervals
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.36	0.09	2	28	< 0.02	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.36	0.09	2	21	< 0.02	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.36	0.09	2	14	0.43	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.36	0.09	2	7	2.7	DK-726-008
Australia, 1994 (Sea Green)	WP 90g+ mnczb	0.36	0.09	2	0	5.6	DK-726-008
Australia, 1995 (Target)	WP 90g+ mnczb	0.36	0.08	2	28	0.04	DK-726-007

LETTUCE Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Australia, 1995 (Target)	WP 90g+ mnczb	0.36	0.08	2	21	0.04	DK-726-007
Australia, 1995 (Target)	WP 90g+ mnczb	0.36	0.08	2	14	0.08	DK-726-007
Australia, 1995 (Target)	WP 90g+ mnczb	0.36	0.08	2	7	1.6	DK-726-007
Australia, 1995 (Target)	WP 90g+ mnczb	0.36	0.08	2	0	3.4	DK-726-007
France, 1992 (Balisto) head lettuce	DC 150g	0.6	0.1	2	17	0.02	DK-727-006 DK-726-003 (GFRR92080) 14day intervals
France, 1992 (Rouge Rosso) head lettuce	DC 150g	0.6	0.12	2	27	< 0.02	DK-727-006 DK-726-003 (GFRR92203) 14day intervals
France, 1992 (Balisto) head lettuce	DC 150g	0.6	0.1	4	9	0.45	DK-727-006 DK-726-003 (GFRR92080) 7day intervals
France, 1992 (Rouge Rosso) head lettuce	DC 150g	0.6	0.12	4	20	0.83	DK-727-006 DK-726-003 (GFRR92203) 7day intervals

Corn salad (lambs lettuce)

In trials conducted in Italy and Spain on protected corn salad (lambs lettuce), 3 applications of dimethomorph were applied at 7 day intervals. WG formulations were applied to unreplicated 8 – 20 square metre plots using knapsack sprayers and hand lances or mini-booms to apply 400 – 900 litres of spray mix/ha at 7 – 12 day intervals.

Samples (12 units or more) of entire plants without roots were frozen within 24 hours of sampling and stored at or below -18 °C for up to 6 months before anaysis for dimethomorph. Analytical methods used in these studies included M 575/0 (LOQ 0.01 mg/kg) and a modified version of the DFG S 19 multi-residue method (LOQ 0.02 mg/kg). Average recovery rates were 65 – 88% at fortification levels of 0.01 – 0.2 mg/kg.

Table 54. Residues in protected corn salad (lambs lettuce) from foliar applications of dimethomorph in supervised trials in Italy and Spain

LAMBS LETTUCE (CORN SALAD) Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) Whole plants (without roots)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Spain, 2005 (Seme Piccolo)	WG 120g+ pyracl	0.18	0.05	3	0 3 7	13.5 9.3 5.3	2005/1027640 (05ES/017R)

LAMBS LETTUCE (CORN SALAD) Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		Whole plants (without roots)	
Italy, 2005 (Verte de Cambrai)	WG 120g+ pyracl	0.18	0.05	3	0 3 7	7.6 6.8 0.79	2005/1027640 (05IT/018R)
Italy, 2005 (Verte de Cambrai)	WG 120g+ pyracl	0.18	0.05	3	0 3 7	11.3 7.7 1.9	2005/1027640 (05GR/019R)
Spain, 2005 (Seme Piccolo)	WG 72g+ pyracl	0.18	0.05	3	0 3 7	12.3 9.9 7.1	2005/1027640 (05ES/017R)
Italy, 2005 (Verte de Cambrai)	WG 72g+ pyracl	0.18	0.05	3	0 3 7	11.0 6.5 0.79	2005/1027640 (05IT/018R)
Italy, 2005 (Verte de Cambrai)	WG 72g+ pyracl	0.18	0.05	3	0 3 7	28.8 10.0 7.1	2005/1027640 (05GR/019R)

Spinach

In trials on outdoor spinach in USA, 7 foliar applications of dimethomorph (WP formulation) were made at 5 – 8 day intervals to unreplicated 40 – 300 square metre plots, using knapsack and tractor-mounted boom sprayers to apply 190 – 280 litres spray mix/ha. Samples were frozen within 5 hours of harvest and stored for up to 30 weeks before analasis for dimethomorph using Method M 3502, with a limit of quantification of 0.05 mg/kg and an average recovery rate of 92% at fortification levels of 0.05 – 10 mg/kg.

Table 55. Residues in outdoor spinach from foliar applications of dimethomorph in supervised trials in USA

SPINACH Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no			
USA (PA), 2001 (Tyee)	WP 500g	0.22	0.09	7	7	1.1	2002/5003869 (2001/868)
USA (NC), 2001 (Skookum Hybrid)	WP 500g	0.22	0.08	7	0 3 7 14 21	9.2 5.3 2.3 0.4 0.4	2002/5003869 (2001/869)
USA (CO), 2001 (Tyee)	WP 500g	0.22	0.1	7	7	0.2	2002/5003869 (2001/870)
USA (CA), 2001 (Viro Faly)	WP 500g	0.22	0.08	7	7	0.6	2002/5003869 (2001/871)
USA (TX), 2001 (612)	WP 500g	0.22	0.12	7	7	10.1	2002/5003869 (2001/872)
USA (TX), 2001 (Samish)	WP 500g	0.22	0.1	7	7	4.0	2002/5003869 (2001/873)

Potatoes

In trials on potatoes in Europe (Belgium, Denmark, France, Greece, Germany, France, Italy, Spain, UK), 3 – 12 foliar applications of dimethomorph (EC, DC, SC, WP formulations) were made to unreplicated 15 – 70 square metre plots using a range of plot knapsack sprayers and mini-booms (up to 3 metres swath width), in most cases applying 200 – 600 litres of spray mix/ha at 6 – 12 day intervals.

In similar trials in Argentina, Australia, Brazil, Canada, New Zealand and USA, 3 – 10 foliar applications of dimethomorph were made to unreplicated 10 – 40 square metre plots at 5 – 8 day intervals using plot sprayers and mini-booms to apply 300 – 800 litres of spray mix/ha. In some trials in Argentina, Canada and USA, larger plot sizes of 120 – 200 square metres were used, with tractor-mounted boom sprayers used to apply about 200 – 300 litres of spray mix/ha at 6 – 15 day intervals.

Samples (minimum 12 – 24 tubers or 2 – 5 kg) were in many cases, brushed to remove excess dirt, frozen within 24 hours and stored at or below -10 °C to -20 °C for up to 22 months before analysis for dimethomorph. Analytical methods used in the European studies were FAMS 002-02 (LOQs of 0.01 – 0.02 mg/kg), M 575/0 (LOQ of 0.01 mg/kg), RLA 12654 (LOQ of 0.05 mg/kg) or FAMS 022-03 (LOQ of 0.01 mg/kg). Average recovery rates were 78 – 99% at fortification levels of 0.01 – 1.0 mg/kg. The analytical methods used in the non-European studies included FAMS 022-01, FAMS 022-02, FAMS 026-01 and M 2639. Limits of quantification ranged from 0.01 mg/kg to 0.05 mg/kg and average recovery rates were 78 – 101% at fortification levels of 0.1 – 0.3 mg/kg.

Table 56. Residues in potatoes from foliar applications of dimethomorph in supervised trials in Europe (Belgium, Denmark, France, Greece, Germany, France, Italy, Spain, UK)

POTATOES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		kg ai/ha	kg ai/hL	no		Tubers	
UK, 1991 (Romano)	WP 75g+ mnczb	0.15	0.06	7	7	<u>≤ 0.02</u>	DK-724-020 (SF9104/1)
UK, 1991 (Romano)	WP 75g+ mnczb	0.15	0.06	7	7	<u>≤ 0.02</u>	DK-724-020 (SF9104/1) with Dobanol ethoxylate adjuvant
UK, 1991 (Maris Piper)	WP 75g + mnczb	0.15	0.08	7	8	<u>≤ 0.02</u>	DK-724-017 (SUKF91/226)
UK, 1991 (Maris Piper)	WP 75g + mnczb	0.15	0.08	7	8	<u>≤ 0.02</u>	DK-724-017 (SUKF91/226) with Dobanol ethoxylate adjuvant
UK, 1991 (Maris Piper)	WP 500g	0.15	0.08	7	8	<u>≤ 0.02</u>	DK-724-017 (SUKF91/226)
UK, 1991 (Maris Piper)	WP 500g	0.15	0.08	7	8	<u>≤ 0.02</u>	DK-724-017 (SUKF91/226) with Dobanol ethoxylate adjuvant
UK, 1993 (Desiree)	WG 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/1)
UK, 1993 (Desiree)	WP 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/1)
UK, 1993 (Marfona)	WG 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/2)
UK, 1993 (Marfona)	WP 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/2)
UK, 1993 (Maris Piper)	WG 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/4)

POTATOES Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
UK, 1993 (Maris Piper)	WP 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/4)
UK, 1993 (Romano)	WG 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/3)
UK, 1993 (Romano)	WP 75g+ mnczb	0.15	0.06	8	7	<u>≤ 0.01</u>	DK-724-026 (AS2067/SL/3)
UK, 1999 (Cara)	WG 75g+ mnczb	0.15	0.05	8	7	<u>≤ 0.01</u>	2000/1022812 (AP/4833/CY/1)
UK, 1999 (Estima)	WG 75g+ mnczb	0.15	0.05	8	7	<u>≤ 0.01</u>	2000/1022812 (AP/4833/CY/3)
UK, 1999 (Maris Piper)	WG 75g+ mnczb	0.15	0.05	8	7	<u>≤ 0.01</u>	2000/1022812 (AP/4833/CY/2)
UK, 1999 (Romano)	WG 75g+ mnczb	0.15	0.05	8	7	<u>≤ 0.01</u>	2000/1022812 (AP/4833/CY/4)
UK, 1989 (Marfona)	WP 75g+ mnczb	0.15	0.06	8	13	< 0.01	DK-724-007 DK-724-010 (SF8904/3
UK, 1989 (Romano)	WP 75g+ mnczb	0.15	0.06	8	26	< 0.01	DK-724-007 DK-724-010 (SF8904/2
UK, 1989 (Cara)	WP 75g+ mnczb	0.15	0.06	8	27	< 0.01	DK-724-007 DK-724-010 (SF8904/1
UK, 1991 (Cara)	WP 75g+ mnczb	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/400)
UK, 1991 (Cara)	WP 75g+ mnczb	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/400) with Dobanol ethoxylate adjuvant
UK, 1991 (Cara)	WP 500g	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/400)
UK, 1991 (Cara)	WP 500g	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/400) with Dobanol ethoxylate adjuvant
UK, 1991 (Desiree)	WP 75g+ mnczb	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/401)
UK, 1991 (Desiree)	WP 75g+ mnczb	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/401) with Dobanol ethoxylate adjuvant
UK, 1991 (Desiree)	WP 500g	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/401)
UK, 1991 (Desiree)	WP 500g	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-019 (SUKF 91/401) with Dobanol ethoxylate adjuvant

POTATOES Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
UK, 1991 (var)	WP 75g + mnczb	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-017 (SUKF91/227)
UK, 1991 (var)	WP 75g + mnczb	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-017 (SUKF91/227) with Dobanol ethoxylate adjuvant
UK, 1991 (var)	WP 500g	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-017 (SUKF91/227)
UK, 1991 (var)	WP 500g	0.15	0.08	9	7	<u>≤ 0.02</u>	DK-724-017 (SUKF91/227) with Dobanol ethoxylate adjuvant
UK, 1991 (Maris Piper)	WP 75g+ mnczb	0.15	0.06	10	7	<u>0.02</u>	DK-724-020 (SF9104/2)
UK, 1991 (Maris Piper)	WP 75g+ mnczb	0.15	0.06	10	7	<u>0.04</u>	DK-724-020 (SF9104/2) with Dobanol ethoxylate adjuvant
Belgium, 2005 (Bintje)	EC 72g+ pyracl	0.18	0.06	3	0 2 7 14	< 0.01 < 0.01 < 0.01 < 0.01	2006/1000581 (G018-05 F-B)
Denmark, 2005 (Hamlet)	EC 72g+ pyracl	0.18	0.06	3	0 3 7 14	< 0.01 < 0.01 < 0.01 < 0.01	2006/1000581 (ALB/190506-01)
France (NE), 2005 (Cesar)	EC 72g+ pyracl	0.18	0.06	3	0 2 7 15	< 0.01 < 0.01 <u>≤ 0.01</u> < 0.01	2006/1000581 (05 F PT FR P22)
France (NE), 2005 (Vitesse)	EC 72g+ pyracl	0.18	0.06	3	0 3 7 14	< 0.01 < 0.01 <u>≤ 0.01</u> < 0.01	2006/1000581 (05 F PT FR P23)
France, 2005 (Agata)	EC 72g+ pyracl	0.18	0.06	3	0 3 7 14	< 0.01 < 0.01 <u>≤ 0.01</u> < 0.01	2006/1000581 (05 F PT FR P21)
Greece, 2005 (Dailfa)	EC 72g+ pyracl	0.18	0.06	3	0 3 7 14	< 0.01 < 0.01 < 0.01 < 0.01	2006/1000581 (05RF048)
France (SE), 2005 (Cherie)	EC 72g+ pyracl	0.18	0.06	3	1 3 7 14	< 0.01 < 0.01 <u>≤ 0.01</u> < 0.01	2006/1000581 (05 F PT FR P24)
Germany, 2005 (Kuras)	EC 72g+ pyracl	0.18	0.06	3	0 3 7 15	0.01 0.03 < 0.01 0.02	2006/1000581 (AT-05/006-1)
Italy, 2005 (Primura)	EC 72g+ pyracl	0.18	0.06	3	0 4 7 14	< 0.01 < 0.01 < 0.01 < 0.01	2006/1000581 (0538R)

POTATOES Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
Spain, 2005 (Gliceta)	EC 72g+ pyracl	0.18	0.06	3	0 4 7 14	< 0.01 < 0.01 < 0.01 < 0.01	2006/1000581 (05ES083R)
France (SE), 2000 (Mona Lisa)	WP 500g	0.18	0.05	5	7 14	< 0.05 < 0.05	DK-724-101 (00-501-642)
Germany, 1987 (Sieglinde)	WP 90g+ mnczb	0.18	0.03	6	0 7 14 21 28 35	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	DK-724-003 DK-724-013 (C870406)
Germany, 1987 (Ulla)	WP 90g+ mnczb	0.18	0.03	6	0 7 14 21 28 35	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	DK-724-003 DK-724-013 (C870405)
Germany, 1987 (Taiga)	WP 90g+ mnczb	0.18	0.03	6	0 7 14 21 29 35	0.02 0.02 0.01 < 0.01 < 0.01 < 0.01	DK-724-003 DK-724-013 (C870401)
France, 1989 (Froise)	SC 48g+ mnczb	0.18	0.05	8	8	< 0.01	DK-724-004 DK-724-012 (WFRF 89277)
UK, 1989 (Marfona)	WP 90g+ mnczb	0.18	0.07	8	13	< 0.01	DK-724-007 DK-724-010 (SF8904/3
Germany, 1996 (Artana)	WG 90g+ mnczb	0.18	0.05	8	14	< 0.05	DK-724-029 (96-545-02)
Germany, 1996 (Artana)	WP 90g+ mnczb	0.18	0.05	8	14	< 0.05	DK-724-029 (96-545-02)
Germany, 1996 (Bintje)	WG 90g+ mnczb	0.18	0.05	8	14	< 0.05	DK-724-029 (96-545-01)
Germany, 1996 (Bintje)	WP 90g+ mnczb	0.18	0.05	8	14	< 0.05	DK-724-029 (96-545-01)
Germany, 1996 (Quarta)	WG 90g+ mnczb	0.18	0.05	8	14	< 0.05	DK-724-029 (96-545-03)
Germany, 1996 (Quarta)	WP 90g+ mnczb	0.18	0.05	8	14	< 0.05	DK-724-029 (96-545-03)
UK, 1989 (Romano)	WP 90g+ mnczb	0.18	0.07	8	26	< 0.01	DK-724-007 DK-724-010 (SF8904/2
UK, 1989 (Cara)	WP 90g+ mnczb	0.18	0.07	8	27	< 0.01	DK-724-007 DK-724-010 (SF8904/1
France, 1989 (Bintje)	SC 48g+ mnczb	0.18	0.04	12	6	< 0.01	DK-724-004 DK-724-012 (WFRF 89514)

POTATOES Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
France, 1989 (Froise)	WP 75g+ mnczb	0.19	0.05	8	8	< 0.01	DK-724-004 DK-724-012 (WFRF 89277)
France, 1989 (Bintje)	WP 75g+ mnczb	0.19	0.04	12	6	< 0.01	DK-724-004 DK-724-012 (WFRF 89514)
Italy, 2001 (Kuroda)	WP 500g	0.18+ 0.19+ 0.18	0.06+ 0.06+ 0.06	3+ 1+ 1	0 4 8 15	< 0.05 < 0.05 < 0.05 < 0.05	DK-724-097 (ITA/19/01)
France (SE), 2000 (Charlotte)	WP 500g	0.16+ 0.17+ 0.18+ 0.16	0.08+ 0.08+ 0.08+ 0.08	1+ 1+ 2+ 1	7 14	< 0.05 < 0.05	DK-724-101 (00-501-284)
Italy, 2001 (Liseta)	WP 500g	0.18+ 0.19+ 0.18+ 0.17	0.06+ 0.06+ 0.06+ 0.06	1+ 1+ 1+ 2	0 2 7 14	< 0.05 < 0.05 < 0.05 < 0.05	DK-724-097 (ITA/21/01)
Italy, 2001 (Vivaldi)	WP 500g	0.19+ 0.18+ 0.17+ 0.18	0.06+ 0.06+ 0.06+ 0.06	1+ 1+ 2+ 1	0 3 8 14	< 0.05 < 0.05 < 0.05 < 0.05	DK-724-097 (ITA/20/01)
Italy, 2000 (Agata)	WP 500g	0.17+ 0.18+ 0.17+ 0.19+ 0.17	0.02+ 0.02+ 0.02+ 0.02+ 0.02	1+ 1+ 1+ 1+ 1	7 14	< 0.05 < 0.05	DK-724-104 (00-1311-01)
Italy, 2000 (Mona Lisa)	WP 500g	0.17+ 0.18+ 0.19+ 0.18+ 0.17	0.02+ 0.02+ 0.02+ 0.02+ 0.02	1+ 1+ 1+ 1+ 1	7 14	< 0.05 < 0.05	DK-724-104 (00-1311-02)
UK, 1991 (Romano)	WP 75g+ mnczb	0.3	0.12	7	7	< 0.02	DK-724-020 (SF9104/1)
UK, 1991 (Romano)	WP 75g+ mnczb	0.3	0.12	7	7	0.05	DK-724-020 (SF9104/1) with Dobanol ethoxylate adjuvant
UK, 1991 (Maris Piper)	WP 75g + mnczb	0.3	0.15	7	8	< 0.02	DK-724-017 (SUKF91/226)
UK, 1991 (Maris Piper)	WP 75g + mnczb	0.3	0.15	7	8	< 0.02	DK-724-017 (SUKF91/226) with Dobanol ethoxylate adjuvant
UK, 1991 (Maris Piper)	WP 500g	0.3	0.15	7	8	< 0.02	DK-724-017 (SUKF91/226)
UK, 1991 (Maris Piper)	WP 500g	0.3	0.15	7	8	< 0.02	DK-724-017 (SUKF91/226) with Dobanol ethoxylate adjuvant
UK, 1989 (Marfona)	WP 75g+ mnczb	0.3	0.12	8	13	< 0.01	DK-724-007 DK-724-010 (SF8904/3

POTATOES Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
UK, 1989 (Romano)	WP 75g+ mnczb	0.3	0.12	8	26	< 0.01	DK-724-007 DK-724-010 (SF8904/2
UK, 1989 (Cara)	WP 75g+ mnczb	0.3	0.12	8	27	< 0.01	DK-724-007 DK-724-010 (SF8904/1
UK, 1991 (Cara)	WP 75g+ mnczb	0.3	0.15	9	7	< 0.02	DK-724-019 (SUKF 91/400)
UK, 1991 (Cara)	WP 75g+ mnczb	0.3	0.15	9	7	0.05	DK-724-019 (SUKF 91/400) with Dobanol ethoxylate adjuvant
UK, 1991 (Cara)	WP 500g	0.3	0.15	9	7	< 0.02	DK-724-019 (SUKF 91/400)
UK, 1991 (Cara)	WP 500g	0.3	0.15	9	7	< 0.02	DK-724-019 (SUKF 91/400) with Dobanol ethoxylate adjuvant
UK, 1991 (Desiree)	WP 75g+ mnczb	0.3	0.15	9	7	< 0.02	DK-724-019 (SUKF 91/401)
UK, 1991 (Desiree)	WP 75g+ mnczb	0.3	0.15	9	7	< 0.02	DK-724-019 (SUKF 91/401) with Dobanol ethoxylate adjuvant
UK, 1991 (Desiree)	WP 500g	0.3	0.15	9	7	< 0.02	DK-724-019 (SUKF 91/401)
UK, 1991 (Desiree)	WP 500g	0.3	0.15	9	7	< 0.02	DK-724-019 (SUKF 91/401) with Dobanol ethoxylate adjuvant
UK, 1991 (var)	WP 75g + mnczb	0.3	0.15	9	7	< 0.02	DK-724-017 (SUKF91/227)
UK, 1991 (var)	WP 75g + mnczb	0.3	0.15	9	7	0.03	DK-724-017 (SUKF91/227) with Dobanol ethoxylate adjuvant
UK, 1991 (var)	WP 500g	0.3	0.15	9	7	< 0.02	DK-724-017 (SUKF91/227)
UK, 1991 (var)	WP 500g	0.3	0.15	9	7	< 0.02	DK-724-017 (SUKF91/227) with Dobanol ethoxylate adjuvant
UK, 1991 (Maris Piper)	WP 75g+ mnczb	0.3	0.12	10	7	0.02	DK-724-020 (SF9104/2)
UK, 1991 (Maris Piper)	WP 75g+ mnczb	0.3	0.12	10	7	0.02	DK-724-020 (SF9104/2) with Dobanol ethoxylate adjuvant

POTATOES Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
UK, 1989 (Marfona)	WP 90g+ mnczb	0.36	0.14	8	13	< 0.01	DK-724-007 DK-724-010 (SF8904/3
UK, 1989 (Romano)	WP 90g+ mnczb	0.36	0.14	8	26	< 0.01	DK-724-007 DK-724-010 (SF8904/2
UK, 1989 (Cara)	WP 90g+ mnczb	0.36	0.14	8	27	< 0.01	DK-724-007 DK-724-010 (SF8904/1
UK, 1991 (Maris Piper)	WP 500g	0.5	0.25	7	8	< 0.02	DK-724-017 (SUKF91/226)
UK, 1991 (Maris Piper)	WP 500g	0.5	0.25	7	8	< 0.02	DK-724-017 (SUKF91/226) with Dobanol ethoxylate adjuvant
UK, 1991 (Cara)	WP 500g	0.5	0.25	9	7	< 0.02	DK-724-019 (SUKF 91/400)
UK, 1991 (Cara)	WP 500g	0.5	0.25	9	7	0.02	DK-724-019 (SUKF 91/400) with Dobanol ethoxylate adjuvant
UK, 1991 (Desiree)	WP 500g	0.5	0.25	9	7	< 0.02	DK-724-019 (SUKF 91/401)
UK, 1991 (Desiree)	WP 500g	0.5	0.25	9	7	0.03	DK-724-019 (SUKF 91/401) with Dobanol ethoxylate adjuvant
UK, 1991 (var)	WP 500g	0.5	0.25	9	7	< 0.02	DK-724-017 (SUKF91/227)
UK, 1991 (var)	WP 500g	0.5	0.25	9	7	0.02	DK-724-017 (SUKF91/227) with Dobanol ethoxylate adjuvant

