EXPLANATION

Clofentezine was reviewed by the JMPR for the first time in 1986 and again in 1987, 1989 and 1990. At the 1990 JMPR the definition of the clofentezine residue was changed to include the sum of all residues containing the 2-chlorobenzoyl moiety. At the 23rd (1991) Session of the CCPR the Committee decided to lower the MRL for citrus fruit from 0.5 to 0.2 mg/kg. The proposal was held at step 7B pending further consideration by JMPR. As requested at the 1991 CCPR, new residue data from supervised trials with citrus fruits and grapes were submitted to the present Meeting.

USE PATTERN

Information on registered uses was summarized in both the 1989 and 1990 JMPR monographs. Additional data concerning the registered use of clofentezine is shown in Table 1A and 1B.

Table 1A. Registered uses of clofentezine

Crop	Country	Application, ai			PHI, days
		No.	Rate kg/ha	Conc. kg/hl	
Mandarins	Spain	1	0.2	0.005	40
Grapes	Germany	1	0.225-0.27	0.015	35
	France	1	0.225	0.225	23-26
	USA	1	0.23	0.02	35
Pears	Canada	1	0.15-0.30		21
Apples	Canada	1	0.15-0.30		

Table 1B. Registered uses of clofentezine for citrus fruits

Crop	Country	Application		PHI, days
		No.	Conc (% ai)	
Citrus Fruits	China	2	0.01-0.125	21
	Cyprus	2	0.03-0.04	21
	Italy	1	0.015	30
	S.Korea	2	0.02	21
	Spain (excl. mandarins)	1	0.02	40
	Taiwan	1	0.015	30

RESIDUES RESULTING FROM SUPERVISED TRIALS

Residue data from supervised trials on mandarins, oranges and lemons are shown in Table 2A and on grapes in Table 2B.

Table 2A. Clofentezine residues in mandarins, oranges and lemons

Crop Country/year	Form	Application No	kg ai/ha	% ai	Residues mg/ g	PHI days	Ref
MANDARINS							
Spain/92 Hernandina	SC	1	0.3	0.005	0.15 whole fruit	30	R252
Spain/92 Clemendes	SC	1	0.3	0.005	0.43 whole fruit	30	R252
ORANGES							
Greece/90	SC	1	0.75	0.015	0.10 whole fruit 0.67 peel 0.02 flesh	32	R250
Greece/90	SC	1	0.75	0.015	0.18 whole fruit 0.58 peel 0.03 flesh	30	R250
LEMONS							
Greece/90	SC	1	0.75	0.15	0.15 whole fruit 0.31 peel 0.03 flesh	30	R250

Mandarins. Data were submitted from two new trials carried out in Spain in 1991. In these trials, mandarin oranges were treated with a single application at a concentration of 0.005% ai (0.3 kg ai/ha) and the fruit harvested 30 days after treatment. Residues of clofentezine in whole fruit ranged from 0.15 to 0.43 mg/kg, and were found predominantly in the peel.

Oranges and Lemons. Two trials were conducted in Greece with oranges and one with lemons treated with 0.015% ai in 5000 l/ha water (0.75 kg ai/ha). The fruits were sampled at 30-32 days and residues in oranges ranged from 0.10 to 0.18 mg/kg for whole fruit. Lemons sampled after 30 days gave residues of 0.15 mg/kg for whole fruit. In both cases most of the residue remained in the peel.

Grapes. Recent developments have included a late-season use of clofentezine to control phytophagous mites. Trials reflecting this new use were carried out in Germany in 1990 and France in 1991. In the former trials the application rate was 0.015% ai (0.225 and 0.27 kg ai/ha) and resulted in residues of 0.34 and 1.2 mg/kg respectively after 35 days. Clofentezine was applied at a rate of 0.225% ai (0.225 kg ai/ha) in the French trials. Residues were 0.30 and 0.12 mg/kg after 23 and 26 days respectively.

