

CARBARYL (8)

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EXPLANATION

Carbaryl residues were last evaluated by the JMPR in 2002 when a number of maximum residue levels were estimated. The last toxicological evaluation was carried out in 2001 when an ADI of 0-0.008 mg/kg bw and ARfD of 0.2 mg/kg bw were established.

For carbaryl, pesticide specifications were established for DP, WP and SC formulations through the Joint FAO/WHO Meeting on Pesticide Specifications (JMPS), and published as FAO Specifications and Evaluations for Agricultural Pesticides – Carbaryl (<http://www.fao.org/ag/agp/agpp/Pesticid/Default.htm>).

The Cranberry Industry performed supervised trials within the Interregional Research Project No. 4 to provide data for the establishment of US tolerances for carbaryl residues in cranberry.

The Thai Department of Agriculture submitted information on the registered use of carbaryl on chilli pepper and results of supervised trials.

The relevant labels and reports of supervised trials were submitted for evaluation to the 2007 JMPR.

RESIDUE ANALYSIS***Analytical methods***

The ground cranberry test portions were mixed with anhydrous sodium sulphate and were extracted twice with dichloromethane. The concentrated extract was purified on Florisil, and analysed by HPLC. Following post-column derivatisation the residue was determined with fluorescence detection. The average recovery in the residue ranges of 0.02 – 10 mg/kg was 91.0% with a CV of 7.8%. The concurrent recoveries ranged between 86 and 90% at 10 mg/kg and 2 mg/kg spike levels, respectively. The limit of quantification was 0.02 mg/kg. No quantifiable residues were observed in the control samples.

The chilli pepper samples were prepared by removing the stems and homogenised in a blender. A 50g portion was extracted with acetone, dichloromethane and sodium chloride mixture, and cleaned up on silica gel (Steinwandter, 1985.) The carbaryl residues were determined with HPLC after post-column derivatisation. The recovery was between 81.2 – 110% at spike levels of 0.1 – 2.0 mg/kg

Stability of pesticide residues in stored analytical samples

Studies on storage stability of incurred residues, reported by the 2002 JMPR, indicated that the residues were stable up to 15 months in apples, grapes, almonds and soybean. No storage stability tests were reported to this meeting, but based on those studies, it is likely that the carbaryl residues would also be stable in cranberry. As chilli peppers were processed on the day of sampling, there is no concern related to storage stability.

USE PATTERN

The carbaryl formulations 80S or 80 WSP containing 80% carbaryl are both registered for the control of fireworm, fruitworm and twig girdler in cranberry.

Raveon 85WP (containing 85% carbaryl/kg) is registered in Thailand for use in chilli pepper to control various worms and bugs. The use patterns are summarised in Table 1.

Table 1. Use pattern of Carbaryl

Crop	Formulation	Method	Max. No	Interval, days	Water l/ha	Application Rate kg ai/ha	PHI day
Chilli pepper	WP	Foliar	NS	7-10	500 ^a	0.425-0.6375	14
Cranberry	80S	Ground, aerial ^b	5	7		1.68-2.24	7
	80WSP	Ground, aerial ^b	5	7		1.68-2.24	7

a - Spray volume is recommended for spraying by knapsack sprayer

b - Thorough and uniform spray coverage is essential for effective control. Apply sufficient volume for adequate coverage. For aerial application use a minimum of 94 L water/ha

NS: not specified

RESIDUES RESULTING FROM SUPERVISED TRIALS

Cranberries

During the 1994 growing seasons six trials were conducted on cranberries in the states of Massachusetts and Wisconsin representing 78% of the cumulative cranberry production in USA.

The cranberry crops were grown and maintained according to typical agricultural practices. Carbaryl was applied 5 times at a nominal rate of 2.24 kg/ha. All applications were made 6 to 9 days apart.

Triplicate random sub-samples of at least 1 kg of fruit were collected from a minimum of 12 separate locations within a treated plot. All samples were harvested dry and shipped to the testing laboratory deep-frozen. The maximum elapsed time between sampling and extraction was 51 days.

The carbaryl residues in cranberry samples derived from the supervised field trials are presented in Table 2.

Table 2. Carbaryl residues in cranberry following 5 applications of carbaryl at a nominal rate of 2.24 kg ai/ha

Trial Number	Location	Carbaryl residues (mg/kg) ^a		
		Replicate Samples	Mean Residues	Maximum Residue
		1.63		
94-0181	Plymouth Co.	1.85	1.75	1.85
	MA	1.77		
		2.95		
94-0182	Plymouth Co.	2.68	2.793	2.95
	MA	2.75		
		0.517		
94-0183	Monroe Co.	0.516	0.498	0.517
	WI	0.462		
		0.914		
94-0184	Monroe Co.	0.880	0.911	0.938
	WI	0.938		

a - All applications were made 6 to 9 days apart. Samples were collected 7 days after last application.

Chilli peppers

Six supervised field trials, carried during the growing seasons of 2004 - 2006, were reported by the Agricultural Toxic Substances Division of the Department of Agriculture in Thailand. Raveon 85WP

was applied at the maximum rate 4 times at 7 days interval by knapsack sprayer on the experimental plots of 5 × 18 m within commercial fields located in two provinces. Sampling was started on the day of the last application (0 day), and the samples were transferred to the laboratory on the day of sampling. The analysis was started on the day of receipt of samples. The remaining homogenised samples and the materials being in the intermediate phase of analysis were kept in deep-freezer at -20 °C. The results are given in Table 3.