Table 57. Residues in potatoes from foliar applications of dimethomorph in supervised trials in Argentina, Australia, Canada, Brazil, New Zealand and USA

POTATOES Country, year (variety)	Form	Application kg ai/ha	kg ai/hL	no	PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
Australia, 1994 (Coliban)	WP 90g+ mnczb	0.18	0.13	3	49	< 0.02	DK-724-027
New Zealand, 1993 (Ilam Hardy)	DC 150g	0.07+ 0.13+ 0.2	0.02+ 0.02+ 0.02	3+ 2+ 5	25	< 0.02	DK-724-028
New Zealand, 1993 (Ilam Hardy)	WP 500g	0.07+ 0.13+ 0.2	0.02+ 0.02+ 0.02	3+ 2+ 5	25	< 0.02	DK-724-028
New Zealand, 1993 (Ilam Hardy)	WP 75g+ mnczb	0.06+ 0.13+ 0.19	0.02+ 0.02+ 0.02	3+ 2+ 5	25	< 0.02	DK-724-028

POTATOES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Brazil, 1999 (Mona Lisa)	SC 100g+ chlthl	0.2	0.03	2	1 3 7 14	< 0.03 < 0.03 < 0.03 < 0.03	2000/304509
Brazil, 1999 (Mona Lisa)	SC 100g+ chlthl	0.2	0.03	3	14	< 0.03	2000/304511
Brazil, 2001 (Jet Bintje)	SC 100g+ chlthl	0.2	0.04	4	7	< 0.03	2000/306299
Brazil, 2001 (Mona Lisa)	SC 100g+ chlthl	0.2	0.24	4	14	< 0.03	2000/304517
Brazil, 2001 (Agata)	SC 100g+ chlthl	0.2	0.24	4	14	< 0.03	2000/304515
Brazil, 2001 (Jet Bintje)	SC 100g+ chlthl	0.2	0.04	4	14	< 0.03	2000/304515
Brazil, 2001 (Agata)	SC 100g+ chlthl	0.2	0.04	4	0 3 7 14 21	< 0.03 < 0.03 < 0.03 < 0.03 < 0.03	2000/304513
USA (NY), 1996 (Chippewa)	WP 90g+ mnczb	0.22	0.09	3	0 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01	DK-724-040
USA (ND), 1996 (Atlantic)	WP 90g+ mnczb	0.22	0.12	7	0 3 7	< 0.01 ≤ 0.01 < 0.01	DK-724-032
USA (FL), 1996 (Atlantic)	WP 90g+ mnczb	0.22	0.12	7	0 3 7	< 0.01 ≤ 0.01 < 0.01	DK-724-033
USA (CA), 1996 (Atlantic)	WP 90g+ mnczb	0.22	0.12	7	0 3 7	0.02 0.02 0.02	DK-724-034
USA (NY), 1996 (Atlantic)	WP 90g+ mnczb	0.22	0.12	7	0 3 7	< 0.01 ≤ 0.01 < 0.01	DK-724-036
USA (ID), 1998 (Russet Burbank)	WP 90g+ mnczb	0.22	0.08	7	0 3 7	< 0.01 ≤ 0.01 < 0.01	DK-724-098
USA (WA), 1998 (Russet Burbank)	WP 90g+ mnczb	0.22	0.08	7	0 3 7	< 0.01 ≤ 0.01 < 0.01	DK-724-099
Brazil, 2001 (Asterix)	WP 90g+ mnczb	0.23	0.05	3	14	< 0.03	2000/306316
Brazil, 2001 (Asterix)	WP 90g+ mnczb	0.23	0.05	3	14	0.03	2000/306310
Canada, 1996 (Norchip)	WP 90g+ mnczb	0.23	0.11	3	0 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01	DK-724-038
Canada, 1996 (Russet Burbank)	WP 90g+ mnczb	0.23	0.09	3	0 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01	DK-724-041
Brazil, 2001 (Bintje)	WP 90g+ mnczb	0.23	0.05	4	0 3 7 14 21	< 0.03 < 0.03 < 0.03 < 0.03 < 0.03	2002/304602
USA (NC), 1998 (Red Pontiac)	WP 90g+ mnczb	0.24	0.13	7	0 3 7	< 0.01 ≤ 0.01 < 0.01	DK-724-045

POTATOES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg) Tubers	Reference & Comments
		kg ai/ha	kg ai/hL	no			
Brazil, 1999 (Bintje)	WP 250+ chlthl	0.25	0.04	3	7	< 0.02	DK-724-050
Australia, 1994 (Coliban)	WP 90g+ mnczb	0.36	0.25	3	49	< 0.02	DK-724-027
New Zealand, 1993 (Ilam Hardy)	WP 75g+ mnczb	0.13+ 0.25+ 0.38	0.04+ 0.04+ 0.04	3+ 2+ 5	25	< 0.02	DK-724-028
Brazil, 1999 (Mona Lisa)	SC 100g+ chlthl	0.4	0.05	3	14	≤ 0.03	2000/304511
Brazil, 2001 (Jet Bintje)	SC 100g+ chlthl	0.4	0.08	4	7	< 0.03	2000/306299
Brazil, 2000 (Mona Lisa)	WP 500g	0.4	0.08	4	14	≤ 0.03	2000/304418
Brazil, 2000 (Mona Lisa)	WP 500g	0.4	0.08	4	14	≤ 0.03	2000/304419
Brazil, 2001 (Mona Lisa)	SC 100g+ chlthl	0.4	0.48	4	14	≤ 0.03	2000/304517
Brazil, 2001 (Agata)	SC 100g+ chlthl	0.4	0.48	4	14	≤ 0.03	2000/304515
Brazil, 2001 (Jet Bintje)	SC 100g+ chlthl	0.4	0.0	4	14	≤ 0.03	2000/304515
Brazil, 2000 (Mona Lisa)	WP 500g	0.4	0.08	4	0 3 7 14	< 0.03 < 0.03 < 0.03 ≤ 0.03	2000/304420
Brazil, 1999 (Mona Lisa)	WP 500g	0.45	0.06	2	1 3 7 14	< 0.03 < 0.03 < 0.03 ≤ 0.03	2000/304416
Brazil, 1999 (Mona Lisa)	WP 500g	0.45	0.06	3	14	≤ 0.03	2000/304417
Brazil, 2001 (Asterix)	WP 90g+ mnczb	0.45	0.09	3	14	≤ 0.03	2000/306316
Brazil, 2001 (Asterix)	WP 90g+ mnczb	0.45	0.09	3	14	0.03	2000/306310
USA (NY), 1996 (Chippewa)	WP 90g+ mnczb	0.45	0.19	3	0 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01	DK-724-040
Canada, 1996 (Russet Burbank)	WP 90g+ mnczb	0.45	0.19	3	0 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01	DK-724-041
Canada, 1996 (Norchip)	WP 90g+ mnczb	0.46	0.23	3	0 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01	DK-724-038
Brazil, 1999 (Bintje)	WP 250+ chlthl	0.5	0.08	3	7	< 0.02	DK-724-050
Brazil, 2000 (Mona Lisa)	WP 500g	0.8	0.16	4	14	< 0.03	2000/304418
Brazil, 2000 (Mona Lisa)	WP 500g	0.8	0.16	4	14	< 0.03	2000/304419
Brazil, 1999 (Mona Lisa)	WP 500g	0.9	0.11	3	14	< 0.03	2000/304417
Argentina, 1997 (Spunta)	WP 500g	1.0	0.33	4	14	< 0.05	DK-724-051
Argentina, 1997 (Spunta)	WP 500g	2.0	0.66	4	14	< 0.05	DK-724-051

Rape seed

In trials on oilseed rape in Germany, dimethoate (WP formulation) was mixed with water to form a slurry and applied as a seed dressing to rape seed using a concrete mixer 3 – 14 days before planting. Samples of mature seeds were taken from the plants grown from the treated seed in unreplicated 40 – 80 square metre plots, stored at or below -18 °C for up to 3 months and analysed for dimethomoprh using the DFG Clean-up Methods 5 and 6 and GC-MS/MS analysis. The limit of quantification was 0.02 mg/kg and the mean recovery rate was 95% at fortification levels of 0.02 – 0.2 mg/kg. The study report noted that the apparent residues detected in the control samples (0.023 – 0.024 mg/kg) and the lack of detectable residues (< 0.006 mg/kg) in the samples from the seed-treated plants suggested that these samples had been cross-labelled.

Table 58. Residues in rape seed from seed dressing treatments with dimethomorph in supervised trials in Germany

RAPE SEED Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)	Reference & Comments
		Method	Rate	no		Seed	
Germany, 1997 (Licosmos) Summer rape	WP 500g	Seed dressing	3.5 gai/kg seed 0.03 kg ai/ha	1	146	< 0.02	DK-750-002 DK-750-003 (9702-01)
Germany, 1997 (Licosmos) Summer rape	WP 500g	Seed dressing	3.5 gai/kg seed 0.03 kg ai/ha	1	163	< 0.02	DK-750-002 DK-750-003 (9702-02)
Germany, 1997 (Licosmos) Summer rape	WP 500g	Seed dressing	3.5 gai/kg seed 0.03 kg ai/ha	1	143	< 0.02 c=0.02	DK-750-002 DK-750-003 (9702-03) probable mis-labelled samples
Germany, 1997 (Licosmos) Summer rape	WP 500g	Seed dressing	3.5 gai/kg seed 0.03 kg ai/ha	1	143	< 0.02 c=0.02	DK-750-002 DK-750-003 (9702-04) probable mis-labelled samples

Hops

In trials on hops in Germany, 4 – 6 foliar applications of dimethomorph (DC or WP formulations) were made to unreplicated 500 – 700 square metre plots at 8 – 13 day intervals using motorised mist-blowers to apply between 2500 and 4000 litres of spray mix/ha. Samples of green cones (1 – 3 kg) were taken and frozen within 24 hours and stored at or below -18 °C until analysed. Subsamples were also dried according to local commercial practice (36 – 48 hours at 60 °C) and shipped under ambient conditions to the laboratory where they were stored at or below -18 °C until analysed. Analysis was conducted using Method DFG S 19 with limits of quantification of 0.05 mg/kg for green and dried cones and average recovery rates of 92% (green cones fortified at 0.05 – 16 mg/kg) and 85% (dried cones fortified at 0.05 – 40 mg/kg).

Table 59. Residues in green and dried hops cones from foliar applications of dimethomorph to hops in supervised trials in Germany

HOPS Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)		Reference & Comments
		kg ai/ha	kg ai/hL	no		Green cones	Dried cones	
Germany, 1997 (Brewers Gold)	WG 150g+ dthnn	0.3 up to 0.48	0.014	4	-0 0 3 7 14 20	2.4 5.1 2.7 2.1 1.6 0.92	 4.1 4.0	DK-790-026 (97-103-01)
Germany, 1997 (Perle)	WG 150g+ dthnn	0.4 up to 0.54	0.014	4	-0 0 3 7 14 21	8.0 15 19 13 5.0 5.3	 20 15	DK-790-026 (97-103-02)
Germany, 1993 (Brewers Gold)	DC 150g	0.33 up to 0.54	0.015	4	0 7 10 14	7.5 6.1 7.4 2.7	 <u>42</u> 39	DK-790-020 DK-790-014 (9325-01)
Germany, 1993 (Hersbrucker)	DC 150g	0.34 up to 0.51	0.015	4	0 7 10 13	14 13 7.2 2.7	 <u>26</u> 16	DK-790-020 DK-790-014 (9325-02)
Germany, 1994 (Brewers Gold)	DC 150g	0.38 up to 0.57	0.015	4	0 7 10 14	16 11 3.1 1.9	 <u>26</u> 20	DK-790-019 (9416-01)
Germany, 1994 (Perle)	DC 150g	0.37 up to 0.58	0.015	4	0 7 10 14	10 2.0 1.9 1.2	 <u>9.3</u> 7.4	DK-790-019 (9416-02)
Germany, 1995 (Brewers Gold)	DC 150g	0.45 up to 0.6	0.015	4	-0 0 7 10 14	1.1 3.1 0.62 2.5 1.8	 <u>8.7</u> 5.9	DK-790-015 (95-074-02) processing study
Germany, 1995 (Brewers Gold)	DC 150g	0.37 up to 0.6	0.015	4	-0 0 7 10 14	0.94 11 3.9 1.9 1.2	 <u>8.3</u> 4.3	DK-790-015 (95-074-04) processing study
Germany, 1995 (Hersbrucker)	DC 150g	0.37 up to 0.6	0.015	4	-0 0 7 10 14	1.4 14 7.4 3.9 1.3	 <u>24</u> 5.8	DK-790-015 (95-074-03)
Germany, 1995 (Northern Brewer)	DC 150g	0.45 up to 0.6	0.015	4	-0 0 7 11 14	6.1 15 11 5.0 8.7	 <u>29</u> 26	DK-790-015 (95-074-01)
Germany, 2000 (Perle)	WG 150g+ dthnn	0.32 up to 0.4	0.015	6	8	9.3	<u>28</u>, 23	DK-790-064 (00-950-03) processing study
Germany, 2000 (Magnum)	WG 150g+ dthnn	0.41 up to 0.59	0.023	6	5	5.5	7.7	DK-790-064 (00-950-02)
Germany, 2000 (Perle)	WG 150g+ dthnn	0.41 up to 0.58	0.023	6	7	5.3	20	DK-790-064 (00-950-01) processing study

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

The Meeting received information on the fate of dimethomorph residues during aqueous hydrolysis (as the primary degradation mechanism associated with processing of raw agricultural commodites). Information was also provided on the fate of dimethomorph residues during the food processing of grapes, tomatoes, potatoes and hops. A number of the supervised field residue trials on oranges and melons (summarised above) also incuded information on the distribution of residues in peel and flesh.

Hydrolysis

In a study by Afzal, 2002 [DK-790-062], radiolabelled dimethomorph (p-chlorophenyl-U-^{14}C-dimethomorph) was dissolved (10ppm) in sterile buffer solutions (pH 4, 5 and 6) and incubated in a closed system (in the dark) for 20 – 60 minutes at temperatures of 90 – 120 °C.

Recoveries of the radioactivity in all test solutions ranged from 96 – 105%, with no significant change in pH being observed and HPLC analysis indicated that 98 – 99% of the applied dose was the unchanged parent compound.

Table 60. Hydrolytic stability of dimethomorph residues under simulated processing conditions.

Temperature °C	Time (min)	pH	%Recovery (mean)	Process represented
90	20	4	96, 100 (98)	Pasteurisation
100	60	5	100, 102 (101)	Baking, brewing, boiling
120	20	6	101, 105 (103)	Sterilisation

Residue distribution in peel and pulp

In oranges, eight supervised field trials in Spain (Table 28), reported no measurable residues (< 0.01 mg/kg) in the pulp of fruit where residues of up to 1.35 mg/kg were found in the peel. In seven of eight supervised field trials on melons in Spain (Table 46), residues were also below the LOQ (0.02 mg/kg) in pulp of fruit with peel residues of up to 0.26 mg/kg. In one of these trials, residues of 0.02-0.08 mg/kg were measured in pulp, with these being attributed to contamination during the peeling process.

Grapes

In a grape processing study reported by by Young & Wimbush, 2002 [DK-713-086], dimethomorph (150 g ai/litre DC formulation) was applied to 2 red and 2 white grape varieties as a series of five foliar applications at an exaggerated rate of 1.2 kg ai/ha in 1000 litres water/ha, at 10 day intervals up to 28 days before harvest. From each trial, 60 kg of grapes were processed into wine according to commercial wine-making practices, with samples of must, stalks, pomace, dregs and wine being taken for analysis using method FAMS 022-02 with a Limit of Quantification of 0.05 mg/kg. Mean recovery rates of 87% in grapes, 87% in must, 88% in stalks, 97% in dregs, 84% in pomace and 97% in wine fortified with 0.05-0.5 mg/kg dimethomorph.

Table 61. Residues in grapes and processed grape fractions following foliar applications of dimethomorph to grape vines in France

Matrix	Dimethomorph residues (mg/kg)			
	Red wine		White wine	
	Cabernet	Syrah	Ugni	Marsanne
Grapes (field)	2.4	3.6	3.3	2.4
Grapes (at processing)	3.2	3.5	6.1	2.4
Must	4.4	4.4	3.0	1.5
Stalks	10.4	9.5		
Pomace	9.3	11	7.8	5.5
Dregs			6.1	2.0

Matrix	Dimethomorph residues (mg/kg)			
	Red wine		White wine	
	Cabernet	Syrah	Ugni	Marsanne
Wine	1.1	2.4	3.7	1.2

In a number of supervised field trials on grapes in Europe, residues of dimethomorph were measured in wine and other processing fractions from grapes treated with 4 – 10 foliar applications of 0.2 – 0.4 kg ai/ha and harvested at maturity, generally 28 – 42 days after the last application. In most cases, residues were analysed using method FAMS 002-02, with a 0.02 mg/kg Limit of Quantification and average recovery rates of 76 – 103%.

Table 62. Residues in grapes, raisins and red wine from applications of dimethomorph in supervised trials in France, Germany and Spain

GRAPES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)				Reference & Comments
		kg ai/ha	kg ai/hL	no		grape	pomace	must	wine	
France, 1989 (Cabernet Sauvignon)	SC 53g+ mncz	0.2	0.035	7	40	0.34		0.31	0.13	DK-713-005 DK-713-011 (W/FR/ER/89/481)
France, 1989 (Cabernet Sauvignon)	WP 100g+ mncz	0.2	0.035	7	40	0.08		0.06	0.01	DK-713-005 DK-713-011 (W/FR/ER/89/481)
France, 1989 (Cabernet Sauvignon)	SC 53g+ mncz	0.2	0.035	4	71	0.17		0.02	< 0.01	DK-713-005 DK-713-011 (W/FR/ER/89/481)
France, 1989 (Cabernet Sauvignon)	WP 100g+ mncz	0.2	0.035	4	71	0.05		0.06	0.04	DK-713-005 DK-713-011 (W/FR/ER/89/481)
France, 1989 (Carignan)	SC 53g/l+ mncz	0.2	0.05	9	37	0.54	2.2		0.19	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignan)	WP 100g+ mncz	0.2	0.05	9	37	0.15	1.1		0.1	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignan)	SC 53g/l+ mncz	0.2	0.05	6	69	0.21	0.56		0.05	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignan)	WP 100g+ mncz	0.2	0.05	6	69	0.29	0.46		0.05	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignan)	WP 100g+ mncz	0.2	0.05	4	90	0.08	0.19		0.03	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1989 (Carignan)	SC 53g/l+ mncz	0.2	0.05	4	90	0.12	0.34		0.02	DK-713-005 DK-713-011 (W/FR/ER/89/066)
France, 1991 (Carignan)	DC 150g	0.3	0.1	10	38	0.5			0.15	DK-713-013 WFRRF91065)
France, 1991 (Gamay Viallat)	DC 150g	0.3	0.1	9	44	0.35			0.1[a/]	DK-713-013 (WFRRF91277)
France, 1992 (Cabernet Sauvignon)	DC 150g	0.3	0.07	9	38	1.6			0.49	DK-713-017 GFRR92479) (c=0.04)
France, 1992 (Cabernet Sauvignon)	WP 500g	0.4	0.1	9	38	1.2			0.35	DK-713-017 (GFRR92479) (c=0.04)

GRAPES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)				Reference & Comments
		kg ai/ha	kg ai/hL	no		grape	pomace	must	wine	
France, 1992 (Cabernet Sauvignon)	SC 600g	0.4	0.1	9	38	1.5			0.37	DK-713-017 (GFRR92479) (c=0.04)
France, 1992 (Cinsault)	DC 150g	0.3	0.1	9	45	0.6			0.42	DK-713-017 (GFRR92087)
France, 1992 (Cinsault)	WP 500g	0.4	0.13	9	45	0.6			0.35	DK-713-017 (GFRR92087)
France, 1992 (Cinsault)	SC 600g	0.4	0.13	9	45	0.36			0.17	DK-713-017 (GFRR92087)
France, 1992 (Gamay Vicella)	DC 150g	0.3	0.07	10	31	0.55			0.13	DK-713-017 (GFRR92292)
France, 1992 (Gamay Vicella)	WP 500g	0.4	0.1	10	31	0.46			0.1	DK-713-017 (GFRR92292)
France, 1992 (Gamay Vicella)	SC 600g	0.4	0.1	10	31	0.61			0.21	DK-713-017 (GFRR92292)
France, 1993 (Gamay Viola)	WP 90g+mczb	0.2	0.05	4	27	0.12		0.03	0.02[a/]	DK-713-022 (GFRR93283)
France, 1995 (NE) Pinot Noir)	WG 113g+ folpet	0.2+ 0.22 0.22	0.05+ 0.03+ 0.11	1+ 1+7	30	0.19		0.15	0.1	DK-713-034
France, 2000 (NE) (Pineau meunier)	DC 150g	0.31	0.06	5	28	0.33		0.13	0.12[a/]	DK-713-082
Germany, 1993 (Portugieser)	DC 150g	0.144 up to 0.28	0.07	8	35	1.1		0.25	0.3 [a/]	DK-713-020 DK-713-026 (9301-01)
Germany, 1994 (Portugieser)	DC 150g	0.16 up to 0.27	0.07	8	35	0.5		0.06	0.08 [a/]	DK-713-024 DK-713-025 (9401-01)
Germany, 1995 (Portugieser)	WG 150+ dthnn	0.1 up to 0.27	0.06	8	35	0.18		0.04	0.03 [a/]	DK-713-032 (95-115-03)
Germany, 1996 (Dornfelder)	WG 113g+ folpet	0.05 up to 0.24	0.041	8	28	0.68		0.25	0.19 [a/]	DK-713-033 (CYD 01-06)
Germany, 1996 (Portugieser)	WG 113g+ folpet	0.05 up to 0.24	0.041	8	28	0.64		0.3	0.16 [a/]	DK-713-033 (CYD 01-07)
Spain, 1996 (Moscatel)	WP 90g+ mnczb	0.12 up to 0.23	0.023	6	28+30 drying	0.09	0.19 raisins			DK-713-031 (96-214-003)
Spain, 1996 (Moscatel)	WP 90g+ mnczb	0.17 up to 0.24	0.023	6	28+30 drying	0.11	0.16 raisins			DK-713-031 (96-21436)

a - mean residue in young and bottled wine. Residue levels in bottled wine generally vary by less than 10% from the levels in young wine.