Table 2B. Clofentezine residues in grapes

Crop Country/year	Form	Application No	kg ai/ha	% ai	Residues mg/kg	PHI days	Ref
GRAPES France/91 Merlot	WP	1	0225	0.255	0.30	23	R255
France Chardonnay	WP	1	0.225	0.225	0.12	26	R255
USA/90 Thompson Seedless	SC		0.23	0.02	0.03 0.06 juice 0.06 wet pom. 0.10 dry pom. <0.02 raisins 0.29 raisins waste	35	R260
Germany/90 Kerner	SC	1	0.225	0.015	0.34	33	R253
Germany/90 Müller- Thurgau	SC	1	0.27	0.015	1.2	35	R253
Germany/86 Müller- Thurgau	SC	2	0.113 +0.28	0.014	0.22 <0.1 wine	37	R164
Germany/86 B.Portugeise	SC	2	0.113 +0.28	0.014	0.14	35	R164
Germany/86 B.Spätbur- Gunder	SC	2	0.113 +0.28	0.014	0.12 <0.01 wine	35	R164
Germany/86 Müller Thurgau	SC	2	0.113 +0.28	0.014	0.20	35	R164
Germany/85 Müller- Thurgau	SC	2	0.112 +0.28	0.014	0.09	35	R131
Germany/85 B.Portugieser	SC	2	0.112 +0.28	0.014	0.61 0.03 wine	34	R131
Germany/82 Müller- Thurgau	SC	2	0.18 +0.18	0.03	0.25	28	R 44
Italy/84 Merlot	SC	1	0.36	0.02	0.35	33	R 75

Additional data involving the application of clofentezine and cyhexatin during the period 1982 to 1986 were also submitted. Eight trials were carried out in Germany and Italy. Six involved two applications of 0.014% (0.113 + 0.281 kg ai/ha). The residue levels in grapes ranged from 0.02 to 0.61 mg/kg and the PHIs from 28 to 37 days.

FATE OF RESIDUES

In processing

In a US study, grapes were processed into raisins and grape juice. Residues of 0.06 mg/kg were found in grape juice: twice the level in the grapes (0.03 mg/kg) . The residues in raisins were <0. 02 mg/kg. Residue levels of 0. 06 mg/kg were also observed in the wet pomace. The highest level, 0.29 mg/kg, was found in the raisin waste.

Residues in wine made from German grapes containing 0.22 and 0.12 mg/kg clofentezine were less than 0.01 mg/kg.

METHODS OF RESIDUE ANALYSIS

The analytical procedure used for animal tissues determines the total clofentezine-derived residues as 2-chlorobenzoic acid and the results are expressed as clofentezine. Apple metabolism studies revealed that clofentezine is degraded very slowly after application, the majority of the residues being retained in the peel. The principal free metabolite amounted to only about 4% of the total in the peel and was identified as 2-chlorobenzonitrile. In addition, there were some bound residues which yielded 2-chlorobenzoic acid after acid hydrolysis. Since the extent of metabolism of clofentezine in plants is very small, the analytical method of choice for crops would be the HPLC procedure which determines clofentezine only.

In one animal feeding study at a dietary level of 10 ppm, residues of free clofentezine in milk were below the limit of determination (<0.01 mg/kg). The corresponding levels determined as the total clofentezine-derived residues measured as 2-chlorobenzoic acid were also below the limit of determination (<0.05 mg/kg). The analytical procedure determining clofentezine only should therefore be adequate for monitoring purposes.

NATIONAL MAXIMUM RESIDUE LIMITS

The national MRLs listed below augment those previously reported. Residues are defined as clofentezine only.