Table 3. Carbaryl residues detected in mature chilli peppers in supervised trials in Thailand

Location Report-No.	Application rate per treatment			DALA	Residues mg/kg
	kg ai/ha	water L/ha	kg ai/hL		
Bang Lane District CA-CH-01	0.6375	500	0.1275	0	5.91
				1	4.37
				3	2.34
				5	0.56
				7	0.39
				14	<u>0.09</u>
				21	0.05
Song Pee Nong District, Supanburi Province CA-CH-02	0.6375	500	0.1275	0	4.56
				1	3.93
				3	2.72
				5	1.04
				7	0.78
				10	0.54
				14	<u>0.25</u>
21	0.09				
Song Pee Nong District, Supanburi Province CA-CH-03	0.6375	500	0.1275	0	2.84
				1	1.69
				3	1.26
				5	0.49
				7	0.36
				10	0.23
				14	<u>0.05</u>
21	ND				
Song Pee Nong District, Supanburi Province CA-CH-04	0.6375	500	0.1275	0	2.34
				1	1.70
				3	1.02
				5	0.59
				7	0.67
				10	0.36
				14	<u>0.05</u>
21	ND				
Song Pee Nong District, Supanburi Province CA-CH-05	0.6375	500	0.1275	0	2.34
				1	2.35
				3	0.72
				5	0.40
				7	0.38
				10	0.22
				14	<u>0.09</u>
21	ND				
Song Pee Nong District, Supanburi Province CA-CH-06	0.6375	500	0.1275	0	1.27
				1	1.33
				3	0.59
				5	0.47
				7	0.34
				10	0.23
				14	<u>0.10</u>
21	ND				

APPRAISAL – RESIDUE AND ANALYTICAL ASPECTS

The compound carbaryl was last evaluated for residues by the 2002 JMPR. Residue data on cranberries and chilli peppers were evaluated by the current Meeting for estimation of maximum residue levels.

Carbaryl is approved for the control of a range of insect pests in cranberries such as Cranberry fireworm, Cranberry fruitworm and Cranberry twig girdler as well various larvae and bugs in chilli peppers.

Results of supervised trials on crops

Supervised trials were carried out following the maximum registered dosage rate in cranberries in the USA and in chilli peppers in Thailand. The residues were determined with HPLC after post-column derivatisation in all trials. The limit of quantification was 0.02 mg/kg. The recoveries ranged between 81% and 110%.

Cranberries

The US GAP permits a maximum of 5 applications at 7 day intervals with a dosage rate of 1.68 – 2.24 kg ai/ha. Three replicate samples were taken from each plot. The highest residues derived from maximum application rates 7 days (PHI) after the last application was: 0.52, 0.94, 1.85, 2.95 mg/kg.

Taking into account that cranberry is a minor crop, the Meeting considered that four trials performed at maximum GAP were sufficient, and estimated a maximum residue level of 5 mg/kg, an STMR of 1.40 mg/kg and an HR of 2.95 mg/kg.

Chilli peppers

Residues in mature chilli peppers treated according to maximum GAP (0.425–0.6375 kg ai/ha at 7 – 10 day intervals with a PHI of 14 days) were: 0.05, 0.5, 0.09, 0.09, 0.10, 0.25 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg, an STMR of 0.09 mg/kg and an HR of 0.25 mg/kg for fresh chilli peppers.

Based on the concentration factor of 7 (for explanation and rationale see report section on Chilli peppers), the Meeting estimated an STMR of 0.63 (7 × 0.09) mg/kg and a maximum residue level of 2 (7 × 0.25=1.75) mg/kg to replace its previous recommendation of 50 mg/kg for dried chilli pepper, which was based on an MRL of 5 for sweet peppers, and the default concentration factor of 10.

RECOMMENDATIONS

On the basis of the data from supervised trials, the Meeting concluded that the residue concentrations listed below are suitable for establishing MRLs and for assessing IEDIs and IESTIs.

Definition of the residue (for compliance with the MRL and for estimation of dietary intake):
carbaryl

CCN	Commodity	MRL, mg/kg		STMR or STMR-P, mg/kg	HR or HR-P, mg/kg
		New	Previous		
VO 444	Chili peppers	0.5		0.09	0.25
HS 0444	Chili peppers, dried	2	50	0.63	
FB 0265	Cranberry	5		1.33	2.95

DIETARY RISK ASSESSMENT**Long-term intake**

Using the consumption figures for chilli peppers and the STMR value of 0.63 for dried chilli peppers, the long term intake from use of carbaryl on chilli peppers and cranberries amounts to 0 – 2% of the ADI (0-0.008 mg/kg bw) in the 13 regional diets.

The Meeting concluded that the long-term intake of residues derived from carbaryl use on cranberries and chilli peppers that have been considered by the present JMPR will not, in practical terms, change the total intake of residues from other uses considered by the 2002 JMPR.

Short-term intake

The rounded cranberry short term intake is 0% of the ARfD (0.2 mg/kg bw) for both children and for adults. The short term intake derived from the consumption of dried chilli pepper is 0% for adults and 1% for children.

The Meeting concluded that the short-term intake estimate derived from residues of carbaryl use on cranberries and chilli peppers that has been considered by the JMPR is unlikely to present a public health problem.

REFERENCES

Code	Author	Year	Title, Institute, Report reference
Freserius Z. Anal. Chem	H. Steinwandter,	1985	Universal 5 min on line Method for Extracting and Isolating Pesticide Residues and Industrial Chemicals, Freserius Z. Anal. Chem. No. 1155
Plant Production and Protection Paper No. 177	FAO	2003	Pesticide Residues in Food - 2003 Evaluations, pp. 731-737
US94S28R	K. A. Mede	1995	Carbaryl: Magnitude of residues in/on Cranberries Resulting from Ground Applications of Sevin XLR Plus (1994), Rhône-Poulenc Ag. Co.