Table 63. Residues in grapes and white wine from applications of dimethomorph in supervised trials in France, Germany and Spain

GRAPES Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)			Reference & Comments
		kg ai/ha	kg ai/hL	no		grape	must	wine	
France, 1991 (Carignan)	DC 150g	0.3	0.1	10	38	0.5		0.05 [a/]	DK-713-013 (WFRRF91065
France, 1991 (Gamay Viallat)	DC 150g	0.3	0.1	9	44	0.35		0.05 [a/]	DK-713-013 (WFRRF91277)
Germany, 1993 (Faber)	DC 150g	0.13 up to 0.28	0.07	8	42	1.1	0.21	0.19 [a/]	DK-713-020 DK-713-026 (9301-03)
Germany, 1993 (Kerner)	WP 90g+ mczb	0.2	0.015	4	28	0.11	0.02	0.02 [a/]	DK-713-019 (BE031)
Germany, 1993 (Muller Thurgau)	DC 150g	0.13 up to 0.26	0.07	8	42	0.6	0.05	0.07 [a/]	DK-713-020 DK-713-026 (9301-02)
Germany, 1994 (Reisling)	DC 150g	0.17 up to 0.27	0.018	8	42	0.67	0.08	0.09 [a/]	DK-713-024 DK-713-025 (9401-02)
Germany, 1995 (Silvaner)	WG 150+ dthnn	0.1 up to 0.27	0.06	8	35	0.29	0.15	0.09 [a/]	DK-713-032 (95-115-04)
Germany, 1996 (Reisling)	WG 113g+ folpet	0.06 up to 0.25	0.041	8	28	0.99	0.76	0.5 [a/]	DK-713-033 (CYD 01-05)
Germany, 1996 (Mulller Thurgau)	WG 113g+ folpet	0.06 up to 0.21	0.041	8	28	0.21	0.17	0.09	DK-713-033 (CYD 01-08)
Spain, 2000 (Airen)	DC 150g	0.3	0.04	5	28	0.98	1.52	1.22 [a/]	DK-713-087

a - mean residue in young and bottled wine. Residue levels in bottled wine generally vary by less than 10% from the levels in young wine.

Tomatoes

In a tomato processing study in USA, reported by Lennon, 1997 [DK-723-030], dimethomorph (WP formulation) was applied to tomato plants six times at a rate of 0.24 kg ai/ha using about 280 litres of spray mix/ha and with a 6 – 8 day interval between applications. Mature fruit (340 kg) were harvested 7 days after the last application and processed in the laboratory, simulating commercial practices, into wet pomace, dry pomace, juice, puree, paste and kechup. In addition, the effect of washing was investigated.

Tomato samples were analysed using Method M 2577, with a Limit of Quantitation of 0.05 mg/kg (0.01 mg/kg for juice). The mean recovery rate for all matrices was 95% ± 12 (n=30) from samples fortified with 0.01-5.0 mg/kg dimethomorph.

Initial residues in tomatoes were 0.16 mg/kg and washing with fresh water and then with chlorinated water resulted in a small decrease in residues (to 0.13 mg/kg). After the tomatoes were crushed and heated to 92 °C, juice was extracted by passing the crushed tomatoes through a 0.84mm screen and the retained wet pomace was dried using a dehydrator (about 63 °C) to achieve a concentration of 95% solids. Residues were measured in juice (0.08 mg/kg), wet pomace (0.87 mg/kg) and dry pomace (2.1 mg/kg). After the juice was concentrated into puree in a stem-jacketed kettle (88 – 93 °C), residues increased to 0.19 mg/kg and when further concentrated in a recirculating vacuum evaporator, residues in the resulting tomato paste increased to 0.38 mg/kg.

Residues in ketchup, produced by adding water (12%), white vinegar (15% and seasoning (19%) to the paste, were 0.22 mg/kg.

Processing factors derived from this study are summarised below:

Table 64. Dimethomorph residues and processing factors in tomatoes and processed tomato fractions

Commodity	Dimethomorph residues (mg/kg)	Processing factors
Unwashed fruit	0.16 (range 0.11-0.22, n=5)	
Washed fruit	0.13	0.81
Wet pomace	0.87	5.4
Dry pomace	2.1	13
Juice	0.08	0.5
Puree	0.19	1.2
Paste	0.38	2.4
Ketchup	0.22	1.4

Potatoes

In a potato processing study conducted in USA by Lennon, 1997 [Ref: DK-723-048], potato plants were treated with a WP formulation of dimethomorph (in combination with mancozeb). Seven foliar applications were made at 6 – 7 day intervals at rates of either 0.22 kg ai/200 litres water/ha (1×) or 1.3 kg ai/200 litres water/ha (5×), with the last application in both cases being 3 days before harvest.

100 kg potatoes were mechanically harvested 3 days after the last application, brushed and stored at 7 °C until processed 5 days later. Simulated commercial practices used in this study involved tub washing (5 – 10 minutes), culling, peeling (using an abrasive peeler), slicing into chips (approximately 16mm thick), rinsing (to remove free starch) and deep frying at 160 – 190 °C for 90 seconds.

Potato granules were also prepared from a subsample of washed potatoes by peeling (using a pilot plant steam peeler to loosen the peel and restaurant-style rubber scrubber to remove the peel), slicing the potatoes into 1 – 1.3 cm slabs, washing the slabs in cold water to remove free starch and pre-cooking in a steam-jacketed kettle at about 75 °C for 20 minutes. After cooling the pre-cooked potatoes to < 32 °C, the slabs were steam cooked (94 – 100°C for about 40 minutes) mashed using a restaurant-style grinder and mixed with pre-weighed additives (emulsifiers, preservatives etc) before being packed and frozen. On thawing, the wet mash was fluidized and bed-dried to achieve a moisture content of 5 – 9% and screened using a 60 mesh screen.

Samples of potatoes and processing fractions were analysed using Method 2639. Limits of quantitation were 0.01 mg/kg for potato tubers and washed unpeeled potatoes, 0.05 mg/kg for potato chips, wet peel, potato granules, and frying oil, and 0.001 mg/kg for wash water. The mean recovery rate for all matrices was 95% ± 13% (n=42) from samples fortified with 0.01 – 0.5 mg/kg dimethomorph.

Dimethomorph residues in brushed, unwashed tubers sampled for processing (3 DAT 5× plot) were 0.10 mg/kg, these reducing to 0.06 mg/kg after washing. The majority of the residue was found in the wet peel (0.64 mg/kg), with peeled potatoes containing 0.015 mg/kg. Residues were < 0.05 mg/kg in both the potato chips and granules, with about 0.09 mg/kg being present in the oil after frying.

Processing factors derived from this study are summarised below:

Table 65. Dimethomorph residues and processing factors in potatoes and processed potato fractions

Commodity	Dimethomorph residues (mg/kg)	Processing factors
Unwashed tubers	0.1	
Washed tubers	0.06	0.56
Wet peel	0.64	6.4
Peeled tubers	0.015	0.15
Frying oil (after frying)	0.09	0.9

Commodity	Dimethomorph residues (mg/kg)	Processing factors
Potato chips	< 0.05	< 0.5
Potato granules	< 0.05	< 0.5

Hops

Four hops trials were conducted in Germany by Bleif, 1996 [DK-790-015]. In two of these trials, hops were treated 4 times (8 – 13 day intervals) with dimethomorph (DC) at a rate of 0.015 kg ai/hL using a mistblower to apply between 2500 and 4000 litres of spray mix/ha. The final application was made 10 – 15 days before commercial harvest. Samples of green cones were taken 10 days after the last application for drying and for further processing into beer.

Green cone samples were dried according to commercial practice (60 °C) and shipped to the processing plant where they were processed into beer under simulated commercial conditions. Samples of bottled beer, spent hops and the yeast residue after fermentation were analysed for dimethomorph residues using DFG Method S 19 with limits of quantification of 0.05 mg/kg for green and dried cones and 0.01 mg/kg for beer, yeast and spent hops. Recovery rates for green and dried hops fortified with 0.05 – 15.0 mg/kg (n=3) averaged 95% and 88%, respectively. In beer and yeast, each fortified with 0.01 – 0.1 mg/kg (n=2), recovery rates ranged from 95 – 99%. Recovery rates for spent hops, fortified with 0.01 – 1.5 mg/kg (n=3), ranged from 73 – 98%.

In a further study by Jones, 2001 [DK-790-064], dried hops from two trials in Germany were used to make beer. In these trials, hops were treated with 6 applications of dimethomorph (WG), applied by mistblower at 8 – 12 day intervals up to 7 – 8 days before harvest. In one trial, dimethomorph was applied at 0.015 kg ai/hL using between 2100 and 4000 litres water/ha while a higher rate of 0.023 kg ai/hL (1800 – 2600 litres water/ha) was used in the second trial.

Samples of green cones were taken at commercial harvest and separate green cone specimens were dried according to local commercial practices before being shipped (ambient temperature) to the processing laboratory. Samples of mature casked beer from both trials and spent hops, yeast residue from the second trial were analysed for dimethomorph using DFG Method S 19. The LOQ of the method in green and dried cones, brewers yeast and spent hops was 0.5 mg/kg, and 0.05 mg/kg in beer. Recovery rates for green and dried hops fortified with 0.05 – 30.0 mg/kg (n=5) averaged 90% and 91% respectively. In beer and yeast, each fortified with 0.05 – 0.5 mg/kg, recovery rates ranged from 84 – 113%. Recovery rates for spent hops, fortified with 0.5 – 5.0 mg/kg (n=3), ranged from 76 – 94%.

Analytical results and calculated processing factors from the above studies are summarised below:

Table 66. Residues and processing factors in hops and beer processing fractions following foliar applications of dimethomorph in supervised hop trials in Germany

HOPS Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)		Reference & Comments
		kg ai/ha	kg ai/hL	no		fraction	residue (PF)	
Germany, 1995 (Brewers Gold)	DC 150g	0.45 up to 0.6	0.015	4	10	green cones dried cones spent hops beer yeast	2.5 8.7 3.1 (0.36) 0.01 (0.0011) 0.01 (0.0011)	DK-790-015 (95-074-02)
Germany, 1995 (Brewers Gold)	DC 150g	0.37 up to 0.6	0.015	4	10	green cones dried cones spent hops beer yeast	1.9 8.3 2.2 (0.265) < 0.01(< 0.0012) 0.01 (0.0012)	DK-790-015 (95-074-04)
Germany, 2000 (Perle)	WG 150g+ dthnn	0.41 up to 0.58	0.023	6	7	green cones dried cones beer	5.3 20 0.05 (0.0025)	DK-790-064 (00-950-01)

HOPS Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)		Reference & Comments
		kg ai/ha	kg ai/hL	no		fraction	residue (PF)	
Germany, 2000 (Perle)	WG 150g+ dthnn	0.32 up to 0.4	0.015	6	8	green cones dried cones spent hops beer yeast	9.3 26 2.4 (0.092) 0.09 (0.0035) 1.6 (0.062)	DK-790-064 (00-950-03)

In nine additional supervised field trials on hops in Germany, residues of dimethomorph were measured in both green and dried hops (after drying at about 60 °C for 8 – 10 hours, according to local commercial practices. In most cases, residues were analysed using DFG Method S 19, with a 0.05 mg/kg limit of quantification and average recovery rates of 82 – 98%.

Table 67. Residues and processing factors in green and dried hops cones following foliar applications of dimethomorph to hops in supervised trials in Germany

HOPS Country, year (variety)	Form	Application			PHI, (days)	Dimethomorph Residues (mg/kg)		Reference & Comments
		kg ai/ha	kg ai/hL	no		green cones	dried cones (PF)	
Germany, 1993 (Brewers Gold)	DC 150g	0.33 up to 0.54	0.015	4	10 14	7.4 2.7	42 (5.7) 39 (14.4)	DK-790-020 DK-790-014 (9325-01)
Germany, 1993 (Hersbrucker)	DC 150g	0.34 up to 0.51	0.015	4	10 13	7.2 2.7	26 (3.6) 16 (5.9)	DK-790-020 DK-790-014 (9325-02)
Germany, 1994 (Brewers Gold)	DC 150g	0.38 up to 0.57	0.015	4	10 14	3.1 1.9	26 (8.4) 20 (10.5)	DK-790-019 (9416-01)
Germany, 1994 (Perle)	DC 150g	0.37 up to 0.58	0.015	4	10 14	1.9 1.2	9.3 (4.9) 7.4 (6.2)	DK-790-019 (9416-02)
Germany, 1995 (Northern Brewer)	DC 150g	0.45 up to 0.6	0.015	4	11 14	5.0 8.7	29 (5.8) 26 (3.0)	DK-790-015 (95-074-01)
Germany, 1995 (Hersbrucker)	DC 150g	0.37 up to 0.6	0.015	4	10 14	3.9 1.3	24 (6.2) 5.8 (4.5)	DK-790-015 (95-074-03
Germany, 1997 (Brewers Gold)	WG 150g+ dthnn	0.3 up to 0.48	0.014	4	14 20	1.6 0.92	4.1 (2.6) 4.0 (4.3)	DK-790-026 (97-103-01)
Germany, 1997 (Perle)	WG 150g+ dthnn	0.4 up to 0.54	0.014	4	14 21	5.0 5.3	20 (4.0) 15 (2.8)	DK-790-026 (97-103-02)
Germany, 2000 (Magnum)	WG 150g+ dthnn	0.41 up to 0.59	0.023	6	5	5.5	7.7 (1.4)	DK-790-064 (00-950-02)

Table 68. Summary of processing factors for dimethomorph residues. The factors are calculated from the data recorded in tables in this section

Raw agricultural commodity	Processed commodity	Calculated processing factors.	Median or best estimate
Grapes	Red wine	0.06, 0.12, 0.16, 0.17, 0.17, 0.17, 0.17, 0.22, 0.24, 0.24, 0.25, 0.25, 0.27, 0.28, 0.29, 0.29, 0.30, 0.31, 0.34, 0.34, 0.35, 0.36, 0.38, 0.38, 0.47, 0.53, 0.58, 0.67, 0.69, 0.70, 0.8	0.29

Raw agricultural commodity	Processed commodity	Calculated processing factors.	Median or best estimate
	White wine	0.10, 0.12, 0.13, 0.14, 0.17, 0.18, 0.31, 0.43, 0.50, 0.51, 0.61, 1.24	0.24
	Pomace, wet (red wine)	1.6, 2.4, 2.7, 2.8, 3.1, 3.3, 4.1, 7.3	3.0
	Pomace, wet (white wine)	1.7, 2.3	2.0
	Raisins	1.5, 2.1	1.8
Tomatoes			
	Washed fruit	0.81	0.8
	Wet pomace	5.4	5.4
	Dry pomace	13	13
	Juice	0.5	0.5
	Puree	1.2	1.2
	Paste	2.4	2.4
Potatoes			
	Washed tubers	0.06	0.06
	Wet peel	0.64	0.64
	Peeled tubers	0.015	0.02
	Frying oil (after frying)	0.09	0.09
	Potato chips	< 0.05	
	Potato granules	< 0.05	
Hops			
	Beer	0.0011, < 0.0012, 0.0025, 0.0035	0.002
	Spent hops	0.092, 0.265, 0.36	0.24
	Brewers yeast	0.0011, 0.0012, 0.062	0.002

RESIDUES IN ANIMAL COMMODITIES

Farm animal feeding studies

The meeting received a lactating dairy cow feeding study reported by Cameron & Weitzel, 1991 [DK-705-007, DK-705-006] investigating residues resulting in animal tissues and milk from the presence of dimethomorph in the animal diet.

Groups of 3 lactating Fresian dairy cows (4-6 year old animals weighing 430 – 618 kg) were dosed twice daily with dimethomorph (in corn oil) added to the feed at concentrations of 12.5 ppm (25×) or 37.5 ppm (75×), to give a daily dose of 50 or 150 mg/animal/day. An additional group of 6 cows were fed an exaggerated concentration of 125 ppm (250×), equivalent to 500 mg/animal/day. Dosing continued for 28 – 35 days with milk being collected twice daily and pooled for analysis.

Cream and skim milk samples were taken on days 14 and 28 with subsamples of the day 28 milk being either pasteurised (63 °C for 30 minutes then cooled to 5 °C), or separated to cream (about 35% butterfat) and skimmed milk (fat content about 0.1%) or treated with lactic acid, heated filtered and centrifuged to obtain acid whey. The milk and milk fractions were analysed for dimethomorph and metabolites Z67/Z69 using Method FAMS 017-01 and also Method FAMS 024-02 to detect dimethomorph and metabolites Z67/Z69 and CUR 7117.

Animals in the 25× and 75× dose groups were sacrificed within 24 hours of the final dose and animals in the exaggerated dose group (250×) were sacrificed 1, 7, 14 and 21 days after the final dose to provide depletion data. Samples of liver, kidney, perirenal/omental fat (pooled), pectoralis/adductor thigh muscle (pooled) and subcutaneous fat were taken for analysis using Method FAMS 023-01 to measure residues of dimethomorph and metabolites Z67/Z69.

Samples for residue analysis were frozen within one hour of sampling and stored at or below -20 °C for about 4 weeks (whole milk), 6 weeks (milk products) and 10 weeks (animal tissues).

Residues in whole milk, pasterised milk, skimmed milk and acid whey and in most of the cream samples were all below the limits of quantitation (0.01 mg/kg for dimethomorph and metabolite

CUR 7117) and 0.02 mg/kg for metabolites Z67/Z69). Only trace residues of dimethomorph (0.01 mg/kg) were found in cream samples from the highest dose group (250×).

The analytical methods were validated at spike levels of 0.02, 0.05 and 0.1 mg/kg for dimethomorph and CUR 7117, and 0.02+0.02 mg/kg for Z67/Z69. The average recovery level was 93% for dimethomorph, 89% for CUR 7117 and for Z67/Z69.

In animals from the 12.5 ppm dose group, residues of dimethomorph and metabolites Z69 and Z67 were not detectable or were below the limit of quantification (0.01 mg/kg) in all tissues analysed. Residues were also all below the limit of quantification for all tissues from the 37.5 ppm dose group except for liver, where residues of up to 0.02 mg/kg of the Z69 metabolite were found. Only in the highest dose group (125 ppm) were significant residues found, mostly in liver and kidney, where residues of the Z69 metabolite were measured at levels up to 0.15 mg/kg and 0.14 mg/kg respectively. Residues of the parent compound were found in liver (up to 0.05 mg/kg), and in fat (up to 0.03-0.04 mg/kg) from animals in the highest dose group.

Table 69. Residues in milk and tissues of lactating dairy cows (3 per group) fed dimethomorph in the diet for 28-35 days.

MATRIX	Residues in animal tissues (mg/kg)[a]								
	Dosing, 12.5 ppm			Dosing 37.5 ppm			Dosing, 125 ppm		
	parent	Z69	Z67	parent	Z69	Z67	parent	Z69	Z67
Muscle	nd	nd	nd	< 0.01	nd	nd	nd	nd	nd
Liver	< 0.01	< 0.01	nd	< 0.01	0.02	nd	0.05	0.15	nd
Kidney	n.d	< 0.01	nd	n.d	< 0.01	nd	< 0.01	0.14	nd
Fat (peritoneal)	< 0.01	nd	nd	< 0.01	nd	nd	0.04	nd	nd
Fat (subcutaneous)	< 0.01	nd	nd	< 0.01	< 0.01	nd	0.03	nd	nd

a - Results are maximum residues from any cows in each dose group, analysed by GC-NPD, confirmed by GC-MSD

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

No information was received on residues of dimethomorph in food in commerce or at consumption.

NATIONAL MAXIMUM RESIDUE LIMITS

National residue definitions for dimethomorph, where found, include:

Australia:	Dimethomorph (sum of E and Z isomers)
Austria:	(E,Z)-4-[3-(4-Chlorphenyl)-3-(3-(3,4-dimethoxyphenyl)acryloyl]morpholin
Canada:	(E,Z)-4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)-1-oxo-2-propenyl]morpholine
Germany:	(E,Z)-4-3[3-(4-Chlorphenyl)-3-(3,4-dimethoxyphenyl)-acryloyl]-morpholin
Japan:	sum of residues of (E)-dimethomorph and (Z)-dimethomorph
The Netherlands:	sum of E and Z-dimethomorph
New Zealand:	Dimethomorph, sum of isomers
USA:	(E,Z)-4-[3-(4-chlorophenyl)-3-(3,4-dimethoxyphenyl)-1-oxo-2-propenyl]morpholine

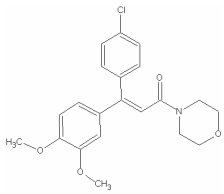
APPRAISAL – RESIDUE AND ANALYTICAL ASPECTS

Dimethomorph is a morpholine fungicide with protective action against plant pathogenic Phytophthora species and a number of downy mildew diseases of fruit, vegetables and potatoes. It was

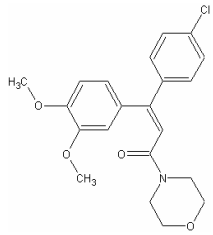
included on the schedule of new compounds for consideration by the 2007 JMPR. The Meeting received a full data package including animal and plant metabolism studies (goats, hens, grapes, potato, lettuce, tomato), soil metabolism, dissipation and photodegradation, crop rotational studies, information on analytical methods, freezer storage stability, supervised residue trial data from use as a foliar spray on a range of fruit, vegetable, cereal and oil seed crops, processing studies and livestock feeding studies. GAP information was also submitted by Australia.

Chemical name and structure

(E,Z) 4-[3-(4-chlorophenyl)-3-(3,4-dimethoxy-phenyl)-1-oxo-2-propenyl]-morpholine



E- isomer



Z- isomer

The following abbreviations are used for the metabolites discussed below:

*Z*7	4-Chloro-3',4'-dimethoxy-benzophenone
*Z*67	(*E/Z*)-4-(3-(4-Chlorophenyl)-3-(3'-methoxy-4'-hydroxyphenyl)-1-oxo-2-prophenyl)-morpholine
*Z*69	(*E/Z*)-4-(3-(4-Chlorophenyl)-3-(3'-hydroxy-4'-methoxyphenyl)1-oxo-2-prophenyl)-morpholine
*Z*89	N-[3-(4-chlorophenyl)-3-3,4-dimethoxyphenyl)-1-oxo-2-propenyl-glycine
CL 411266	4-[(1Z)-1-(4-chlorophenyl)-3-(4-morpholinyl)-3-oxo-1-propenyl]-2-methoxyphenyl

Animal metabolism

The Meeting received information on the fate of orally dosed dimethomorph in the lactating goat and in laying hens. Experiments were carried out with dimethomorph with the chlorophenyl ring uniformly labelled with [^{14}C]. Metabolism in laboratory animals (rats) was summarized and evaluated by the WHO panel of this JMPR Meeting.

In rats, after oral gavage with a single dose of 10 mg/kg bw per day, dimethomorph is quantitatively absorbed and excreted to more than 90% via bile and to 7% via urine in both sexes. Following a single dose of 500 mg/kg bw per day, absorption was decreased to 65% in males and to 40% in females. At the low dose rate, excretion virtually is complete after 48 h with less than 1% of dose found in carcass and in liver and less or equal to 0.2% in kidneys. Dimethomorph is extensively metabolized by demethylation of one of the methoxy groups and formation of O-conjugate and degradation products of morpholine ring opening were found.

Two lactating goats orally treated twice daily with [^{14}C] labelled dimethomorph at 0.55 mg/kg bw per day (equivalent to 25 ppm in feed for a day). Each animal received 15 doses over 7.5 days, the last being the morning of the 8th day, 4 h before slaughter.