Country	Commodity	MRL (mg/kg)
Canada	apple	0.5
	pears	0.5
	meat	0.05
	milk	0.01
	peaches	1
	nectarines	1

APPRAISAL

At the 23rd (1991) Session of the CCPR, the Committee decided to lower the MRL for citrus fruits from 0.5 to 0.2 mg/kg. The proposal was held at step 7B pending consideration by the JMPR. The 1992 CCPR also requested that the definition of residues as the total clofentezine-derived products be re-examined with respect to commodities of plant origin.

The residue levels in oranges and lemons treated at 0.75 kg ai/ha (0.015% ai) ranged from 0.10 to 0.18 mg/kg (whole fruit) for samples taken at days 30 to 32. Clofentezine residues in mandarin oranges treated at 0.3 kg ai/ha (0.005% ai) and sampled after a minimum PHI of 30 days ranged from 0.15 to 0.43 mg/kg (whole fruit). The residue data for citrus fruits submitted to the JMPR in 1986 and 1990 were also re-examined. Several trials carried out according to GAP resulted in residue levels higher than 0.2 mg/kg but less than 0.5 mg/kg. Taking into account the residue levels in mandarins, together

with a re-examination of previous data on citrus fruits, the Meeting concluded that the original MRL of 0.5 mg/kg was appropriate. In general, the higher residue levels appear to be associated with citrus fruit having thinner peel, e.g. tangerines, mandarins etc.

Residue trials carried out in France, Germany and the USA on grapes showed a wide variation in the clofentezine residues. After 23-35 days they ranged from 0.03 to 1.2 mg/kg with an average value of 0.31 mg/kg. The level of 1.2 mg/kg was found in a trial carried out according to GAP in Germany. Although in one trial the residues slightly exceeded 1.0 mg/kg, in estimating an MRL the Meeting took into account the fact that residues were below 1 mg/kg when two applications were made, whereas GAP requires one application. In view of the development of a late-season use for clofentezine and the typical variability in residue levels from GAP trials. the Meeting proposed that the existing MRL for grapes should be increased from 0.2 to 1 mg/kg.

In response to the CCPR request to re-examine the definition of the residues in plant products, the Meeting noted that metabolic studies on apples revealed that clofentezine is degraded very slowly in plants, in contrast to animals where it is degraded extensively. The analytical method of choice for animal products determines the total clofentezine-derived residues as 2-chlorobenzoic acid and the results are expressed as clofentezine. Because degradation in plants is slight, crops are analyzed by an HPLC procedure which determines the parent compound only. After considering the merits of the two analytical procedures, and observing that all the residue data on plants were for the parent compound only, the Meeting decided to revise the proposal made in 1990 that the total residues method should be used for determining clofentezine residues in crops. The HPLC procedure which determines the parent compound can be used for plant material. For animal material, total clofentezine-derived residues should be determined as 2-chlorobenzoic acid and expressed as clofentezine.

RECOMMENDATIONS

The current definition of the residue as the sum of all residues containing the 2-chlorobenzoyl moiety expressed as clofentezine should be retained for animal products, but revised to clofentezine (parent compound only) for plant materials.

On the basis of the data on residues resuIting from supervised trials the Meeting concluded that the residue level shown below is suitable for use as an MRL.

Definition of the residue: plant products: clofentezine
animal products: sum of all compounds containing the 2-chlorobenzoyl moiety, expressed as clofentezine.

Commodity		Recommended MRL (mg/kg)		PHI on which based, days
CCN	Name	New	Previous	
FB 0269	Grapes	1	0.2	35

FURTHER WORK OR INFORMATION

Desirable

Information on current CAP for citrus fruits to facilitate re-evaluation of the residue data.

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9. Peatman, M.H. and Snowdon, P.J. 1989. The decline of clofentezine residues in grapes treated with a co-formulation of clofentezine and cyclohexatin in the Federal Republic of Germany 1986. Schering NC 21314/R164.

10. Residue data on mandarins, oranges and lemon are reported in Schering documents, NC 21314/R250 and R252.

11. Residue data on grapes are reported in Schering documents, NC 21314/ R44, R164, R253, R255 and R260.