

## METHOPRENE (147)

First draft prepared by Mr Makoto Irie, Ministry of Agriculture, Forestry and Fisheries, Tokyo, Japan

### EXPLANATION

Methoprene is an insect growth regulator with activity against a variety of insect species. It was first evaluated by JMPR in 1984 and re-evaluated for residues several times. The ADI was established as 0–0.09 mg/kg bw for racemic methoprene, 0–0.05 mg/kg bw for S-methoprene; and an ARfD was considered unnecessary in 2001. Methoprene was scheduled at the 47th Session of the CCPR (2015) for the evaluation of additional MRLs in 2016 JMPR.

The residue studies on sunflower seeds and analytical method were submitted by the manufacturer for additional MRLs for oilseeds.

### RESIDUE ANALYSIS

#### *Analytical method*

The Meeting received information on the analytical method (CAP 427.05) for the determination of S-methoprene residues in grain-based feed and molasses based liquid products which can be used on sunflower seeds (Witte and Hunter, 2012).

Samples with HPLC-grade methanol were shaken for a minimum of 5 hours on a shaker at a minimum of 250 rpm. Then the samples were allowed to sit or shake for 19 additional hours. After addition of dibutyl phthalate (DBP) as an internal standard, the samples were shaken by hand and filtered into an autosampler vial. S-methoprene residues were analysed by reverse-phase HPLC-UV (264 nm). The recoveries of S-methoprene from sunflower seeds fortified at 2.0 mg/kg were 102–109%.

### USE PATTERN

The Meeting received the label from the USA. The authorized uses (post harvest application to stored commodities) relevant to the supervised residue trials data submitted to the current Meeting are summarized in Table 1. The formulation may be diluted in water or oil.

Table 1 Registered uses of S-methoprene relevant to the residue evaluation by the current Meeting

Crop	Country	Formulation		Application		PHI, days
		Type	Conc. of S-methoprene	Rate	No.	
Sunflower	USA	EC	288 g/L	max 34.6 g ai/1000 bushels <sup>b</sup> (2.4-3.2 g ai/t)	ns	ns
Peanuts	USA	EC	288 g/L	max 34.6 g ai/1000 bushels <sup>b</sup> (3.6-4.5 g ai/t)	ns	ns
Any <sup>a</sup>	USA	EC	288 g/L	max 2.2 g ai/t	ns	ns

<sup>a</sup> All grains, spices, feeds and seeds

<sup>b</sup> 1000 bushels (USA): 10.9-14.5 t for sunflower seeds and 7.7-9.5 t for peanuts

ns: not stated

### RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on S-methoprene supervised field trials for sunflower seeds.

Each of the field trial sites generally consisted of an untreated control plot and a treated plot. Residues, application rates and spray concentrations have generally been rounded to two significant figures.

Residue values from the trials, which have been used for the estimation of maximum residue levels, STMRs and HRs, are underlined.

Laboratory reports included method validation with procedural recoveries from spiking at residue levels similar to those occurring in samples from the supervised trials. Although trials included control plots, no control data are recorded in the tables except when residues were found in samples from control plots. Residue data are not corrected for percent recovery.

### *Sunflower seed*

Commercially grown confectionary un-shelled sunflowers seeds from 4 different farm locations were harvested, bagged, and sent to the testing facility for treatment and residue analysis. Each farm location submitted 23 kg of un-shelled sunflower seeds. The 288 g/L formulation was applied at 2.7 g ai/t seeds (120 mL of formulation per 1,000 bushels) while confectionary un-shelled seeds (4.5 kg seeds) were mixed in a cement mixer. The cement mixer simulated seeds flowing through a grain auger. The samples were analysed approximately 4–24 hours after mixing. S-methoprene residues were determined by following the method CAP 427.05 using reverse-phase HPLC with diode array detection. The procedural recoveries of S-methoprene fortified at 2.7 mg/kg were 82–110%.