Most of the applied radioactivity was excreted in urine (about 15%) and faeces (about 72%). Total Radioactive Residues (TRR) in edible tissues averaged 7.1 mg/kg in liver, 0.28 mg/kg in kidney, 0.07 mg/kg in fat and 0.03 mg/kg in muscle. In milk, residues reached a plateau of about 0.06 mg/kg after 2 days, with residues generally ranging from 0.03 – 0.1 mg/kg (average 0.06 mg/kg).

About 80% of the TRR in milk was present in whey. The overall recovery of the radioactivity was 88 – 92%.

The unchanged parent was the primary residue, comprising 72% of the liver TRR, 10% of the kidney TRR, 7.5% of the muscle TRR and 75% of the fat TRR. In milk, the major identified residue was the polar Z89 metabolite, making up approximately 48% of the milk TRR. Metabolites Z67 and Z69 were also detected in liver at levels of 3 – 4% of the liver TRR.

The proposed metabolic pathway for dimethomorph in the lactating goat is similar to that suggested for rats, involving the demethylation of one of the phenolic methoxy-groups, with an alternative pathway being the cleavage of the morpholine-ring.

Groups of 6 – 9 laying hens were orally dosed twice daily for seven consecutive days with 1 mg [^{14}C] labelled dimethomorph/kg bw per day, equivalent to 40 ppm in the feed. The hens were sacrificed 8 h, 7 days and 12 days after the last administration. Most of the administered radioactivity (85%) was found in the excreta, with edible tissues (liver, kidney, muscle and fat) containing about 0.4% and < 0.1% found in eggs. The highest radioactive residues were in liver (1.1 mg/kg dimethomorph equivalents) with lower levels found in kidney (0.3 mg/kg), fat/skin (0.04 mg/kg) and muscle (0.02 mg/kg). In egg whites, TRR reached a maximum of 0.056 mg/kg after 4 days, while in yolks, highest TRR (0.51 mg/kg) was found at day 7. At the end of the depuration period (12 days) the radioactivity levels had decreased to about the background level of 0.01 mg/kg (egg whites) and 0.02 mg/kg (yolks). The overall recovery of the radioactivity (including residues in the cage wash) was around 88%.

Dimethomorph (unchanged parent) was only found in fat and skin, at levels of < 0.02 mg/kg. Metabolites Z67 and Z69 were the major residue components identified in liver (0.13 mg/kg), egg yolks (0.07 mg/kg), kidney (0.03 mg/kg) and muscle (0.003 mg/kg). Low levels (0.02 – 0.05 mg/kg) of the Z43 and Z95 metabolites were reported in kidney and/or egg yolks.

In general, the metabolism of dimethomorph in farm animals is similar to that in laboratory animals, and is mostly (85–87%) excreted in urine or faeces. Most of the remaining radioactive residues are found in liver and to a much lesser extent in kidney and egg yolk, with other edible tissues and milk containing less than 0.1 mg/kg TRR. Unchanged parent is the predominant residue identified in goat liver (about 5 mg/kg) and is also present in fat, kidney (goats), poultry skin and muscle (goats), but at levels below 0.06 mg/kg. In milk, the major residue is the Z89 metabolite (0.05 mg/kg). The metabolites Z67 and Z69 are the major residue components present in poultry, mostly in liver and kidney but also at low levels in muscle (0.003 mg/kg) and in egg yolks (0.07 mg/kg).

The Meeting concluded that the major residue component in ruminant animal commodities, from the oral administration of dimethomorph, is the parent compound, with the metabolite Z89 being the major residue in milk and that the metabolites Z67 and Z69 are the predominant residues in poultry commodities.

Plant metabolism

The Meeting received information on the fate of dimethomorph in grapes, potato, lettuce and tomato, following treatment with [p-chlorophenyl-U-^{14}C]dimethomorph and also on potato following treatment with [morpholine-U-^{14}C]dimethomorph.

Grape vines grown outdoors under shelter in Germany were treated by syringe with an EC formulation of [^{14}C] labelled dimethomorph at a rate equivalent to 0.09 kg ai/hL or 0.9 kg ai/ha with four applications being made at 9 – 10 day intervals up to 35 days before harvest. Grapes and leaves were washed with acetone to remove surface residues and the washed samples were then homogenised and remaining residues were further extracted with acetone and methanol. Radioactive residues in the surface washes (leaves and grapes) accounted for 70 – 72% of the applied radioactivity with about 26% of the TRR in grapes (3.8 mg/kg) being found in the homogenised samples. The majority of the extractable residue was the unchanged parent (83 – 86% TRR).

Potato plants grown in pots in a glasshouse in Germany were sprayed with [^{14}C]-[chlorophenyl]-dimethomorph (EC) at a rate equivalent to 0.06 kg ai/hL or 0.6 kg ai/ha with four applications at 10 day intervals with the last up to 7 days before harvest. Stems, leaves and tubers were washed with acetone to remove surface residues and the washed samples were then homogenised and remaining residues extracted with methanol. About 61% of the recovered radioactivity was present as a surface residue. The majority of the extractable residue in foliage was the unchanged parent dimethomorph (68% of the TRR). Only trace amounts of radioactivity (0.01 – 0.02 mg/kg) were found in tubers.

In a complimentary potato metabolism study, dimethomorph (EC) labelled with [^{14}C] in the morpholine ring was applied to greenhouse potato plants at a rate equivalent to 0.06 kg ai/hL (0.6 kg ai/ha) with four applications at 10 day intervals up to 7 days before harvest. Surface residues were removed in acetone, after which the samples were homogenised and the remaining residues extracted in methanol. In treated foliage the acetone surface wash contained about 72% of the TRR. Small amounts of radioactivity were measured in tubers from treated plants predominantly in peel where radioactive residues of < 0.03 mg/kg were found. The majority of the foliage residue was the unchanged parent (76% of the foliage TRR or 13.8 mg/kg) with the remaining extractable residue consisting of several unknown (mainly polar) metabolites at levels too low to identify.

In an additional study on potato plants grown in a lysimeter, [^{14}C]-[chlorophenyl]-dimethomorph (DC) was applied at a rate equivalent to 0.3 kg ai/ha as a foliar spray three times, 10 days apart, up to 28 days before harvest. About 98% of the recovered radioactivity was found in the foliage, with about 1.5% TRR being found in the tubers, 0.8% (0.12 mg/kg) in the peel and 0.7% (0.025 mg/kg) in the peeled potatoes. Further investigation of the tuber residues identified the unchanged parent compound to be the major residue, predominantly in the peel (about 46% or 0.06 mg/kg), with the metabolites Z67 and Z69 comprising < 10% of the peel TRR.

In field grown lettuce, chlorophenyl ring labelled [^{14}C]dimethomorph (DC) was applied in four successive foliar applications at a rate equivalent to 1.14 kg ai/ha. Applications were made 8 days after transplanting and at intervals of 9, 10 and 11 days, with plants (without roots) being sampled four days after the final application. Close to 99% of the TRR was extracted from macerated samples with acetone or acetone:water with most of this (93%) being the unchanged parent. Trace levels of the metabolites Z7 and Z67 were also reported, each accounting for 0.5% TRR (0.5 mg/kg). The remaining extractable residue (4.5% TRR) consisted of several minor unknown polar components, which were not further characterized.

Tomatoes (young plants) were treated with [^{14}C]-[chlorophenyl]-dimethomorph by the addition of 8 mg ai/L to the hydroponic nutrient solution for 7 days. Plant samples (without roots) were taken 0, 14 and 28 days after termination of the application. Total radioactive residues in leaves and stems, at the end of the 7 day exposure period were 24.5 mg/kg dimethomorph equivalents, reducing to 12.5 mg/kg after 14 days and to 7 mg/kg after 28 days. Dimethomorph was the predominant residue, initially comprising 66% of the TRR and reducing to 28% after 14 days and to 16% after 28 days. The calculated half-life of the parent compound was about 13 days. The demethylated metabolite Z69 (including conjugates) was the major metabolite found (13 – 34% TRR), with metabolites Z93 (8 – 17% TRR), Z95 (4 – 8% TRR) and Z98 (1 – 7% TRR) also being found.

The Meeting concluded that the metabolic pathways of dimethomorph in plants show a common pattern, with the unchanged parent being the only significant residue in plant commodities. Residues are mostly found on the plant surface, i.e., negligible systemic translocation, with only low residues being found in potato tubers (almost all in the peel). However, when young tomato plants are exposed to dimethomorph in a hydroponic nutrient solution, residues can be taken up by the roots and translocated to leaves and stems. The primary metabolic pathway involves the demethylation of the dimethoxyphenyl ring to produce the metabolites Z67 and Z69, with the probable formation of the associated glucose conjugates. A secondary pathway involves the hydrolysis of dimethomorph to form the Z7 metabolite.

Environmental fate in soil

The Meeting received information on the environmental fate of dimethomorph in soil, including aerobic soil metabolism, soil photodegradation and also confined and field rotational crop studies.

Aerobic soil metabolism

In six laboratory studies the degradation of dimethomorph in soil under aerobic conditions was investigated in sand, loamy sand, sandy loam and silty clay loam, using [^{14}C] labelled dimethomorph (labelled in either the chlorophenyl or the morpholine ring). Under sterile conditions, dimethomorph was stable, with about 90% of the applied radioactivity identified as the parent compound after four months (compared with 36% remaining in a comparable unsterile soil), indicating microbial action was the major source of degradation. As the levels of extractable dimethomorph decreased over time, there was a corresponding increase in unextracted residues, the nature of which was not investigated. The shift in the ratio of *E*- and *Z*-isomers of dimethomorph was investigated in most of these studies, with the initial *E:Z* ratio of about 50:50 shifting to about 40:60 after 60 – 90 days and 30:70 after 180 days. Half-lives in the laboratory studies ranged from 47 days to 90 days except in one atypical acidic sandy soil (pH 3.5, 99% sand), where 86% of the applied dimethomorph remained after 120 days.

In field studies, where dimethomorph was applied at rates of 0.43 – 0.6 kg ai/ha to a range of different soil types (sand, loamy sand, sandy loam, clay), dimethomorph residues were only detected in the top 10 cm, with trace amounts of the metabolites Z67 and Z69 being found in the top 20 cm, but only within the first two months after treatment. Half-lives for dimethomorph in these studies ranged from 10 – 61 days.

Photodegradation in soil

In a soil photolysis study where [^{14}C] labelled dimethomorph was added to sterile sandy-loam soil and exposed to light continuously for 15 days, less than a 10% decrease in dimethomorph residues was observed, with two minor (unidentified) metabolites found at levels up to 4.2% of the applied radioactivity. During the study period, the *E/Z*-isomer ratio shifted from about 40:60 to 34:66.

Residues in rotational crops

In two confined rotational crop studies, [^{14}C] labelled dimethomorph was applied to bare soil at rates equivalent to 4 kg ai/ha and 1.7 kg ai/ha.

In the first study, lettuce, carrots and wheat were planted in soil treated with dimethomorph to simulate the application of 4 kg ai/ha followed by incorporation to a depth of 15 cm and aged for 29, 120 and 361 days. Total radioactive residues of 4.8 mg/kg were found in wheat straw, 1 mg/kg in wheat forage and 0.14 – 0.2 mg/kg in carrot tops and lettuce planted in the 29 day aged soil. Dimethomorph residues in soil at the time of planting were about 0.8 mg/kg. In the soil aged for 120 days, dimethomorph residues at planting were about 0.05 mg/kg and total radioactive residues in all subsequent crops were < 0.1 mg/kg except wheat foliage (0.24 mg/kg) and wheat straw (0.78 mg/kg).

In the second study, wheat, lettuce, soya beans and radish were planted in soil treated with the equivalent of 1.7 kg ai/ha and aged for 30 – 394 days. In soil aged for 30 days, total radioactive residues were < 0.1 mg/kg in all crops except wheat straw (0.15 mg/kg). Dimethomorph residues were 0.01 mg/kg or less in all crops and the only metabolite found was CL 411266, at 0.04 mg/kg in wheat straw and 0.01 mg/kg in radish tops and wheat forage. In soil aged for 60 days, total radioactive residues were < 0.05 mg/kg in all crops except wheat straw (0.13 mg/kg). Dimethomorph residues were not found in any crops and the metabolite CL 411266 was measured in wheat straw (0.03 mg/kg) and lettuce (0.02 mg/kg). Radioactive residues did not exceed 0.05 mg/kg in any samples from crops grown in soil aged for 394 days.

Rotational crop field studies were conducted Germany, where carrots, spinach and beans were planted immediately after harvest of a potato crop treated with 3 applications of 0.18 kg ai/ha dimethomorph (PHIs of 2 – 6 weeks). At the time of planting the rotational crops, dimethomorph residues in soil were 0.08 – 0.14 mg/kg. Dimethomorph residues in subsequent crops were all

0.02 mg/kg or less, except in spinach sampled 72–76 days after the last soil treatment, where residues of 0.09 mg/kg and 0.21 mg/kg were found. Residues were below the limit of quantification in all three crops at maturity.

The Meeting concluded that dimethomorph is stable to hydrolysis and photolysis and is moderately persistent in soil with field half-lives of 10 – 61 days. In rotational crops, dimethomorph can be taken up by the roots and dimethomorph residues may occur in early harvest crops (e.g., spinach) planted within 44 days of the last application.

Methods of analysis

The Meeting received data on analytical methods for enforcement and monitoring of dimethomorph and its major metabolites in plant and animal commodities. A number of these methods are capable of determining the individual dimethomorph isomers but in most cases these residues have been combined in the supervised field trial reports, as to minimise isomerization reactions during preparation and analysis, the analytical work needs to be conducted in the absence of light. However these isomerization reactions do not influence the measurement of total residues.

Analytical methods for enforcement and monitoring

The multi-residue analytical method DFG S19, with a modification to use ethyl acetate:cyclohexane instead of dichloromethane in the partition clean-up step, has been validated in a range of commodities as an enforcement-monitoring method for the determination of dimethomorph in plant commodities. With an alternative extraction procedure for fat (DFG Method 5), this method can be used to measure dimethomorph residues in animal matrices. Reported LoQs are 0.01 mg/kg for animal matrices and 0.02 mg/kg for plant matrices.

Analytical methods used in study reports

Analytical methods used in the supervised residue trials and in the animal residue studies generally involve extraction with acetone, acetonitrile or acidified methanol with residues being partitioned into dichloromethane, ethyl acetate or cyclohexane and cleaned-up by gel permeation chromatography prior to analysis. An additional silica gel column clean-up step is included in some methods, and for some matrices, an additional partition step with hexane (to remove fatty constituents) is included. Analysis can be by HPLC-UV, GC-NPD, GC-MS or HPLC-MS/MS. In most of the commonly used methods, LOQs of 0.01 mg/kg or 0.02 mg/kg have been reported. The methods used in the animal studies were capable of measuring the parent compound, the Z89 metabolite and the sum of the Z67 and Z69 metabolite residues.

Validation studies on the more commonly used analytical methods generally reported mean recovery rates of 73 – 116% when a wide range of plant and animal matrices were fortified with dimethomorph at concentrations of 0.01 – 5 mg/kg and with 0.1 mg/kg of the metabolites Z89, Z67 and Z69 in the case of cattle matrices.

The Meeting concluded that adequate analytical methods exist for the determination of dimethomorph in crops and livestock commodities both for data collection and MRL enforcement purposes.

Stability of residues in stored analytical samples

The Meeting received information on the frozen storage stability of residues in cattle milk and edible tissues, grapes, rape seed, hops, tomato, broccoli, spinach, potato and processed grape, hops, tomato and potato matrices. In all cases, residues were stable in the macerated matrices under conditions of frozen storage for an interval at least as great as the storage interval of supervised field trial or livestock feeding samples.

Dimethomorph residues were stable under conditions of frozen storage for the intervals tested: 24 months in broccoli, grapes, spinach, tomato, 21 months in processed tomato matrices, 18 months in soil, rape seed, hops, beer, spent hops and brewer's yeast, 16 months in processed grape

commodities, 14 months in raisins and 6 months in potatoes and processed potato commodities. In cattle meat, milk, liver and kidney, residues of dimethomorph and its metabolites Z67 and Z69 were stable for the 16 month frozen storage interval. The predominant residue in milk (the Z89 metabolite) was also stable over the 16 month test interval.

The Meeting concluded that dimethomorph is stable (less than 10% loss of residues) in most crop, processed commodity, and livestock commodity samples under frozen storage conditions.

Definition of the residue

In plants, dimethomorph is stable to hydrolysis and occurs mostly as surface residue with no significant metabolism. The major residue resulting from foliar applications of dimethomorph is the parent compound, present as a mixture of the *E*- and *Z*-isomers, the ratio of which can change over time as a result of isomerisation reactions stimulated by light.

In animals, while metabolism studies indicate that the parent compound is the major residue in cattle liver and fat, residues of the metabolites Z67 and Z69 are also present in significant amounts and metabolite Z89 is the largest single component in milk. In poultry commodities, the parent compound is only found in fat and skin, with metabolites Z67 and Z69 being the major residues. However the Meeting noted that these results were from feeding studies involving exaggerated dosing regimes, and that under practical conditions, residues are not expected in animal commodities.

A validated multi-residue method is available to measure dimethomorph, as the sum of the *E*- and *Z*-isomers in both plant and animal matrices.

Based on the above, the Meeting agreed:

Definition of the residue in plant commodities for estimation of dietary intake and for compliance with MRLs: dimethomorph (sum of isomers).

Definition of the residue in animal commodities for estimation of dietary intake and for compliance with MRLs: dimethomorph (sum of isomers).

The results of the animal metabolism studies indicate that dimethomorph is not fat-soluble.

Results of supervised trials on crops

Supervised trials were available for the use of dimethomorph as a foliar spray on citrus (oranges), strawberries, grapes, pineapples, onions, green onions, brassica vegetables (cabbage, broccoli, kohlrabi), cucumber, courgettes (zucchini), melons, tomatoes, peppers (sweet), lettuce, spinach and hops.

Supervised trials involving dimethomorph seed-piece treatment on pineapples and as a seed treatment on oil seed rape were also made available.

In many countries, dimethomorph is available in formulations with and without other complimentary fungicides such as mancozeb, chlorothalonil, copper and folpet. For the purpose of this evaluation, the PHIs defined as GAP for each crop are those established for dimethomorph when formulated without other active ingredients. Where dimethomorph is available only as combination products with different PHIs, the shortest PHI has been selected when defining GAP.

Oranges, sweet, sour

The results of residue trials in Spain involving foliar applications on oranges were made available to the Meeting.

The only GAP provided to the Meeting was for stem paint treatments in Thailand and Vietnam.

The Meeting agreed the data was not sufficient to estimate a maximum residue limit for oranges.

Strawberries

In Belgium, GAP is for three root drench applications of 0.05 g ai/plant, just after planting, one month later and again at the start of spring growth (about 2 months before harvest). In trials from Belgium, matching this GAP, residues found were 0.01, 0.01, 0.02 and 0.02 mg/kg.

In Netherlands, GAP for protected strawberries is to apply 0.05 g ai/plant with the nutrient solution as a root drench up to 35 days before harvest. In three outdoor trials match Netherlands GAP, residues found were 0.01, 0.01 and 0.02 mg/kg.

GAP for outdoor strawberries in Netherlands is for a single foliar spray (0.15 kg ai/ha) just after planting and in four trials in Netherlands matching this GAP, residues were all < 0.01 mg/kg.

The Meeting agreed to use the data from the root drench trials in Belgium and Netherlands to give a combined data set of: 0.01 (4), 0.02 and 0.02 mg/kg.

The Meeting estimated a maximum residue level of 0.05 mg/kg for dimethomorph in strawberries and estimated an STMR of 0.01 mg/kg and an HR of 0.02 mg/kg.

Grapes

The results of residue trials in grapes from France, Germany, Greece, Italy, Spain, Australia, New Zealand and Brazil were made available to the Meeting.

Residues in trials in Brazil matching the GAP in Columbia (0.3–0.4 kg ai/ha, PHI 19 days) were: 0.24, 0.31, 0.99 and 1.1 mg/kg.

Residues in trials from Germany matching the GAP of Belgium (0.3 kg ai/ha, up to 3 applications per season, with a PHI of 28 days) were: 0.26, 0.36, 0.6, 0.71, 1.2 and 1.3 mg/kg.

Residues in trials from Spain matching the GAP of Spain (0.03 kg ai/hL, with a PHI of 28 days) were: 0.09, 0.11, 0.14, 0.24 and 0.25 mg/kg.

Residues in trials from France, matching the GAP of Spain (0.03 kg ai/hL, PHI 28 days), were: 0.16, 0.20, 0.27, 0.38, 0.38, 0.39, 0.39, 0.46, 0.47, 0.51, 0.51, 0.61, 0.62, and 1.7 mg/kg.

Residues in trials from Italy, matching the GAP of Spain (0.03 kg ai/hL, PHI 28 days), were: 0.1, 0.18, 0.19, 0.21, 0.42, 0.85, 0.94, and 1.2 mg/kg.

Residues from a single trial from Greece, matching the GAP of Spain (0.03 kg ai/hL, PHI 28 days), were: 0.39 mg/kg.

The Meeting agreed to use the trials in Spain, France, Italy and Greece matching the GAP of Spain. Residues in ranked order (median underlined) were: 0.09, 0.1, 0.11, 0.14, 0.16, 0.18, 0.19, 0.20, 0.21, 0.24, 0.25, 0.27, 0.38, 0.38, 0.39, 0.39, 0.39, 0.42, 0.46, 0.47, 0.51, 0.51, 0.61, 0.62, 0.85, 0.94, 1.2 and 1.7 mg/kg (n=27).

The Meeting estimated a maximum residue level of 2 mg/kg for dimethomorph in grapes and estimated an STMR of 0.39 mg/kg and an HR of 1.7 mg/kg.

Pineapple

GAP for pineapples in Philippines is for pre-plant dip treatments of seed-pieces (0.19 kg ai/hL dipping solution) and up to 3 post-planting foliar spray applications (1.8 kg ai/ha), 4, 7 and 10 months after planting. Pineapples are commonly harvested about 16 – 17 months after planting, about 6 months after the last foliar spray.

In a set of trials in Philippines, residues in pineapples following pre-plant seed-piece dipping treatments at 2× and 4× the recommended rate were < 0.01 (2) mg/kg in both flesh and peel. Residues were also < 0.01 (2) mg/kg in flesh and peel of pineapples following the pre-plant seed-piece dip treatments (2× and 4×) combined with three foliar sprays matching the recommended application rate and timing. Similarly, pineapples treated with a combination of pre-plant seed-piece dipping (2× and 4×) and three foliar sprays (2×), residues were also < 0.01 (2) mg/kg in both flesh and peel.

Since residues were all < 0.01 mg/kg in all four trials involving exaggerated (2× and 4×) pre-plant dipping treatment combined with foliar treatments (1× and 2×), the Meeting agreed to use the results of these trials to give a combined data set of < 0.01, < 0.01, < 0.01 and < 0.01 mg/kg.

The Meeting estimated a maximum residue level of 0.01* mg/kg for dimethomorph in pineapple and estimated an STMR of 0 mg/kg and an HR of 0 mg/kg.

Onions, bulb

In Australia, GAP for onions is up to 0.18 kg ai/ha (maximum 3 – 4 applications per season), with a PHI of 7 days and in one trial in Australia matching this GAP (but with 7 applications), residues were < 0.02 mg/kg.

Residues in two trials from Germany, matching the German GAP of 4 × 0.3 kg ai/ha, with a PHI of 14 days for bulb vegetables, were < 0.01 and < 0.01 mg/kg.

In one trial in France, matching the German GAP, residues were 0.02 mg/kg.

The Meeting agreed the data was not sufficient to estimate a maximum residue limit for onions, bulb.

Green onions

The Meeting received results of residue trials in Australia on green onions (spring onions).

GAP for bulb vegetables in USA is 0.22 kg ai/ha, PHI 0 days, in Australia GAP for onions is 0.18 kg ai/ha, PHI 7 days, maximum 4 applications/season and in Germany, GAP for bulb vegetables is 0.3 kg ai/ha, PHI 14 days.

No trials matching these GAPs were available and the Meeting agreed the data was not sufficient to estimate a maximum residue limit for green onions.

Cabbage, head

The Meeting received results of residue trials in USA on cabbage.

In trials in USA matching the GAP of Cuba (0.2 – 0.23 kg ai/ha, PHI 7 days for vegetables) residues of dimethomorph in cabbages (including wrapper leaves) were < 0.05, 0.14, 0.25, 0.4, 0.69, 1.1 and 1.4 mg/kg.

The Meeting estimated a maximum residue level of 2 mg/kg for dimethomorph in cabbage and estimated an STMR of 0.4 mg/kg and an HR of 1.4 mg/kg.

Broccoli

The Meeting received results of residue trials in the USA on broccoli.

In trials in USA matching the GAP of Cuba (0.2 – 0.23 kg ai/ha, PHI 7 days for vegetables), residues of dimethomorph in broccoli were: < 0.05, 0.12, 0.17, 0.2, 0.25 and 0.52 mg/kg.

The Meeting estimated a maximum residue level of 1 mg/kg for dimethomorph in broccoli and estimated an STMR of 0.19 mg/kg and an HR of 0.52 mg/kg.

Kohlrabi

GAP in Germany for kohlrabi is 0.3 kg ai/ha (maximum 2 applications per season), PHI 14 days and in two outdoor trials and three indoor trials in Germany matching this GAP, residues in kohlrabi were: < 0.02, < 0.02, < 0.02, < 0.02 and < 0.02 mg/kg.

The Meeting estimated a maximum residue level of 0.02 mg/kg for dimethomorph in kohlrabi and estimated an STMR of 0.02 mg/kg and an HR of 0.02 mg/kg.

Fruiting vegetables, Cucurbits

Cucumber

The Meeting received results of residue trials in outdoor cucumbers in Hungary and Germany. No GAP matched these trials.

The Meeting received results of residue trials on protected cucumbers from France, Greece, Italy and Spain.

GAP for cucurbits in the USA is 0.22 kg ai/ha (maximum 5 applications/season), PHI 0 days. In protected cucumber trials, matching the GAP of USA, residues were: 0.02, 0.05 and 0.08 mg/kg in trials in Spain, 0.03 mg/kg in one trial in France, 0.05 mg/kg in one trial in Italy and 0.07 and 0.07 mg/kg in trials in Greece.

The Meeting noted that these trials involved 3 – 4 applications per season but agreed to use these results because 1 – 2 additional treatments applied more than 3 – 4 weeks before harvest would not contribute significantly to the final residue in rapidly growing protected cucumbers. Residues were: 0.02, 0.03, 0.05, 0.05, 0.07, 0.07 and 0.08 mg/kg.

Squash, summer:

The Meeting received results of residue trials on protected summer squash (courgettes) in Greece, Italy and Spain and on outdoor summer squash (zucchini) in Australia.

Residues from five protected summer squash trials in Greece, Italy and Spain, matching the GAP for cucurbits in the USA (0.22 kg ai/ha, maximum of 5 applications per season, PHI 0 days) were: 0.2 and 0.24 mg/kg (Greece), 0.07, 0.13 and 0.17 mg/kg (Italy) and 0.02 mg/kg (Spain).

The Meeting noted that these trials involved 3 applications per season and agreed that the contribution of 2 additional treatments applied more than 3 – 4 weeks before harvest would not contribute significantly to the final residue.

In one outdoor summer squash trial in Australia matching the Australian GAP (0.18 kg ai/ha, maximum 4 applications per season, PHI 7 days), residues were < 0.02 mg/kg.

The Meeting noted that the residues in protected summer squash trials matching the USA GAP were higher than those from the outdoor summer squash trial in Australia and agreed to use the data on protected summer squash. Residues found were: 0.02, 0.07, 0.13, 0.17, 0.2 and 0.24 mg/kg.

Melons, except watermelons

The Meeting received results of residue trials from Australia, Brazil, France, Italy and Spain.

Residues in trials in France matching the GAP of Israel (0.18 kg ai/ha, PHI 3 days) were: 0.03 and 0.04 mg/kg (whole fruit).

In two trials in Italy matching the GAP of Israel, whole fruit residues were 0.04 and 0.11 mg/kg.

In trials in Spain matching the GAP of Israel, whole fruit residues were: 0.02, 0.02, 0.2 and 0.24 mg/kg and in a further four trials, residues in melon flesh were: < 0.02, ≤ 0.02, < 0.02 and 0.05 mg/kg.

The Meeting agreed to combine the results of the trials in France, Italy and Spain matching the GAP in Israel. Whole fruit residues were: 0.02, 0.02, 0.03, 0.04, 0.04, 0.11, 0.2 and 0.24 mg/kg and residues in melon flesh were: < 0.02, ≤ 0.02, < 0.02 and 0.05 mg/kg.

The Meeting agreed that the data on cucumbers, summer squash and melons were sufficient to support a group MRL and estimated a maximum residue level of 0.5 mg/kg for dimethomorph in fruiting vegetables (cucurbits).

The Meeting estimated an STMR of 0.15 mg/kg and an HR of 0.24 mg/kg for cucurbits with an edible peel (based on the summer squash data) and an STMR of 0.02 mg/kg and an HR of 0.05 mg/kg for cucurbits with an inedible peel (based on the melon data).

Fruiting vegetables, other than Cucurbits

Tomato

In protected tomato trials from France, Greece, Italy and Spain, matching the GAP of Japan (0.025 kg ai/hL, maximum 3 applications per season, PHI 1 day), residues were: 0.03, 0.05, 0.06, 0.07, 0.1, 0.1, 0.1, 0.11, 0.11, 0.13, 0.16, 0.16, 0.19 and 0.26 mg/kg.

Residues in outdoor tomato trials in USA matching the USA GAP (0.22 kg ai/ha, maximum 5 applications per season, PHI 4 days) were: 0.06, 0.08, 0.21, 0.26 and 0.41 mg/kg (n=5).

Residues in a further seven trials from the USA matching this GAP but with 6–7 applications per season were: < 0.05, < 0.05, < 0.05, 0.05, 0.14, 0.14, and 0.51 mg/kg (n=7).

The Meeting agreed that the contribution of 1 – 2 additional treatments applied more than 4 weeks before harvest would not contribute significantly to the final residue and agreed to use these results to give a combined data set of: < 0.05, < 0.05, < 0.05, 0.05, 0.06, 0.08, 0.14, 0.14, 0.21, 0.26, 0.41 and 0.51 mg/kg (n=12) for outdoor tomatoes.

The Meeting noted that the residues from the protected tomato trials matching the GAP of Japan and the outdoor tomato trials matching the GAP of the USA were from similar populations and agreed to combine the results. Residues in ranked order (median underlined) were: 0.03, < 0.05, < 0.05, < 0.05, 0.05, 0.05, 0.06, 0.06, 0.07, 0.08, 0.1, 0.1, 0.1, 0.11, 0.11, 0.13, 0.14, 0.14, 0.16, 0.16, 0.19, 0.21, 0.26, 0.26, 0.41 and 0.51 mg/kg (n=26).

Peppers sweet

In trials on protected sweet peppers in Greece, Italy and Spain matching the GAP of the USA for fruiting vegetables, except tomatoes (0.22 kg ai/ha, maximum 5 applications per season, PHI 0 days), residues in ranked order (median underlined) were: 0.13, 0.13, 0.16, 0.17, 0.18, 0.21, 0.21, 0.26, 0.31, 0.38, 0.48 and 0.56 mg/kg (n=12).

The Meeting noted that these trials involved 3 applications per season but agreed to use this data because the contribution of 2 additional treatments applied more than 3 weeks before harvest would not contribute significantly to the final residue in rapidly growing protected peppers.

Peppers, chilli

The GAP for peppers in the Republic of Korea is 0.3 kg ai/hL with a maximum of 4 applications per season with a PHI of 3 days. In three outdoor chilli pepper trials in Korea, matching this GAP, residues were 0.22, 0.31 and 0.53 mg/kg.

The Meeting noted that the results of the trials on peppers, sweet and peppers, chilli were from similar populations and agreed to combine the results. Residues in ranked order (median underlined) were: 0.13, 0.13, 0.16, 0.17, 0.18, 0.21, 0.21, 0.22, 0.26, 0.31, 0.31, 0.38, 0.48, 0.53 and 0.56 mg/kg.

The Meeting noted that GAP existed in the USA for the fruiting vegetable group and based on the data for peppers and tomatoes, agreed to establish a group MRL for 'fruiting vegetables, other than cucurbits' except mushrooms and sweet corn of 1 mg/kg and estimated an STMR of 0.22 mg/kg and an HR of 0.56 mg/kg.

Lettuce, head

In protected head lettuce trials in Germany, Greece, Italy and Spain matching the GAP in the USA (0.22 kg ai/ha, maximum 5 applications per season, PHI 0 days), residues were: 1.5, 2.2, 2.2, 2.3, 2.7, 2.9, 3.1, 3.6, 3.9, 3.9, 4.2, 4.3, 4.6, 7.1 and 7.2 mg/kg (n=15).

The Meeting noted that these trials involved 2–3 applications per season and agreed to use these results because the contribution of 2 – 3 additional treatments applied more than 3 weeks before harvest would not contribute significantly to the final residue in rapidly growing protected lettuce.

In outdoor lettuce trials in Spain, matching the GAP of Spain (0.23 kg ai/ha, PHI 7 days), residues found were: 0.05, 0.06, 0.07, 0.1, 0.16, 0.38, 0.39 and 0.43 mg/kg.

The Meeting noted that the residues from the protected lettuce trials and the outdoor lettuce trials were from different populations and agreed to use the data from the protected lettuce trials.

The Meeting estimated a maximum residue level of 10 mg/kg for dimethomorph in lettuce, head and estimated an STMR of 3.6 mg/kg and an HR of 7.2 mg/kg.

Corn salad

The Meeting received results of residue trials in protected corn salad (Lambs lettuce) from Italy and Spain. Residues in trials matching the GAP for lettuce (including Lambs lettuce) in Spain (0.23 kg ai/ha, PHI 7 days) were: 0.79, 0.79, 1.9, 4.8, 5.3 and 7.1 mg/kg.

The Meeting estimated a maximum residue limit of 10 mg/kg for dimethomorph in corn salad and estimated an STMR of 3.4 mg/kg and an HR of 7.1 mg/kg.

Spinach

The Meeting received results of residue trials in spinach in USA.

No GAP matching these USA trials was available and the Meeting agreed the data was not sufficient to estimate a maximum residue limit for spinach.

Potatoes

The Meeting received results of residue trials from Argentina, Australia, Belgium, Brazil, Canada, Denmark, France, Greece, Germany, Italy, New Zealand, Spain, UK and USA on potatoes.

In trials in Brazil matching the GAP of Brazil (0.4 kg ai/ha, maximum 4 applications per season, PHI 14 days), residues were: < 0.03 (9) and 0.03 mg/kg (n=10).

In trials in USA matching USA GAP (0.22 kg ai/ha, maximum 8 applications per season, PHI 4 days), residues were: < 0.01 (6) and 0.02 mg/kg (n=7).

Residues in trials in UK matching the GAP of the UK (0.15 kg ai/ha, maximum 8 applications per season, PHI 7 days), were: < 0.01 (12), < 0.02 (18), 0.02 and 0.04 mg/kg (n=32).

Residues in trials in France matching the GAP of France (0.18 kg ai/ha, maximum 4 applications per season, PHI 7 days) were: < 0.01 (4) and < 0.05 mg/kg (n=5).

The Meeting agreed to combine the results to give a total data set of: < 0.01(22), < 0.02(18), 0.02(2), < 0.03(9), 0.03, 0.04, < 0.05 mg/kg (n=54).

The Meeting estimated a maximum residue level of 0.05 mg/kg for dimethomorph in potatoes and estimated an STMR of 0.02 mg/kg and an HR of 0.05 mg/kg.

Rape seed

GAP in Germany for rape seed is for a pre-plant seed treatment using 5 g ai/kg of seed and in two trials from Germany matching this GAP, residues in rape seed from plants grown from treated seed were both < 0.02 mg/kg. In two related trials, residues of < 0.02 mg/kg were reported in rape seed from treated plots. However the presence of residues of 0.02 mg/kg in control samples suggested that the samples had been mislabelled.

The Meeting agreed that while residues would not be expected in rape seed following a pre-plant seed treatment, there was insufficient data to estimate a maximum residue level for dimethomorph in rape seed.

Hops

In Austria and Germany, GAP on hops is 0.015 kg ai/hL (maximum 6 applications per season in two sets of three applications), PHI 10 days.

One trial in Germany matched the GAP in Germany, with residues of 28 mg/kg in dried hops. A further eight trials in Germany matching GAP but with 4 applications per season reported residues of 8.3, 8.7, 9.3, 24, 26, 26, 29 and 42 mg/kg.

The Meeting agreed that the final 3 applications in these trials would contribute most to the final residue and agreed to use these results to give a combined data set: 8.3, 8.7, 9.3, 24, 26, 28, 26, 29 and 42 mg/kg for dried hops.

The Meeting estimated a maximum residue level of 80 mg/kg for dimethomorph in hops, dry and estimated an STMR of 26 mg/kg.

Fate of residues during processing

Dimethomorph is stable under the standard hydrolysis conditions used to simulate food processing.

The Meeting received information on the fate of incurred residues of dimethomorph during the processing of grapes, tomatoes, potatoes and hops. The processing factors (PF) shown below were calculated from the residues for the commodities for which MRLs, STMRs and HRs were estimated.

Raw commodity (RAC)	Processed commodity	Calculated processing factors.	Median or best estimate	
Grapes	Red wine	0.06, 0.12, 0.16, 0.17, 0.17, 0.17, 0.17, 0.22, 0.24, 0.24, 0.25, 0.25, 0.27, 0.28, 0.29, 0.29, 0.30, 0.31, 0.34, 0.34, 0.35, 0.36, 0.38, 0.38, 0.47, 0.53, 0.58, 0.67, 0.69, 0.70, 0.8	0.29	0.29
	White wine	0.10, 0.12, 0.13, 0.14, 0.17, 0.18, 0.31, 0.43, 0.50, 0.51, 0.61, 1.24	0.24	
	Pomace, wet (red wine)	1.6, 2.4, 2.7, 2.8, 3.1, 3.3, 4.1, 7.3	3.0	2.75
	Pomace, wet (white wine)	1.7, 2.3	2.0	
	Raisins	1.5, 2.1	1.8	
Tomatoes	Juice	0.5	0.5	
	Paste	2.4	2.4	
Potatoes	Wet peel	6.4	6.4	
Hops	Beer	0.0011, < 0.0012, 0.0025, 0.0035	0.002	

Grapes were processed into wine and dried grapes (raisins). Processing factors were 0.29 (wine), 1.8 (raisins) and 2.75 (grape pomace). Based on the STMR value of 0.39 mg/kg for grapes and the median processing factors of 0.29 (red and white wine combined) 1.8 for raisins and 2.75 for wet pomace, the STMR-Ps for dimethomorph residues were 0.11 mg/kg in wine, 0.7 mg/kg in dried grapes and 1.07 mg/kg in grape pomace, wet.

Based on the HR of 1.7 mg/kg estimated for grapes and the processing factor of 1.8 for raisins, the Meeting estimated a maximum residue level of 5 mg/kg for dimethomorph in dried grapes.

Tomatoes were processed into juice, puree and paste with processing factors of 0.5, 1.2 and 2.4 respectively. Based on the STMR value of 0.11 mg/kg for tomato, the STMR-Ps for dimethomorph residues were 0.055 mg/kg (tomato juice) and 0.264 mg/kg (tomato paste).

Potatoes, based on a processing factor of 6.4 for wet peel and an STMR of 0.02 mg/kg, the Meeting estimated an STMR-P for dimethomorph residues in potato process waste of 0.128 mg/kg.

Hops were processed into beer with a processing factor of 0.002. Based on the STMR value of 26 mg/kg for hops, dry, the STMR-P for dimethomorph residues in beer was 0.052 mg/kg.

Peppers, chilli dried. Based on the HR value of 0.56 mg/kg and the STMR value of 0.22 mg/kg for fresh peppers (including chilli peppers) and using the new generic processing factor of 7 for dried chilli peppers, the Meeting estimated a maximum residue level of 5 mg/kg and an STMR-P of 1.54 mg/kg for dimethomorph in peppers, chilli dried.

Estimated maximum and mean dietary burdens of farm animals

The Meeting estimated the dietary burden of dimethomorph in farm animals on the basis of the diets listed in Annex 6 of the 2006 JMPR Report (OECD Feedstuffs Derived from Field Crops). Calculation from highest residue, STMR (some bulk commodities) and STMR-P values provides the levels in feed suitable for estimating MRLs, while calculation from STMR and STMR-P values for feed is suitable for estimating STMR values for animal commodities. The percentage dry matter is taken as 100% when the highest residue levels and STMRs are already expressed as dry weight.

Dietary burden calculations for beef cattle, dairy cattle, broilers and laying poultry are provided in Annex VI. The calculations were made according to the animal diets from US-Canada, EU and Australia in the OECD Table (Annex 6 of the 2006 JMPR Report).

	Animal dietary burden, dimethomorph, ppm of dry matter diet					
	US-Canada		EU		Australia	
	max	mean	max	mean	max	mean
Beef cattle	0.32	0.32	2.3 [a]	0.96	1.48	1.48 [b]
Dairy cattle	0.11	0.11	2.19	0.85	1.43	1.43 [c]
Poultry - broiler	0	0	0.03	0.01	0	0
Poultry - layer	0	0	0.5 [d]	0.14 [e]	0	0

a - Highest maximum beef or dairy cattle dietary burden suitable for MRL estimates for mammalian meat and milk.

b - Highest mean beef or dairy cattle dietary burden suitable for STMR estimates for mammalian meat.

c - Highest mean dairy cattle dietary burden suitable for STMR estimates for milk.

d - Highest maximum poultry dietary burden suitable for MRL estimates for poultry meat and eggs.

e - Highest mean poultry dietary burden suitable for STMR estimates for poultry meat and eggs.

Farm animal feeding studies

The Meeting received information on feeding studies with lactating cows.

A residue transfer study in livestock was conducted with 4 groups of 3 Friesian cows that were fed for 28 to 35 days with diets containing dimethomorph, administered (in corn oil) in the diet, corresponding to feeding levels of 0 – 12.5–37.5 – 125 ppm. Milk was collected daily at morning and afternoon milking and pooled for analysis. Sub-samples of milk were separated into cream and skim milk on days 14 and 28, with the day 28 milk also being pasteurised, separated into cream (35% butterfat) and skimmed milk (fat content about 0.1%) or treated and centrifuged to obtain acid whey. Liver, kidney muscle, and fat (subcutaneous and peritoneal) were taken within 24 h of the final administration for analysis.

Residues in whole milk, pasteurised milk, skimmed milk, acid whey and cream were all below the limits of quantitation (0.01 mg/kg for dimethomorph and metabolite Z89) and 0.02 mg/kg for metabolites Z67/Z69) except in the 125 ppm dose group, where trace residues of dimethomorph (0.01 mg/kg) were found in cream samples.

In animals from the 12.5ppm dose group, residues of dimethomorph and metabolites Z69 and Z67 were not detectable or below the limit of quantification (0.01 mg/kg) in all tissues analysed. Residues were also all below the limit of quantification for all tissues from the 37.5 ppm dose group except for liver, where residues of up to 0.02 mg/kg of the Z69 metabolite were found. Only in the highest dose group (125 ppm) were significant residues found, mostly in liver and kidney, where

residues of the Z69 metabolite were measured at levels up to 0.15 mg/kg and 0.14 mg/kg respectively and residues of the parent compound were found in liver (up to 0.05 mg/kg), and in fat (up to 0.03 – 0.04 mg/kg).

Residues in animal commodities

The maximum calculated animal burden estimated for dairy and beef cattle is 2.3 ppm. In the cattle feeding study, where lactating cows were dosed at 12.5 ppm (more than 5 times higher than the calculated animal burden), no dimethomorph residues were detected in tissues and milk. Therefore, the Meeting concluded that no residues are to be expected at the maximum calculated dietary burden.

The maximum animal burden estimated for poultry (layers) is 0.5 ppm. In the metabolism study where laying hens were fed the equivalent of 40 ppm in feed for seven days, dimethomorph residues in fat and skin were < 0.02 mg/kg and were not detected in eggs or other edible tissues. Metabolites Z67 and Z69 were the major residue components identified in liver (0.13 mg/kg), egg yolks (0.07 mg/kg), kidney (0.032 mg/kg) and muscle (0.003 mg/kg). Low levels (0.02 – 0.05 mg/kg) of the Z43 and Z95 metabolites were reported in kidney and/or egg yolks.

On the basis that the maximum calculated dietary burden is about 80 times lower than the dose rate in the metabolism study, the Meeting concluded that no residues of dimethomorph, or its primary metabolites, are to be expected at the maximum calculated dietary burden of 0.5 ppm.

The Meeting estimated a maximum residue level of 0.01* mg/kg in meat (from mammals except marine mammals) and estimated HRs and STMRs of 0 mg/kg.

The Meeting also estimated a maximum residue level of 0.01* mg/kg in edible offal (mammalian) and estimated HRs and STMRs of 0 mg/kg.

For milks, the Meeting estimated a maximum residue level of 0.01* mg/kg and estimated an STMR of 0 mg/kg.

The Meeting estimated a maximum residue level of 0.01* mg/kg in poultry meat, poultry offal and eggs and estimated HRs and STMRs of 0 mg/kg.

RECOMMENDATIONS

On the basis of the data from supervised trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue levels and for IEDI assessment.

Definition of the residue (for compliance with MRLs and for estimation of dietary intake): dimethomorph (sum of isomers).

Definition of the residue for estimation of dietary intake: dimethomorph (sum of isomers).

CCN	Commodity Name	MRL (mg/kg) New	MRL (mg/kg) Previous	STMR or STMR-P (mg/kg)	HR or HR-P (mg/kg)
VB 0400	Broccoli	1		0.19	0.52
VB 0041	Cabbages, Head	2		0.4	1.4
VL 0470	Corn salad (Lambs lettuce)	10		3.4	7.1
DF 0269	Dried grapes	5		0.7	
MO 0105	Edible offal (Mammalian)	0.01*		0	0
PE 0112	Eggs	0.01*		0	0
VC 0045	Fruiting vegetables, Cucurbits	0.5		edible peel 0.15 inedible peel 0.02	edible peel 0.24 inedible peel 0.05
VO 0050	Fruiting vegetables, other than cucurbits [a/]	1		0.22	0.56
FB 0269	Grapes	2		0.39	1.7

CCN	Commodity Name	MRL (mg/kg) New	MRL (mg/kg) Previous	STMR or STMR-P (mg/kg)	HR or HR-P (mg/kg)
DH 1100	Hops, dry	80		26	
VB 0405	Kohlrabi	0.02		0.02	0.02
VL 0482	Lettuce, Head	10		3.6	7.2
MM 0095	Meat (from mammals ex marine mammals)	0.01*		0	0
ML 0106	Milks	0.01*		0	
FI 0353	Pineapple	0.01*		0	0
VR 0589	Potato	0.05		0.02	0.05
PM 0110	Poultry meat	0.01*		0	0
PO 0111	Poultry, Edible offal of	0.01*		0	0
FB 0275	Strawberry	0.05		0.01	0.02
JF 0048	Tomato juice			0.055	
HS 0444	Peppers, chilli dried	5		1.54	
	Grape pomace, wet			1.07	
	Tomato paste			0.264	
	Wine			0.11	
	Beer			0.052	

* at or about the LOQ.

a - except: fungi, edible; mushrooms; sweet corn (corn-on-the-cob); sweet corn (kernels)

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of dimethomorph has resulted in recommendations for MRLs and STMRs for raw and processed commodities. Consumption data was available for 31 food commodities and was used in the dietary intake calculation. The results are shown in Annex 3.

The International Estimated Daily Intakes in the 13 GEMS/Food cluster diets, based on the estimated STMRs were in the range 0 – 1% of the maximum ADI of 0.2 mg/kg bw (Annex 3). The Meeting concluded that the long-term intake of residues of dimethomorph from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The international estimated short-term intake (IESTI) for dimethomorph was calculated for the food commodities (and their processing fractions) for which maximum residue levels and HRs were estimated and for which consumption data was available. The results are shown in Annex 4.

The IESTI varied from 0 – 10% of the ARfD (0.6 mg/kg bw) for the general population. The IESTI varied from 0 – 20% of the ARfD for children 6 years and below. The Meeting concluded that the short-term intake of residues of dimethomorph from uses considered by the Meeting was unlikely to present a public health concern.

REFERENCES

Code	Author(s)	Year	Title, Institute, Report Reference
1997/1004020	Offenbae-cher, G.	1997	Rueckstandsbestimmung von Dimethomorph und Mancozeb in Kopfsalat. Pflanzenschutzdienst und Rueckstandslabor des Landes Pheinland Pfalz, Bonn, Germany. BASF Document No. 1997/1004020. Unpublished. AK Lueck
1997/1004021	Offenbae-cher, G.	1997	Rueckstandsbestimmung von Dimethomorph und Mancozeb in Kopfsalat. Pflanzenschutzdienst und Rueckstandslabor des Landes Pheinland Pfalz, Bonn, Germany. BASF Document No. 1997/1004021. Unpublished. AK Lueck
1998/1002634	Leeson H.	1998	Dimethomorph: The validation of a method for the determination of residues in tomatoes. Restec Laboratories Ltd, Birlingham, Worcestershire, England. BASF Document No. 1998/1002634. Unpublished. BASF
2000/1022812	Bailey, A.	2000	Invader, Dimethomorph/Mancozeb 75/667 g ai/kg WG (CY50625): At harvest residue study on Dimethomorph in potatoes, UK 1999. Agrisearch UK Ltd, Wilson, Melbourne, Derbishire, UK. BASF Document No. 2000/1022812. Unpublished. BASF
2000/304416	Steling, C.	2000	Estudo de Residuo de Dimethomorph (CL 336,379) em Batata (Tubérculo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2000/304416 (including Report R-AR-335-00). Unpublished. BASF
2000/304417	Steling, C.	2000	Estudo de Residuo de Dimethomorph (CL 336,379) em Batata (Tubérculo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2000/304417 (including Report R-AR-334-00). Unpublished. BASF
2000/304418	Dantas, C	2001	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2000/304418 (including Report R-AR-483-01). Unpublished. BASF
2000/304419	Dantas, C	2001	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2000/304419 (including Field report RES - Forum Potato 4). Unpublished. BASF
2000/304420	Dantas, C	2001	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2000/304420 (including Field report RES - Forum Potato 5). Unpublished. BASF
2000/304509	Steling, C.	2000	Estudo de Residuo de Dimethomorph (CL 336,379) em Batata (Tubérculo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2000/304509 (including Report R-AR-337-00). Unpublished. BASF
2000/304511	Steling, C.	2000	Estudo de Residuo de Dimethomorph (CL 336,379) em Batata (Tubérculo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2000/304511 (including Report R-AR-336-00). Unpublished. BASF
2000/304513	Dantas, C	2002	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/304513 (including Report R-AR-502-02). Unpublished. BASF
2000/304515	Dantas, C	2002	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/304515 (including Field report RES - Forum Plus Potato 5). Unpublished. BASF
2000/304517	Dantas, C	2002	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/304517 (including Field report RES - Forum Plus Potato 6). Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
2000/304602	Dantas, C	2002	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/304602 (including Report RES - Acrobat MZ Potato 8). Unpublished. BASF
2000/306299	Dantas, C	2003	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/306299 (including Report RES - Forum Plus Potato 7). Unpublished. BASF
2000/306301	Dantas, C	2003	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/306301 (including Report RES - Forum Plus Potato 8). Unpublished. BASF
2000/306310	Dantas, C	2003	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/306310 (including Field report RES - Acrobat MZ Potato 11). Unpublished. BASF
2000/306316	Dantas, C	2003	Estudo de Residuo de Dimethomorph (BAS 550 F) em Batata (Tubérculo Total) do Brasil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2000/306316 (including Report RES - Acrobat MZ Potato 13). Unpublished. BASF
2001/304498	Dantas, C.	2002	Estudo de Resíduos de Dimethomorph (CL 336,379) em Cebola (Bulbo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2001/304498. Unpublished. BASF
2001/304500	Dantas, C.	2002	Estudo de Resíduos de Dimethomorph (CL 336,379) em Cebola (Bulbo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2001/304500. Unpublished. BASF
2001/304504	Steling, C.	2001	Estudo de Resíduos de Dimethomorph (CL 336,379) em Cebola (Bulbo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2001/304504. Unpublished. BASF
2001/304506	Steling, C.	2001	Estudo de Resíduos de Dimethomorph (CL 336,379) em Cebola (Bulbo Total) do Brasil. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. 2001/304506. Unpublished. BASF
2002/1008775	Daum	2002	Determination of the melting point of Dimethomorph E-isomere (PAI) (BAS 550 F, Reg.No. 4110868 identical with CL 901221). BASF AG, Agrarzentrum Limburgerhof; Limburgerhof, Germany Fed.Rep.. BASF Document No. 2002/1008775. Unpublished. BASF
2002/1008776	Daum	2002	Determination of the melting point of Dimethomorph Z-isomere (PAI) (BAS 550 F, Reg.No. 4110869 identical with CL 901222). BASF AG, Agrarzentrum Limburgerhof; Limburgerhof, Germany Fed.Rep.. BASF Document No. 2002/1008776. Unpublished. BASF
2002/1010480	Jones S.,	2002	Study on the residue behaviour of BAS 550 F and BAS 500 F in grapes after application of BAS 536 00 F, BAS 550 09 F or BAS 500 00 F under field conditions in Germany, France (N), Italy, 2001. BASF plc, BASF Agro Research, Gosport, Hampshire, United Kingdom. BASF Document No. 2002/1010480. Unpublished. BASF
2002/304412	Dantas, C.	2002	Estudo de Resíduo de Dimethomorph (BAS 550 F) em Uva (Fruto Total) do Brazil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2002/304412. Unpublished. BASF
2002/304413	Dantas, C.	2002	Estudo de Resíduo de Dimethomorph (BAS 550 F) em Uva (Fruto Total) do Brazil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2002/304413. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
2002/304414	Dantas, C.	2002	Estudo de Resíduo de Dimethomorph (BAS 550 F) em Uva (Fruto Total) do Brazil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2002/304414. Unpublished. BASF
2002/304415	Dantas, C.	2002	Estudo de Resíduo de Dimethomorph (BAS 550 F) em Uva (Fruto Total) do Brazil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2002/304415. Unpublished. BASF
2002/306305	Dantas, C.	2003	Estudo de Resíduo de Dimethomorph (BAS 550 F) em Uva (Fruto Total) do Brazil. Laboratório Agro de Resíduos da Latina America - LARAL, Brasil. BASF Document No. 2002/306305. Unpublished. BASF
2002/5002982	Stewart J.	2002	Independent method validation of BASF analytical method M3502 entitled "BAS 550 F (dimethomorph): LC/MS/MS method for the determination of BAS 550 F in broccoli, celery, spinach, and wheat (grain, hay, straw, forage)". BASF Corporation Agro Research, Research Triangle Parc, NC 27709, United States of America. BASF Document No. 2002/5002982. Unpublished. BASF
2002/5003869	Johnston, R.	2002	BAS 550 F (CL 336379, Dimethomorph): Residues of BAS 550 F in Spinach after multiple applications of ACROBAT 50WP Fungicide, U.S.. Report No. RES 02-013. BASF Document No. 2002/5003869. Unpublished. BASF
2003/5000256	Johnston, R.	2002	BAS 550 F (CL 336379, Dimethomorph): Residues of BAS 550 F in Brassica after multiple application of Acrobat 50 WP fungicide, US. BASF Agro Research RTP, Research Triangle Park, NC 27709, United Stated of America. BASF Document No. 2003/5000256. Unpublished. BASF
2003/5000425	Jones J E.	2003	BAS 550 F: Freezer storage stability of residues of BAS 550 F in broccoli, canola, and spinach. BASF Agro Research RTP, Research Triangle Park, NC 27709, United Stated of America. BASF Document No. 2003/5000425. Unpublished. BASF
2004/1000746	Raunft, E.	2004	Study on the residue behaviour of Dimethomorph and Dithianon in grapes after application of BAS 553 00 F under field conditions in Germany, France (N/S), Italy and Spain, 2003. BASF Agrarzentrum, Limburgerhof, Germany. BASF Document No. 2004/1000746. Unpublished. BASF
2005/1004963	Schulz, H.	2005	Study on the residue behaviour of BAS 550 F and BAS 216 F in vine after treatment with BAS 553 00 F under field conditions in Germany, Northern and Southern France, Greece, Italy and Spain, 2004. SGS Institut Fresenius GmbH, Taunusstein, Germany. BASF Document No. 2005/1004963. Unpublished. BASF
2005/1016640	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph (BAS 536 F) in tomato after application of BAS 536 00 F under greenhouse conditions in Spain and Italy, 2004. Agrologia, Spain. BASF Document No. 2005/1016640. Unpublished. BASF
2005/1016641	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph (BAS 536 F) in pepper after the application of BAS 536 00 F under greenhouse conditions in Spain and Italy, 2004. Agrologia, Spain. BASF Document No. 2005/1016641. Unpublished. BASF
2005/1016642	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph (BAS 536 F) in cucumber and courgette after application of BAS 536 00 F under greenhouse conditions in Spain and Italy, 2004. Agrologia, Spain. BASF Document No. 2005/1016642. Unpublished. BASF
2005/1016643	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph (BAS 536 F) in head lettuce after application of BAS 536 00 F under greenhouse conditions in Spain and Italy, 2004. Agrologia, Spain. BASF Document No. 2005/1016643. Unpublished. BASF
2005/1025857	Jobst, H.	2005	Residue behaviour of Dimethomorph in/on kohlrabi outdoor and in glasshouse after application of Forum (DC 150) in Germany. LUFA, Speyer, Germany. BASF Document No. 2005/1025857. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
2005/1025858	Offenbae-cher G	2005	Residue behaviour of Dimethomorph in/on kohlrabi in glasshouse after application of Forum (DC 150) in Germany, 2004. LUFA, Speyer, Germany. BASF Document No. 2005/1025858. Unpublished. AK Lueck, Ger-many
2005/1026082	Lehmann A and Mackenroth C.	2005	Validation of the analytical method 575/0: Method for the determination of BAS 550 F (Dimethomorph) in plant matrices. BASF Agrarzentrum, Limburgerhof, Germany. BASF Document No. 2005/1026082. Unpublished. BASF
2005/1027637	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph in tomato after the application of BAS 536 00 F and BAS 536 01 F under greenhouse conditions in Spain, Italy and Greece, 2005. Agrologia, Spain. BASF Document No. 2005/1027637. Unpublished. BASF
2005/1027638	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph in pepper after the application of BAS 536 00 F and BAS 536 01 F under greenhouse conditions in Spain, Italy and Greece, 2005. Agrologia, Spain. BASF Document No. 2005/1027638. Unpublished. BASF
2005/1027639	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph in cucumber and courgette after the application of BAS 536 00 F and BAS 536 01 F under greenhouse conditions in Spain, Italy and Greece, 2005. Agrologia, Spain. BASF Document No. 2005/1027639. Unpublished. BASF
2005/1027640	Schroth, E.	2005	Study on the residue behavior of Pyraclostrobin and Dimethomorph in head lettuce and lambs lettuce after the application of BAS 536 00 F and BAS 536 01 F under greenhouse conditions in Spain, Italy and Greece, 2005. Agrologia, Spain. BASF Document No. 2005/1027640. Unpublished. BASF
2005/1028930	Jobst, H.	2005	Residue behaviour of Dimethomorph in/on tomatoes in glasshouse after application of Forum (DC 150) in Germany, 2003. LUFA, Speyer, Germany. BASF Document No. 2005/1028930. Unpublished. BASF
2005/1034175	Moreno, S.	2005	Study of the residue degradation of Dimethomorph in oranges after foliar application of FORUM DC (Dimethomorph 150 g/L) under field conditions in Spain, season 2004. Agricultura y Ensayo S.L., Alcala de Guadaira, Spain. BASF Document No. 2005/1034175. Unpublished. BASF
2006/1000581	Schulz, H.	2006	Study on the residue behaviour of Dimethomorph and Pyraclostrobin in potatoes after treatment with BAS 536 01 F under field conditions in France (N & S), Denmark, Germany, Belgium, Italy, Spain and Greece, 2005. SGS Fresenius, Taunusstein, Germany. BASF Document No. 2006/1000581. Unpublished. BASF
2006/1015075	Moreno, S.	2006	Study on the residue behaviour of Dimethomorph in strawberry after dripping irrigation application of Forum DC (Dimethomorph 150 g/L) under field conditions in Spain, 2004. Agricultura y Ensayo S.L., Alcala de Guadaira, Spain. BASF Document No. 2006/1015075. Unpublished. BASF
2006/1015076	Moreno, S.	2006	Study of the residue degradation of Dimethomorph in oranges after foliar application of Forum DC (Dimethomorph 150 g/L) under field conditions in Spain, season 2005.. Agricultura y Ensayo S.L., Alcala de Guadaira, Spain. BASF Document No. 2006/1015076. Unpublished. BASF
2006/1015077	Moreno, S.	2006	Study of the residue degradation of Dimethomorph in oranges after foliar application of Forum DC (Dimethomorph 150 g/L) under field conditions in Spain, season 2004 - 2005. Agricultura y Ensayo S.L., Alcala de Guadaira, Spain. BASF Document No. 2006/1015077. Unpublished. BASF
2006/1015079	Moreno, S.	2006	Study on the residue behaviour of Dimethomorph in strawberry after dripping irrigation application of FORUM DC (Dimethomorph 150g/l) under field conditions in Spain, season 2004 - 2005 . Agricultura y Ensayo S.L., Alcala de Guadaira, Spain. BASF Document No. 2006/1015079. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
2006/1035428	Schroth, E.	2006	Study on the residue behavior of Dimethomorph (BAS 550 F), Pyraclostrobin (BAS 500 F) and Mancozeb (BAS 266 F) in melon after the application of BAS 551 00 F, BAS 536 01 F and BAS 266 12 F under field conditions in South France, Italy and Spain, 2005. Agrologia, Spain. BASF Document No. 2006/1035428. Unpublished. BASF
DK-123-114	Zeng M.	1997	Method M 2577: CL 336,379 (Dimethomorph): GC determinative and GC/MS confirmatory method for the determination of CL 336,379 residues in tomato fruit and various tomato processing commodities (tomato dry pomace, wet pomace, puree, paste, catsup and juice). American Cyanamid Company, Princeton, NJ 08543, United States of America . BASF Document No. DK-123-114. Unpublished. BASF
DK-123-249	Kukel, C.	2001	BAS 550 F (Dimethomorph): Residues in fresh market tomato fruit with a radish rotational crop after multiple treatments with Acrobat MZ (90/600) WP fungicide in California, U.S.. BASF Agro Research, Princeton, NJ, USA. BASF Document No. DK-123-249. Unpublished. BASF
DK-240-004	Class T.	1999	Assessment and Validation of the Multi-Residue Enforcement Method DFG S19 with Modified Extraction (with DFG Cleanup Method 5 for Fatty/Oily Matrices) for the Determination of Residues of Dimethomorph (CL 336379) in Plant Material (Grape, Hops, Onion, and Oilseed Rape Seed) and in Foodstuffs of Animal Origin (Muscle, Milk, Fat and Egg). PTRL Europe, Ulm, Germany Fed.Rep.. BASF Document No. DK-240-004. Unpublished. BASF
DK-244-011	Memmers-heimer H.	1995	Dimethomorph (CL 183776, CL 336379): Validation of method FAMS 022-02 for the determination of residues in potatoes (Germany, 1995). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-244-011. Unpublished. BASF
DK-244-015	Weitzel R.	1995	Dimethomorph (CL 183776, CL 336379): Method for the determination of residues of dimethomorph in potatoes, tomatoes and grapes (including grape waste material, raisins, fruit juice, wine) (Germany, 1995). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-244-015. Unpublished. BASF
DK-244-020	Weeren R and Pelz S.	1997	Independent Laboratory Validation (ILV) of Cyanamid Analytical Method FAMS 073-03 for the Determination of Residues of Dimethomorph (CL 336379) in Dried Hops Cones,. Dr. Specht & Partner, Chemische Laboratorien GmbH, Hamburg, Germany. BASF Document No. DK-244-020. Unpublished. BASF
DK-244-023	Zeng M.	1997	CL 336379 (Dimethomorph): Independent laboratory validation of GC and GC/MS confirmatory method M 2577 for the determination of CL 336379 residues in potato tubers, washed unpeeled potato, potato chips, wet peel, granules, frying oil and potato wash water. American Cyanamid Company, Princeton, NJ 08543, United States of America. BASF Document No. DK-244-023. Unpublished. BASF
DK-244-025	Weitzel R.	1999	Dimethomorph (CL 336379): Validation of method FAMS 098-02 for the determination of residues of the active ingredient in oil seed rape (Germany, 1998). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-244-025. Unpublished. BASF
DK-244-026	Weeren R and Pelz S.	1999	Dimethomorph (CL 336379): Validation of DFG Method S 19 with Modified Extraction (With DFG Cleanup Method 5 for Rapeseed) For the Determination of Residues of Dimethomorph (CL 336379) in Wine Grapes, Hops, Onions, and Rapeseed. Dr. Specht & Partner, Chemische Laboratorien GmbH, Hamburg, Germany Fed.Rep.. BASF Document No. DK-244-026. Unpublished. BASF
DK-244-032	Devine S.	2001	Validation of Cyanamid Forschung Method FAMS 022-02. CEMAS, North Ascot, Great Britain. BASF Document No. DK-244-032. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-244-033	Richard-son K.	2001	BAS 550 F (dimethomorph, CL 183776, CL 336379): GC method for measurement of residues in potatoes, grapes and wine (SOP No. RLA 12654.00V).. BASF Agro Research, Gosport, Great Britain. BASF Document No. DK-244-033,. Unpublished. BASF
DK-244-034	Jones S.	2002	Confirmation of the specificity of method RLA 12654.00V, used for the determination of BAS 550 F (dimethomorph, CL 183776, CL 336379): residues in potatoes, grapes and wine.. BASF Agro Research, Gosport, Great Britain. BASF Document No. DK-244-034,. Unpublished. BASF
DK-249-004	Class T.	1999	Dimethomorph (CL 336379): Confirmatory Methods for the Determination of Dimethomorph in Air, Soil and Animal Food Stuff (Milk, Egg). PTRL Europe, Ulm, Germany Fed.Rep.. BASF Document No. DK-249-004. Unpublished. BASF
DK-249-005	Weeren R and Pelz S.	1999b	Dimethomorph (CL 336379): Validation of DFG Method S19 for the determination of residues of Dimethomorph (CL 336379) in foodstuff of animal origin and in soil. Dr. Specht & Partner, Chemische Laboratorien GmbH; Hamburg; Germany Fed.Rep.. BASF Document No. DK-249-005. Unpublished. BASF
DK-301-007	Cevasco A A.	1999	Determination of the physical state, color, and odor of Dimethomorph technical grade active ingredient (TGAI) and purified active ingredient (PAI). American Cyanamid Company, Princeton, NJ 08543, United States of America. BASF Document No. DK-301-007. Unpublished. BASF
DK-303-001	Allmann A and Henke S.	1989	Determination of the melting point of Dimethomorph (CME 151). Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-303-001. Unpublished. BASF
DK-306-004	Rech H and Henke S.	1989	Determination of the vapour pressure of Dimethomorph (CME 151). Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-306-004. Unpublished. BASF
DK-308-001	Allmann A and Henke S.	1989	Determination of the density (20 degrees C.) of Dimethomorph (CME 151). Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-308-001. Unpublished. BASF
DK-311-006	Akkari K H.	2002	BAS 550F: Determination of the solubilities of the E (CL901221) and Z (CL901222) isomers of Dimethomorph in water using the shake flask method. BASF Corporation Agricultural Products Center; Raleigh, NC 27709-3528; United States of America. BASF Document No. DK-311-006. Unpublished. BASF
DK-311-007	Akkari K H.	2002	BAS 550F: Determination of the Solubility of Dimethomorph (AC 336379) in water and buffers of pH 4, 7, and 9 using the shake flask method. BASF Corporation Agro Research; Princeton NJ 08543-0400; United States of America. BASF Document No. DK-311-007. Unpublished. BASF
DK-312-001	Grimm K H and Henke S.	1989	Determination of the Solubility of Dimethomorph CME 151 in different solvents at 20 degrees C.. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-312-001. Unpublished. BASF
DK-312-003	Werle H.	1999a	Determination of the Solubility of Dimethomorph (CL 336379) at 20 degrees C. in 6 organic solvents analogous to EC Directive 92/69/EEC, A.6.. BioChem; Karlsruhe; Germany Fed.Rep.. BASF Document No. DK-312-003. Unpublished. BASF
DK-315-001	Rech H and Henke S.	1989b	Determination of the partition coefficient of CME 151. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-315-001. Unpublished. BASF
DK-322-003	Ochsenbein U.	1989	Hydrolysis determination of 14C-Dimethomorph (CME 151) at different pH values. RCC Umweltchemie AG; Itingen; Switzerland. BASF Document No. DK-322-003. Unpublished. BASF
DK-324-004	Knoch E and Holman J C.	1998	Dimethomorph (AC 336379): Determination of the Direct Phototransformation in Buffered Medium at pH 7. Institut Fresenius Gruppe Isotope Laboratory; Herten; Germany Fed.Rep.. BASF Document No. DK-324-004. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-324-006	Panek M G. et al.	2001	Aqueous Photolysis of 14C-BAS 550 F. BASF AG; Ludwigshafen/Rhein; Germany Fed.Rep.. BASF Document No. DK-324-006. Unpublished. BASF
DK-326-002	Eichler D.	1991	The storage stability at <-18 ° C of Dimethmomorph (CME152) in Grapes and Soil. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-326-002,. Unpublished. BASF
DK-326-003	Eichler D.	1991	The storage stability at <-18 ° C of Dimethmomorph (CME151) in Grapes and Soil, Supplemental Data. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-326-003,. Unpublished. BASF
DK-326-008	Weitzel R.	1994	Dimethomorph: Storage stability of active ingredient and relevant metabolites in bovine milk and tissues at minus 18 C (Germany, 1992). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-326-008,. Unpublished. BASF
DK-326-022	Weitzel R.	1997	Dimethomorph (CL 336379): Storage Stability of Residues of CL 336379 in Grape Juice (Must), Grape Waste Material and Raisins at < -18° C (Germany, 1996). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-326-022,. Unpublished. BASF
DK-326-032	Class T.	2000	Dimethomorph (CL 336379) - Storage stability of Dimethomorph (CL 336379) - Residues in oilseed rape seed at <-18 C. PTRL Europe, Ulm, Germany.Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-326-032,. Unpublished. BASF
DK-390-059	Martin C A.	2002	BAS 550 F (Dimethomorph): Calculation of Dissociation Constant. BASF Corporation Agro Research; Princeton NJ 08543-0400; United States of America. BASF Document No. DK-390-059. Unpublished. BASF
DK-390-060	Martin C A.	2002	BAS 550 F (Dimethomorph): Calculation of Henry's Law Constant. BASF Corporation Agro Research; Princeton NJ 08543-0400; United States of America. BASF Document No. DK-390-060. Unpublished. BASF
DK-440-003	Van Dijk A.	1990b	14C-Dimethomorph (CME 151): Absorption, distribution, metabolism and excretion after repeated oral administration to laying hens. RCC Umweltchemie AG; Itingen; Switzerland. BASF Document No. DK-440-003. Unpublished. BASF
DK-440-005	Van Dijk A.	1990c	14C-Dimethomorph (CME 151): Absorption, distribution, metabolism and excretion after repeated oral administration to lactating goats. RCC Umweltchemie AG; Itingen; Switzerland. BASF Document No. DK-440-005. Unpublished. BASF
DK-440-007	Van Dijk A.	1991	14C-Dimethomorph (CME 151): Absorption, distribution, metabolism and excretion after repeated oral administration to laying hens . RCC Umweltchemie AG; Itingen; Switzerland. BASF Document No. DK-440-007. Unpublished. BASF
DK-440-008	Schluter H.	1991c	14C-Dimethomorph (CME 151): Absorption, distribution, metabolism and excretion after repeated oral administration to lactating goats . RCC Umweltchemie AG; Itingen; Switzerland. BASF Document No. DK-440-008. Unpublished. BASF
DK-620-006	Thiele J.	1990a	Soil dissipation of Dimethomorph (CME 151) under field conditions I. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-620-006. Unpublished. BASF
DK-620-007	Thiele J.	1990b	Soil dissipation of Dimethomorph (CME 151) under field conditions II. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-620-007. Unpublished. BASF
DK-620-008	van Dijk A.	1989	Photodegradation study of 14C-Dimethomorph (CME 151) on soil. RCC Umweltchemie AG; Itingen; Switzerland. BASF Document No. DK-620-008. Unpublished. BASF
DK-620-010	Schluter H.	1990b	[Chlorophenyl-14C]-Dimethomorph. Degradation in soil under aerobic conditions. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-620-010. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-620-012	Edwards V T and Standen M E.	1990c	Dimethomorph [Morpholine-14C]. Degradation in soil under aerobic conditions. Sittingbourne Research Centre; Kent ME9 8AG; United Kingdom. BASF Document No. DK-620-012. Unpublished. BASF
DK-620-015	Thiele J.	1991a	Soil dissipation of Dimethomorph (CME 151) under field conditions III. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-620-015. Unpublished. BASF
DK-620-020	Thiele J.	1991c	Soil dissipation of Dimethomorph (CME 151) under field conditions V. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-620-020. Unpublished. BASF
DK-620-021	Thiele J and Buch T.	1991	Soil dissipation of Dimethomorph (CME 151) under field conditions IV. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-620-021. Unpublished. BASF
DK-620-028	McCullough J and Yan Z.	1998	AC 336379 (Dimethomorph) Aerobic soil metabolism. American Cyanamid Company, Princeton, NJ 08543, United States of America. BASF Document No. DK-620-028. Unpublished. BASF
DK-620-029	Bissinger H.J.	1997	Degradation of Dimethomorph (CL 336379) in sterile soil. Cyanamid Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-620-029. Unpublished. BASF
DK-620-037	Steinfuhrer T. et al.	1998	14C-Dimethomorph (CL 336379) Rate of degradation in soil under aerobic conditions at 20 degrees C.. Cyanamid Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-620-037. Unpublished. BASF
DK-620-048	Beigel C.	2001a	Calculation of DT50 and DT90 values of BAS 550 F (Dimethomorph) in five trial sites from field dissipation studies. BASF Corporation Agro Research; Princeton NJ 08543-0400; United States of America. BASF Document No. DK-620-048. Unpublished. BASF
DK-620-049	Hall B E and Lowrie C.	2002	Dimethomorph (BAS 550 F): Rate of degradation in soil under aerobic conditions at 10 degrees C.. BASF Corporation Agro Research; Princeton NJ 08543-0400; United States of America. BASF Document No. DK-620-049. Unpublished. BASF
DK-620-050	Bayer H and Zangmeister W.	2002	Field soil dissipation of BAS 550 F (Dimethomorph) in the formulation BAS 550 09 F on bare soil in the United Kingdom, France (S) and Spain, 2001-2002. BASF AG, Agrarzentrum Limburgerhof; Limburgerhof; Germany Fed.Rep.. BASF Document No. DK-620-050. Unpublished. BASF
DK-630-001	Van Dijk A.	1990	Photodegradation study of 14-C Dimethomorph (CME 151) in water. RCC Umweltchemie AG; Itingen; Switzerland. BASF Document No. DK-630-001. Unpublished. BASF
DK-640-004	Thiele J.	1990d	14C-Dimethomorph (CME 151) (Chlorophenol ring label) – Metabolism and translocation in potato plants. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-640-004. Unpublished.
DK-640-005	Schluter H.	1990c	14C-Dimethomorph (CME 151) - Metabolism and translocation in vines. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-640-005. Unpublished.
DK-640-006	Thiele J.	1990e	14C-Dimethomorph (CME 151) (Morpholine ring label) – Metabolism and translocation in potato plants. Shell Forschung GmbH; Ingelheim; Germany. BASF Document No. DK-640-006. Unpublished.
DK-640-008	Schluter H.	1990d	14C-Dimethomorph (CME 151) - Confined accumulation study on rotational crops. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-640-008. Unpublished. BASF
DK-640-009	Thiele J.	1991d	14C-Dimethomorph (CME 151) (Chlorophenyl ring label) – Metabolism and translocation in potato plants Supplemental data. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-640-009. Unpublished.
DK-640-010	Schluter H.	1991b	14C-Dimethomorph (CME 151): Metabolism and translocation in vines Supplemental data. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-640-010. Unpublished.

Code	Author(s)	Year	Title, Institute, Report Reference
DK-640-011	Thiele J.	1991e	14C-Dimethomorph (CME 151) (Morpholine ring label) – Metabolism and translocation in potato plants Supplemental data. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-640-011. Unpublished.
DK-640-014	Edwards VT.	1992	Dimethomorph (CME 151) (Chlorophenyl ring-14C) metabolism: The nature of the residue in potato tubers Supplemental report. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-640-014. Unpublished.
DK-640-020	Schluter H and Varga J.	1995	14C-Dimethomorph: Metabolism in tomato plants after uptake through the roots. Cyanamid Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-640-020. Unpublished. BASF
DK-640-021	Goodyear A.	1995	Dimethomorph (Chlorophenyl ring - 14C): Metabolism in field grown lettuce . Corning Hazleton; Harrogate; United Kingdom. BASF Document No. DK-640-021. Unpublished. BASF
DK-701-015	Hausmann, S.	1998	Magnitude of Residues in Minor Crops after Application of ACROBAT PLUS: Determination of Residues of Dimethomorph. Report No. P247-1 G. BASF Document No. DK-701-015. Unpublished. BASF
DK-705-006	Weitzel R.	1991	CME 151 (Dimethomorph) technical – Determination of CME 151 Residues and metabolites in bovine tissues – supplemental data. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-705-006. Unpublished. BASF
DK-705-007	Weitzel D.	1991	CME 151 (Dimethomorph) technical – Residues in milk and tissues of dairy cows (Volume I to Volume III). Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-705-007 (a to c). Unpublished. BASF
DK-713-005	Weitzel, R.	1991	Dimethomorph: Residues of CME 151, Mancozeb and its metabolite Ethylenethiourea (ETU) in grapes, grape waste material, grape juice and wine grown in France in 1989. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-005. Unpublished. BASF
DK-713-011	Weitzel, R.	1991	Dimethomorph: Residues of CME 151, Mancozeb and its metabolite Ethylenethiourea (ETU) in grapes, grape waste material, grape juice and wine grown in France in 1989. Supplement No 1 to DK-713-005. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-11. Unpublished. BASF
DK-713-013	Weitzel, R.	1992	Dimethomorph: Determination of residue in Grapes, red wines and white wine produced in France in 1991. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-013. Unpublished. BASF
DK-713-017	Bitz, K.	1994	Dimethomorph: Determination of residues in red grapes and wine following treatment with 500 g/kg wettable powder, SY 50574, or 150 g/l dispersible concentrate, SF 07460, or 600 g/l suspension concentrate, SF 07276 (France, 1992). Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-017. Unpublished. BASF
DK-713-018	Weitzel, R.	1994	Dimethomorph: Residues in strawberries following treatment with PARAAT, 500 g/kg wettable powder, under field conditions (The Netherlands, 1994). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK- DK-713-018. Unpublished. BASF
DK-713-019	Weitzel, R.	1995	Dimethomorph residues in grapes must and wine following treatment with 90/600 g/kg dimethomorph / mancozeb WP Germany 1993. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-019. Unpublished. BASF
DK-713-020	Weitzel, R.	1995	Dimethomroph: Residue in grapes, must and wine following treatment with Forum, 150 g/l Dispersible Concentrate, under filed conditions (Germany, 1993) – Analytical part. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-020. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-713-022	Weitzel, R.	1995	Dimethomorph residues in grapes must and wine following treatment with 90/600 g/kg dimethomorph/ mancozeb WP France 1993. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-022. Unpublished. BASF
DK-713-024	Deutsch E.	1995	Rückstandsstudie – CYA 151 07 F; Weinanbau/Rebenperonospora (Plasmopara vit.). Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-024. Unpublished. BASF
DK-713-025	Weitzel, R.	1995	Dimethomorph: Residues in grapes, must and wine following treatment with Forum, 150 g/l Dispersible Concentrate (CYA 15107 F), under field conditions (Germany, 1994) – Analytical part. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-025. Unpublished.
DK-713-026	Deutsch E.	1995	Rückstandsstudie – CYA 151 07 F; Weinanbau/Rebenperonospora (Plasmopara vit.) [field report]. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-026. Unpublished. BASF
DK-713-027	Anon.	1993	Residues of Dimethomorph in grapes from 1 trial (#507) in New Zealand in 1993 after treatment with Dimethomorph/Mancozeb. Food and Biological Chemistry Division, The Horticulture and Food Research Institute of New Zealand Limited, Ruakura Research Centre, Hamilton. BASF Document No. DK-713-027, DK-713-080. Unpublished. BASF
DK-713-028	Perret, G.	1996	Report on residues of Dimethomorph in red grapes for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-713-028. Unpublished. BASF
DK-713-029	Perret, G.	1996	Report on residues of Dimethomorph in red grapes for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-713-029. Unpublished. BASF
DK-713-030	Perret, G.	1996	Report on residues of Dimethomorph in red grapes for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-713-030. Unpublished. BASF
DK-713-031	Bleif, J.	1997	Dimethomorph/mancozeb CL 336379/cl903067 90/600 g ai/kg WP cy50586: at harvest residue study of dimethomorph CL 336379 in grapes and raisins spain 1996. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-031. Unpublished. BASF
DK-713-032	Dombo. P.	1997	Dimethomorph (CL 336379)/Dithianon (CL37114) 150/350 g/kg WG (SF 09392): Decline curve residue study on CL 336379 and CL 37114 in vines (Germany, 1995). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-032. Unpublished. BASF
DK-713-033	Bleif, J.	1997	Dimethomorph (CL 336379)/Folpet (CL 047615) - 113/600 g ai/kg - WG (SF 09591): Decline curve residue study in vines (Germany, 1996). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-033. Unpublished. BASF
DK-713-034	Dombo, P.	1997	Dimethomorph/Folpet (CL 336379/CL 47615) 113/600 g ai/kg WG (SF 09486): Decline curve residue study in vine and processed commodities (France, 1995). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-034. Unpublished. BASF
DK-713-035	Bleif, J.	1998	Dimethomorph (CL 336379)/Folpet (CL 047615) 113/600 g ai/kg WG (SF 09591): Decline curve residue study of Dimethomorph (CL 336379) and of Folpet (CL 047615) in vines (Germany, 1997). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-713-035. Unpublished. BASF
DK-713-038	Fagnani, A.	2000	Dimethomorph WG: At harvest residue study on Dimethomorph/Mancozeb 90/600g a.i./kg WG (SF 09537) and WP, Dimethomorph/Copper 60/400g a.i./kg WG (batch 776) and WP and Dimethomorph/Mancozeb/Phosetyl Al 60/300/300 g a.i./kg WG (batch 802) in grape bunches (Italy, 1998). Cyanamid Italy, Bologna, Italy. BASF Document No. DK-713-038. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-713-039	Roland, L.	1993	Dosage de residus de Dimethomorph dans des fraises (Essai: 1991-1992 - Opzoekingsstation van Gorsem). Faculté de Sciences Agronomiques, Gembloux, Belgium. BASF Document No. DK- DK-713-039. Unpublished. BASF
DK-713-040	Roland, L.	1994	Residus de Dimethomorph sur fraises - Essai 1993-1994 - Melsele. Faculté de Sciences Agronomiques, Gembloux, Belgium. BASF Document No. DK- DK-713-040. Unpublished. BASF
DK-713-041	Roland, L.	1994	Residus de Dimethomorph sur fraises - Essai 1993-1994 - Zwijndrecht. Faculté de Sciences Agronomiques, Gembloux, Belgium. BASF Document No. DK- DK-713-041. Unpublished. BASF
DK-713-042	Roland, L.	1994	Residus de Dimethomorph sur fraises - Essai 1993-1994 - Stekene. Faculté de Sciences Agronomiques, Gembloux, Belgium. BASF Document No. DK- DK-713-042. Unpublished. BASF
DK-713-077	Fagnani, A.	2000	Dimethomorph WG: Decline curve residue study on Dimethomorph/Mancozeb 90/600 g a.s./kg WG (SF 09537) and WP (batch 05FP1E), Dimethomorph/Copper 60/400 g a.s./kg WG (batch 776) and WP (SF 09499) in grape bunches (Italy, 1999). Cyanamid Italy, Bologna, Italy. BASF Document No. DK-713-077. Unpublished. BASF
DK-713-078	Fagnani, A.	2000	Dimethomorph WG: At harvest residue study on Dimethomorph/Mancozeb 90/600 g a.s./kg WG (SF 09537) and WP (batch 05FP1E), Dimethomorph/Copper 60/400 g a.s./kg WG (batch 776) and WP (SF 09499) in grape bunches (Italy, 1999). Cyanamid Italy, Bologna, Italy. BASF Document No. DK-713-077 DK-713-078. Unpublished. BASF
DK-713-080	Anon.	1993	Residues of Dimethomorph in grapes from 1 trial (#508) in New Zealand in 1993 after treatment with Dimethomorph/Mancozeb. Food and Biological Chemistry Division, The Horticulture and Food Research Institute of New Zealand Limited, Ruakura Research Centre, Hamilton. BASF Document No. DK-713-027, DK-713-080. Unpublished. BASF
DK-713-082	Devine, H.	2002	BAS 550 F (Dimethomorph) 150 g as/L DC BAS 550 09 F (CF07460): At Harvest Residue Study on dimethomorph in Vines, Northern France, 2000. CEMAS, North Ascot, United Kingdom. BASF Document No. DK-713-082. Unpublished. BASF
DK-713-083	Devine, H.	2002	BAS 550 F (Dimethomorph) 150 g as/L DC BAS 550 09 F (CF 07460): A Decline Residue Study on dimethomorph in Vines, (Northern France, 2000). CEMAS, North Ascot, United Kingdom. BASF Document No. DK-713-083. Unpublished. BASF
DK-713-084	Devine, H.	2002	BAS 550 F (Dimethomorph) 150 g as/L DC BAS 550 09 F (CF07460): A Decline Residue Study on dimethomorph in Vines, (Italy, 2000). CEMAS, North Ascot, United Kingdom. BASF Document No. DK-713-084. Unpublished. BASF
DK-713-085	Devine, H.	2002	Dimethomorph (CL 336379) 150 g as/L DC (CF 07460): A Decline Curve Residue Study on Dimethomorph in Vines, Spain, 2000. CEMAS, North Ascot, United Kingdom. BASF Document No. DK-713-085. Unpublished. BASF
DK-713-086	Young H.	2002	Study on the residue behaviour of BAS 550 F in Grapes (processing) after application of BAS 550 09 F under field conditions in France (S), 2001. BASF Agro Research, Gosport, Great Britain. BASF Document No. DK-713-086. Unpublished. BASF
DK-713-087	Devine, H.	2002	BAS 550 F (Dimethomorph) 150 g as/L DC BAS 550 09 F (CF07460): At Harvest Residue Study on dimethomorph in Vines, (Spain, 2000). CEMAS, North Ascot, United Kingdom. BASF Document No. DK-713-087. Unpublished. BASF
DK-713-088	Devine, H.	2002	BAS 550 F (Dimethomorph) 150 g as/L DC BAS 550 09 F (CF 07460): At Harvest Residue Study on dimethomorph in Vines, (Hellas, 2000). CEMAS, North Ascot, United Kingdom. BASF Document No. DK-713-088. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-713-089	Jones, S.	2002	Study on the Residue Behavior of BAS 550 F in Grapes (processing) after application of BAS 550 09 F under Field Conditions in Spain, Germany, France (S and N), Italy and Greece, 2001). BASF plc, BASF Agro Research, Gosport, Hampshire, United Kingdom. BASF Document No. DK-713-089. Unpublished. BASF
DK-714-001	Weitzel, R.	1994	Dimethomorph: Determination of the residues in pineapples (Philippines, 1992/93) - Analytical part. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-714-001. Unpublished. BASF
DK-721-001	Kukel, C.	2002	BAS 550 F (Dimethomorph): Residues of BAS 550 F in cabbage with a spinach rotational crop after multiple applications of Acrobat MZ (90/600) WP fungicide, Georgia, U.S.. BASF Agro Research, Princeton, NJ, USA. BASF Document No. DK 721-001. Unpublished. BASF
DK-721-002	Kukel, C.	2002	BAS 550 F (Dimethomorph): Decline residues of BAS 550 F in cabbage after multiple applications of Acrobat MZ (90/600) WP fungicide, California, U.S.. BASF Agro Research, Princeton, NJ, USA. BASF Document No. DK 721-002. Unpublished. BASF
DK-722-001	Weitzel, R.	1992	Dimethomorph: Determination of residues in onions grown in Australia in 1988 after treatment with 100 g/L emulsifiable concentrate, F 87 0495. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-722-001. Unpublished. BASF
DK-722-002	Weitzel, R.	1992	Dimethomorph: Determination of residues in salad onions grown in Australia in 1988 after treatment with 100 g/L emulsifiable concentrate, F 87 0495. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-722-002. Unpublished. BASF
DK-722-003	Schanne; C.	1994	Dimethomorph: Determination of the residues in onions following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in France, 1992. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-722-003, DK-722-006. Unpublished. BASF
DK-722-004	Schanne, C.	1994	Dimethomorph: Determination of the residues in onions following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Germany, 1992 - Field part. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-722-004, DK-722-005. Unpublished. BASF
DK-722-005	Schanne, C.	1994	Dimethomorph: Determination of residues in onions following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Germany, 1992. - Field part. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-722-004, DK-722-005. Unpublished. BASF
DK-722-006	Schanne; C.	1994	Dimethomorph: Determination of the residues in onions following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in France, 1992. - Field part. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-722-003, DK-722-006. Unpublished. BASF
DK-722-008	Weitzel, R.	1995	Dimethomorph: Residues in onions following treatment with 75/667 g/kg Dimethomorph/Mancozeb wettable powder (Germany, 1993). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-722-008. Unpublished. BASF
DK-722-009	Perret, G.	1994	Report on residues of Dimethomorph in onions for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-722-009. Unpublished. BASF
DK-722-010	Perret, G.	1994	Report on residues of Dimethomorph in onions for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-722-010. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-723-001	Schulz, H.	1993	Dimethomorph: Determination of the residues in tomatoes following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Spain, 1991. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-001. Unpublished. BASF
DK-723-002	Schulz, H.	1993	Dimethomorph: Determination of the residues in cucurbits following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Spain, 1991. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-002. Unpublished. BASF
DK-723-003	Dae-Song, H.	1992	Residue trial results of Dimethomorph on red pepper (fruit). Research Institute of Agric. Sc, Kong Weon Nat. University, Chucheon city, Korea. BASF Document No. DK-723-003. Unpublished. BASF
DK-723-005	Voelkl, S.	1993	Dimethomorph: Determination of the residues in cucumbers following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in France, 1992. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-005 and DK-723-012. Unpublished. BASF
DK-723-006	Schanne, C.	1993	Dimethomorph: Determination of the residues in tomatoes following treatment with 150 g/L dispersible concentrate, SF . RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-006. Unpublished. BASF
DK-723-007	Voelkl, S.	1993	Dimethomorph: Determination of the residues in tomatoes following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Germany, 1992. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-007 and DK-723-009. Unpublished. BASF
DK-723-008	Voelkl, S.	1993	Dimethomorph: Determination of the residues in cucumbers following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Germany, 1992. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-008 and DK-723-010. Unpublished. BASF
DK-723-009	Voelkl, S.	1993	Dimethomorph: Determination of the residues in tomatoes following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Germany, 1992. - Field report. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-007 and DK-723-009. Unpublished. BASF
DK-723-010	Voelkl, S.	1993	Dimethomorph: Determination of the residues in cucumbers following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in Germany, 1992. - Field part. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-008 and DK-723-010. Unpublished. BASF
DK-723-012	Voelkl, S.	1993	Dimethomorph: Determination of the residues in cucumbers following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in France, 1992. - Field part. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-723-005 and DK-723-012. Unpublished. BASF
DK-723-014	Weitzel, R.	1994	Dimethomorph: Determination of residues in tomatoes following treatment with 150 g/L dispersible concentrate, SF 07460 or 500 g/kg WP CME 15104 (France, 1991). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-723-014. Unpublished. BASF
DK-723-015	Weitzel, R.	1994	Dimethomorph: Determination of residues in cucumbers following treatment with 150 g/L dispersible concentrate, Forum, or 75/667 g/kg wettable powder Dimethomorph/Mancozeb, Acrobat M (Spain, 1992/93) - Analytical part. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-723-015. Unpublished. BASF
DK-723-018	Weitzel, R.	1995	Dimethomorph residues in cucumbers following treatment with 90/600 g/kg dimethomorph/mancozeb WP France 1993. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-723-018. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-723-019	Weitzel, R.	1995	Dimethomorph: Residues in cucumbers following treatment with 75/667 g/kg Dimethomorph/Mancozeb wettable powder (Germany, 1993). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-723-019. Unpublished. BASF
DK-723-021	Bitz, K.	1995	Dimethomorph: Residue study of Acrobat MZ (75/667 Dimethomorph/Mancozeb g a.i./kg WP) in tomatoes at harvest (Spain, 1994). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-723-021. Unpublished. BASF
DK-723-022	Bitz, K.	1995	Dimethomorph: Residue study in cucumbers at harvest (Spain, 1994). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-723-022. Unpublished. BASF
DK-723-023	Perret, G.	1995	Report on residues of Dimethomorph in zucchini for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-723-023. Unpublished. BASF
DK-723-024	Perret, G.	1994	Report on residues of Dimethomorph in rockmelons for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-723-024. Unpublished. BASF
DK-723-026	Shin, K.S.	1995	Residue of Dimethomorph 25% WP on tomato. Hankook Samkong Co, Ltd, Korea. BASF Document No. DK-723-026. Unpublished. BASF
DK-723-027	Lennon, G.	1997	CL 336,379: Crop residue study: RES 96-052. Dimethomorph residues in tomato fruit after multiple applications of Dimethomorph 50 WP fungicide (TX; 1995). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-027. Unpublished. BASF
DK-723-028	Lennon, G.	1997	CL 336,379: Crop residue study: RES 96-054. Dimethomorph residues in tomato fruit after multiple applications of Dimethomorph 50 WP fungicide (CA, 1995). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-028. Unpublished. BASF
DK-723-029	Lennon, G.	1997	CL 336,379: Crop residue study: RES 96-053. Dimethomorph residues in tomato fruit after multiple applications of Dimethomorph 50 WP fungicide (CA, 1995). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-029. Unpublished. BASF
DK-723-030	Lennon, G.	1997	CL 336,379: Crop residue study: RES 96-072. Dimethomorph residues in tomato fruit after multiple applications of Dimethomorph 50 WP fungicide (CA, 1995). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-030. Unpublished. BASF
DK-723-031	Lennon, G.	1997	CL 336,379: Crop residue study: RES 96-071. Dimethomorph residues in tomato fruit after multiple applications of Dimethomorph 50 WP fungicide (CA, 1995). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-031. Unpublished. BASF
DK-723-032	Higham, J.W.	1998	CL 336379: Crop residue study: RES 97-050. CL 336379 residues in fresh market tomato fruit after multiple applications of Acrobat MZ (90/600) WP fungicide. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-032. Unpublished. BASF
DK-723-035	Higham, J.W.	1998	CL 336379: Crop residue study: RES 97-044. CL 336379 residues in fresh market tomato fruit after multiple applications of Acrobat MZ (90/600) WP fungicide. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-035. Unpublished. BASF
DK-723-036	Higham, J.W.	1998	CL 336379: Crop residue study: RES 97-045. CL 336379 residues in fresh market tomato fruit after multiple applications of Acrobat MZ (90/600) WP fungicide. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-732-036. Unpublished. BASF
DK-723-037	Scharm, M.	1998	Dimethomorph/mancozeb CL 336379/cl90367 75/667 g ai/kg WP dy50588 decline curve residue study on dimethomorph in melon in open field trials spain 1996. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK 723-037. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-723-038	Scharm, M.	1998	Dimethomorph/mancozeb CL 336379/cl90367 75/667 g ai/kg WP dy50588 decline curve residue study on dimethomorph in melon spain 1996. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK 723-038. Unpublished. BASF
DK-723-039	Scharm, M.	1999	Dimethomorph/mancozeb CL 336379/cl903067 75/667 g ai/kg WP cy50588: at harvest residue study on dimethomorph CL 336379 in melons spain 1997. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK 723-039. Unpublished. BASF
DK-723-040	Babbitt B.	1998	CL 336379 (Dimethomorph): Freezer stability of CL 336379 residues in tomato fruit, tomato puree, tomato juice, tomato paste and tomato dry pomace. Centre Analytical Laboratories Inc., State College PA, United States of America. BASF Document No. DK-723-040. Unpublished. BASF
DK-723-041	Steling, C.	1998	Determination of Dimethomorph and Chlorothalonil residues in tomato samples from Brazil treated with a Dimethomorph + Chlorothalonil formulation. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No DK-723-041. Unpublished. BASF
DK-723-043	Hallman, D.C.	1999	CL 336379 (Dimethomorph): RES 99-122. CL 336379 residues in fresh market tomato fruit after multiple treatments with Acrobat MZ (90/600) WP fungicide in California. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-043. Unpublished. BASF
DK-723-048	Hallman, D.C.	1999	CL 336379 (Dimethomorph): RES 99-121. CL 336379 residues in fresh market tomato fruit after multiple treatments with Acrobat MZ (90/600) WP fungicide in California. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-723-048. Unpublished. BASF
DK-723-049	Fagnani, A.	1998	Dimethomorph WG: At harvest residue study on Dimethomorph/Copper 60/400 g a.i./kg WG (batch 776) and WP in tomato (Italy, 1998). Cyanamid Agricola S.p.A., Bologna, Italy. BASF Document No. DK-723-049. Unpublished. BASF
DK-723-054	Papadopoulou-Mourkidou E	1997	Residues of Dimethomorph (Acrobat, WP) in cucumbers grown in greenhouse, Esobalta, Giannitsa Greece, 1997. Aristotle University, Pesticide Science Lab., Tessaloniki, Greece. BASF Document No. DK-723-054. Unpublished. BASF
DK-723-055	Benyhge, J.	1995	Determination of Dimethomorph and Mancozeb residues in protected cucumber after treatment with Acrobat MZ. Cyanamid Hungary KFT, Budapest, Hungary. BASF Document No. DK-723-055. Unpublished. BASF
DK-724-003	Weitzel, R.	1989	Residues of CME 151 (Dimethomorph) in Potatoes Grown in Germany in 1987. Shell Forschung GmbH, Ingelheim, Germany . BASF Document No. DK-724-003. Unpublished. BASF
DK-724-004	Eichler, D.	1990	Residues of Dimethomorph (CME 151), Mancozeb and its metabolite ethylenethiourea (ETU) in Potatoes Grown in France in 1989. Shell Forschung GmbH, Ingelheim, Germany. BASF Document No. DK-724-004. Unpublished. BASF
DK-724-007	Weitzel, R.	1991	Dimethomorph Residues of WL 127 294 (CME 151) in Potatoes Grown in UK in 1989 after Application of 75 G/Kg Wettable Powder (SY 50587) or 90 G/KG Wettable Powder (SY 50586) Vol. II. Shell Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-724-007. Unpublished. BASF
DK-724-010	Weitzel, R.	1991	Dimethomorph Residues of WL 127 294 (CME 151) in Potatoes Grown in UK in 1989 after Application of 75 G/Kg Wettable Powder (SY 50587) or 90 G/KG Wettable Powder (SY 50586) Vol. II. Shell Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-724-010 (Supplement to DK-724-007). Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-724-012	Eichler, D.	1990	Residues of Dimethomorph (CME 151), Mancozeb and its metabolite ethylenethiourea (ETU) in Potatoes Grown in France in 1989. Shell Forschung GmbH, Ingelheim, Germany. BASF Document No. DK-724-012 (Supplement to DK-724-004). Unpublished. BASF
DK-724-013	Weitzel, R.	1989	Residues of CME 151 (Dimethomorph) in Potatoes Grown in Germany in 1987. Shell Forschung GmbH, Ingelheim, Germany . BASF Document No. DK-724-013 (Supplement to DK-724-003). Unpublished. BASF
DK-724-017	Schulz, H.	1993	Dimethomroph: Determination of the Residues in Potatoes , Following Treatment with 500 G/KG Wettable Powder, SY50574 or 75+ 667 G/Kg Wettable Powder Dimethomorph/ Mancozeb SY50588P, Under Field Conditions in the United Kingdom, 1991 Vol. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-724-017. Unpublished. BASF
DK-724-019	Wyss-Benz, S.	1993	Residues of Dimethomorph in Potatoes Grown in UK in 1991 Treated with 75/667 G/Kg WP Dimethomorph/Mancozeb SY50588P. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-724-019. Unpublished. BASF
DK-724-020	Voelkl, S.	1993	Residues of Dimethomorph in Potatoes Grown in UK in 1991 Treated with 75/667 G/Kg WP Dimethomorph/Mancozeb SY50588P. RCC Umweltchemie AG, Itingen, Switzerland. BASF Document No. DK-724-020. Unpublished. BASF
DK-724-026	Weitzel, R.	1995	Dimethomorph: Determination of the Residues in Potatoes Following Treatment with Dimethomorph/Mancozeb 75/667 G/KG Water Dispersible Granule, SY50625, or Dimethomorph/Mancozeb 75/667 G/KG Wettable Powder, SY50588 (UK, 1993). Cyanamid Forschung GmbH, Schwabenhiem, Germany. BASF Document No. DK-724-026. Unpublished. BASF
DK-724-027	Perret, G.	1994	Report on residues of Dimethomorph in potatoes for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-724-027. Unpublished. BASF
DK-724-028	Anon.	2003	Publication: Residues of Dimethomorph in potatoes grown in New Zealand in 1993 after treatment with Acrobat MZ Dimethomorph/Mancozeb 75/667 WP. Vegetable Research Station, NZ Institute for Crop & Food Research Ltd, Pukekohe, New Zealand. BASF Document No. DK-724-028. Unpublished. BASF
DK-724-029	Young, H.	1997	Dimethomorph/Mancozeb (CL 336379/CL 903067) 90/600 g a.i./kg WG (SF 09537) & 90/600 g a.i./kg WP (DF 50586R). At Harvest Residue Study on Dimethomorph and Mancozeb in Potatoes (Germany, 1996). PRDL, Cyanamid Agriculture Ltd., Gosport, Great Britain. BASF Document No. DK-724-029. Unpublished. BASF
DK-724-032	Cenni, M.	1997	Crop residue study RES 97-028: CL 336379 residues in potatoes after multiple applications of Acrobat MZ 90/600 WP Fungicide at 0.2lbs ai/a/application (1.4 lbs a.i./a - total applied). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-724-032. Unpublished. BASF
DK-724-033	Cenni, M.	1997	Crop residue study RES 97-030: CL 336379 residues in potatoes after multiple applications of Acrobat MZ 90/600 WP Fungicide at 0.2lbs ai/a/application (1.4 lbs a.i./a - total applied). American Cyanamid Co, Princeton, NJ, USA. BASF Document No.DK-724-033. Unpublished. BASF
DK-724-034	Cenni, M.	1997	Crop residue study RES 97-029: CL 336379 residues in potatoes after multiple applications of Acrobat MZ 90/600 WP Fungicide at 0.2lbs ai/a/application (1.4 lbs a.i./a - total applied). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-724-034. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-724-036	Cenni, M.	1997	Crop residue study RES 97-031: CL 336379 residues in potatoes after multiple applications of Acrobat MZ 90/600 WP fungicide at 0.2lbs ai/a/application (1.4 lbs a.i./a - total applied). American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-724-036. Unpublished. BASF
DK-724-038	Cenni, M.	1998	Crop residue study RES 96-114: CL 336,379 residues in potatoes after multiple applications of Acrobat MZ (90/600) WP fungicide. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-724-038. Unpublished. BASF
DK-724-039	Cenni M.	1998	CL 336,379: Freezer storage stability of CL336,379 in potato tuber, potato chips, potato granules, frying oil and wash water. American Cyanamid Company, Princeton, NJ 08543, United States of America. BASF Document No. DK-724-039. Unpublished. BASF
DK-724-040	Cenni, M.	1998	Crop residue study RES 97-058: CL 336,379 residues in potatoes after multiple applications of Acrobat MZ (90/600) WP fungicide. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-724-040. Unpublished. BASF
DK-724-041	Cenni, M.	1998	Crop residue study RES 97-057: CL 336,379 residues in potatoes after multiple applications of Acrobat MZ (90/600) WP fungicide. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-724-041. Unpublished. BASF
DK-724-045	Fletcher, P.	1998	CL 336379 (Dimethomorph): CL 336379 residues in potatoes after multiple applications of Acrobat MZ (90/600) WP fungicide in North Carolina. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-724-045. Unpublished. BASF
DK-724-048	Lennon G.	1997	CL 336379 (Dimethomorph): CL 336379 residues in potatoes and potato processed commodities after multiple applications of Acrobat MZ (90/600) WP fungicide at 0.2 lb ai/acre/application (1X) and 1.0 lb ai/acre/application (5X) and in winter wheat planted 16 days after the last (7th) application at the 0.2 lb ai/acre/application (1X) rate in Washington. American Cyanamid Company, Princeton, NJ 08543, United States of America. BASF Document No. DK-724-048. Unpublished. BASF
DK-724-050	Steling, C.	1998	Determination of Dimethomorph and Chlorothalonil residues in potato samples from Brazil treated with a Dimethomorph + Chlorothalonil formulation. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. DK-724-050. Unpublished. BASF
DK-724-051	Steling, C.	1999	CL 336,379 Dimethomorph + Mancozeb - Determination of CL 336,379 (Dimethomorph) and Mancozeb residues in potatoes samples from Argentina. Laboratorio de Desenvolvimento de Produtos Agricolas da America Latina - LAADL, Brasil. BASF Document No. DK-724-051. Unpublished. BASF
DK-724-057	Guendel, L.	1998	Gewinnung von Proben zur Erstellung einer Abbaureihe von der Pruefsubstanz Acrobat Plus WG (Dimethomorph + Mancozeb) in/auf Kopfsalat (Feldteil). Landesanstalt für Pflanzenbau und Pflanzenschutz, Mainz, Germany. BASF Document No. DK-724-057. Unpublished. BASF
DK-724-097	Young, H.	2002	Study on the Residue Behaviour of BAS 550 F in Potatoes after application of BAS 550 01 F under field conditions in Italy, 2001. BASF Agro Research, Gosport, Great Britain. BASF Document No. DK-724-097. Unpublished. BASF
DK-724-098	Leonard, R.	2001	BAS 550 F (CL 336379) (Dimethomorph): Residues of BAS 550 F in potatoes following multiple applications with Acrobat MZ (90/600) fungicide from a trial conducted in Idaho. BASF Agro Research, Princeton, NJ, USA. BASF Document No. DK-724-098. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-724-099	Leonard, R.	2001	BAS 550 F (CL 336379) (Dimethomorph): Residues of BAS 550 F in potatoes following multiple applications with Acrobat MZ (90/600) fungicide from a trial conducted in Washington. BASF Agro Research, Princeton, NJ, USA. BASF Document No. DK-724-099. Unpublished. BASF
DK-724-101	Devine, H.	2002	BAS 550 F (Dimethomorph) 500 g as/kg WP BAS 550 01 F (SY50574) At Harvest Residue Study on dimethomorph in Potatoes, (South France, 2000). CEMAS, Berkshire, Great Britain. BASF Document No. DK-724-101. Unpublished. BASF
DK-724-104	Devine, H.	2002	BAS 550 F (Dimethomorph) 500g as/kg WP BAS 550 01 F (SY50574) At Harvest Residue Study on dimethomorph in Potatoes, (Italy, 2000). CEMAS, Berkshire, Great Britain. BASF Document No. DK-724-104. Unpublished. BASF
DK-726-003	Weitzel, R.	1993	Dimethomorph: Determination of the residues in lettuce following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in France, 1992 Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-726-003. Unpublished. BASF
DK-726-006	Weitzel, R.	1993	Dimethomorph: Determination of the residues in lettuce following treatment with 150 g/L dispersible concentrate, SF 07460, under field conditions in France, 1992 - Field part. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-726-006 and DK-726-003. Unpublished. BASF
DK-726-007	Perret, G.	1995	Report on residues of Dimethomorph in lettuce for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-726-007. Unpublished. BASF
DK-726-008	Perret, G.	1994	Report on residues of Dimethomorph in lettuce for Cyanamid Australia proprietry limited. Microchem Associates PTY Ltd., Australia. BASF Document No. DK-726-008. Unpublished. BASF
DK-726-009	Dorr, S.	1999	Dimethomorph/mancozeb CL 336379/cl903067 75/667 g ai/kg wg sf09600 decline curve residue study on dimethomorph CL 336379 mancozeb cl903067 and metabolite etu in lettuce spain 1998. Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-726-009. Unpublished. BASF
DK-726-012	Braunmiller, H.	1997	Pruefung des Rueckstandsverhalten von Acrobat Plus WG (Fungizid), zur Bekaempfung des falschen Mehltaus an Salat mit 3 Behandlungen nach dem Pflanzen. Pflanzenschutzamt Berlin, Germany. BASF Document No. DK-726-012. Unpublished. BASF
DK-726-014	Martin, B.	2000	Dimethomorph/mancozeb CL 336379/CL 903067 75/667 g ai/kg wg SF 09600 at harvest residue study on dimethomorph CL 336379 mancozeb CL 903067 and metabolite ETU in lettuce Spain 1999. DK-SP-99-214. Dr. Specht & Partner, Hamburg, Fed. Rep. of Germany. BASF Document No. DK-726-014. Unpublished. BASF
DK-726-015	Martin, B.	2000	Dimethomorph/mancozeb CL 336379/CL 903067 75/667 g ai/kg wg SF 09600 at harvest residue study on dimethomorph CL 336379 mancozeb CL 903067 and metabolite ETU in lettuce Spain 1999. DK-SP-99-213. Dr. Specht & Partner, Hamburg, Fed. Rep. of Germany. BASF Document No. DK-726-015. Unpublished. BASF
DK-732-034	Higham, J.W.	1998	CL 336379: Crop residue study: RES 97-043. CL 336379 residues in fresh market tomato fruit after multiple applications of Acrobat MZ (90/600) WP fungicide. American Cyanamid Co, Princeton, NJ, USA. BASF Document No. DK-732-034. Unpublished. BASF
DK-750-002	Deutsch E.	1998	Dimethomorph (CL 336379) 500 g ai/kg WP (CY50574): At harvest residue study on Dimethomorph in summer rape (Germany, 1997). Cyanamid Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-750-002. Unpublished. BASF

Code	Author(s)	Year	Title, Institute, Report Reference
DK-750-003	Hausmann S	1998	Dimethomorph (CL 336379) 500 g a.i./kg WP (CY 50574): At harvest residue study on dimethomorph in summer rape (Germany, 1997). Analytical part with analytical method. PTRL Europe, Ulm, Germany Fed.Rep.,. BASF Document No. DK-750-003. Unpublished. BASF
DK-790-010	Bitz K and Weitzel R.	1994b	Dimethomorph: Determination of the residues in field rotational crops (Germany, 1992). Cyanamid Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-790-010. Unpublished. BASF
DK-790-011	Bitz K and Weitzel R.	1994c	Dimethomorph: Determination of Dimethomorph residues in field rotational crops (Germany, 1991). Cyanamid Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-790-011. Unpublished. BASF
DK-790-014	Pelz, S.	1994	Determination of Residues of Dimethomorph in Hops after Application of SAG 151 07 F (Shell Trial No SKG 9325-01 and SKG 9325-02) . Dr. Specht & Partner, Hamburg, Fed. Rep. of Germany. BASF Document No.DK-790-014 (analytical). Unpublished.
DK-790-015	Bleif J.	1996	Dimethomorph (CL 336379) – 150 G ai/L DC (CF 07460): Decline Curve Residue Study in Hops and Processed Products (Beer, Brewers Yeast, Spent Hops, (Germany 1995). Cyanamid Forschung GmbH, Schwabenheim, Germany . BASF Document No. DK-790-015. Unpublished. BASF
DK-790-019	Deutsch, E.	1996	Dimethomorph (CL 336379) 150 G/L DC (CYD 151 07-SF 07460): Decline Curve Residue Study in Hops (Germany 1994). Cyanamid Agrar Gmbh & Co. KG, Ingelheim, Germany Fed. Rep.. BASF Document No. DK-790-019. Unpublished. BASF
DK-790-020	Deutsch, E.	1994	Ruckstandsstudie – SAG 151 07 F- Hopfen/Peronspora (Sekundarinfektion). Cyanamid Agrar Gmbh, Ingelheim, Fed.Rep. of Germany. BASF Document No. DK-790-020 . Unpublished. BASF
DK-790-022	Eichler D.	1991	Dimethomorph (CL 336379): Storage Stability of Residues of Dimethomorph in Hops and Processed Matrices. Shell Forschung GmbH, Schwabenheim, Germany. BASF Document No. DK-790-022,. Unpublished. BASF
DK-790-026	Bleif, J.	1998	Dimethomorph CL 336379/dithianon CL 37114 150/350 g ai/kg wg sf09720: decline curve residue study of dimethomorph CL 336379 and dithianon CL 37114 in hops Germany 1997. Cyanamid Forschung Gmbh, Schwabenheim, Germany Fed. Rep. and Dr. Specht & Partner, Chemische Laboratorien Gmbh, D-20354 Hamburg, Germany Fed. Rep. BASF Document No. DK-790-026. Unpublished. BASF
DK-790-028	Afzal J.	1999	Dimethomorph (AC 336379): Metabolism of carbon-14 labeled AC 336379 using lettuce, radishes, soybeans, and wheat as rotational crops. American Cyanamid Company, Princeton, NJ 08543, United States of America. BASF Document No. DK-790-028. Unpublished. BASF
DK-790-050	Trevisan, L.	1999	Laudo tecnico de analises de residuos de Forum Plus em melancia. Laboratorio de Residuas de Pesticidas, Dep. De Entomologia, Fitopatologia e Zoologia Agricola, ESALQ/USP 13418-900 Piracicaba-SP, Cadashi - MMA SP, Brasil. BASF Document No. DK-790-050. Unpublished. BASF
DK-790-062	Afzal J.	2002	BAS 550 F (dimethomorph): Effects of Processing on the Nature of the Residues due to Hydrolysis. BASF Corporation, BASF Agro Research, Princeton, NJ. BASF Document No. DK-790-062. Unpublished. BASF
DK-790-064	Jones S.	2001	BAS 550 F/BAS 216 F (Dimethomorph/Dithianon) 150/350 g a.s./L WG (SF 09720): Transfer Residue Study on BAS 550 F/ BAS 216 F in Hops and Beer-Germany 2000. BASF Agro Research, Gosport, Great Britain. BASF Document No. DK-790-064,. Unpublished. BASF