Table 2 S-methoprene residues on sunflower seeds from supervised trials in USA

Sunflower seeds country, year (variety)	Application			DALA Days	Residues, mg/kg	Ref
	Form	g ai/t seeds	no.			
<i>GAP, USA</i>	<i>EC</i>	<i>max 2.4-3.2</i>	<i>ns</i>	<i>ns</i>		
USA, 2014 Dallas/TX (2215) Farm ID: Krause	EC	2.7	1	0	1.7, 1.8, 1.9 mean <u>1.8</u> (LOD = 0.007)	4657 Haas and Witte, 2014
USA, 2014 Dallas/TX (2215) Farm ID: Miller S.D	EC	2.7	1	0	2.5, 2.5, 2.8 mean <u>2.6</u> (LOD = 0.006)	
USA, 2014 Dallas/TX (Jags) Farm ID: Jamestown	EC	2.7	1	0	2.0, 2.0, 2.1 mean <u>2.0</u> (LOD = 0.003)	
USA, 1999 Dallas/TX (Jags) Kadramas	EC	2.7	1	0	1.8, 1.9, 1.9 mean <u>1.9</u> (LOD = 0.003)	

## APPRAISAL

Methoprene is an insect growth regulator with activity against a variety of insect species. It was first evaluated by JMPR in 1984 and has been re-evaluated for residues several times. The ADI was established as 0–0.09 mg/kg bw for racemic methoprene, 0–0.05 mg/kg bw for S-methoprene; and an ARfD was considered unnecessary in 2001. Methoprene was scheduled at the 47<sup>th</sup> Session of the CCPR (2015) for the evaluation of additional MRLs in 2016 JMPR.

The residue studies on sunflower seeds and analytical method were submitted by the manufacturer for additional MRLs for oilseeds.

### *Methods of analysis*

The Meeting received information on the analytical method used for the determination of S-methoprene residues on sunflower seeds. Samples with 50 mL HPLC-grade methanol were shaken for a minimum of 5 hours on a shaker at a minimum of 250 rpm. Then the samples were allowed to sit or shake for 19 additional hours. After 5 mL of dibutyl phthalate (DBP) was added as internal standard, the samples were shaken by hand and filtered into an autosampler vial. S-methoprene residues were analysed by reverse-phase HPLC-UV (264 nm). The LOD was 0.003–0.007 mg/kg. The concurrent recoveries in supervised residue trials on sunflower seeds were 82–110%.

**Results of supervised residue trials on crops**

The Meeting received supervised trial data for post-harvest application of S-methoprene on sunflower seeds. The residue trials were conducted in the USA. Labels in the USA were available describing the registered uses of S-methoprene.

**Sunflower seed**

Data were available from supervised trials on sunflower seeds in the USA.

The GAP of the USA is post-harvest treatment for seeds of maximum 34.6 g ai/1000 bushels (2.4–3.2 g ai/t).

S-methoprene residues in sunflower seeds from independent trials in the USA matching GAP were (n = 4): 1.8, 1.9, 2.0 and 2.6 mg/kg.

The Meeting noted that use pattern for ‘Any’ (all grains, spices, feeds and seeds) also covers all commodities of oilseeds. Therefore, the application rates of oilseed were calculated as shown in the Table below. The Meeting recognized that there was more than 25% deviation between the application rate of trials on sunflower seed and GAP rate for peanuts.

Commodities of oilseed	Weight/volume, kg/bushel (t/1000 bushels)	Maximum application rate	
		g ai/1000 bushels	g ai/t
Peanuts, unshelled			
Virginia type	7.7	34.6	4.5
Runners, south-eastern	9.5	34.6	3.6
Sunflower seed			
Oil type	10.9-14.5	34.6	2.4-3.2
Confectionary type	11.3	34.6	3.1
Other	-	-	2.2

Ref.: Weight, Measures, and Conversion Factors for Agricultural Commodities and their Products; USDA Agricultural Handbook, No. 697, 1992

Since GAP in the USA is post-harvest application, the Meeting agreed to extrapolate the residues in sunflower seeds to those in oilseed except peanut.

The Meeting estimated a maximum residue level of 4 mg/kg, an STMR value of 2.0 mg/kg and a highest residue value of 2.6 mg/kg for S-methoprene in oilseed except peanut.

**Residues in animal commodities**

The 2016 JMPR evaluated residues of S-methoprene in oilseed, which is listed in the OECD feeding table. The Meeting noted that the estimation did not result in a significant change of the dietary burdens of farm animals. The previous recommendations of maximum residue levels for animal commodities were maintained.

**RECOMMENDATIONS**

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

**Plant and animal commodities:**

Definition of the residue for plant and animal commodities (for compliance with the MRL and for estimation of dietary intake): *methoprene*

Commodity		Recommended MRL, mg/kg		STMR, mg/kg	Highest value, mg/kg
CCN	Name	New	Previous		
SO 0089	Oilseed except peanut	4 Po	-	2.0	2.6

## DIETARY RISK ASSESSMENT

### *Long-term dietary exposure*

The International Estimated Daily Intakes (IEDIs) of methoprene were calculated for the 17 GEMS/Food cluster diets using STMRS/STMR-Ps estimated by the 2005 and current Meeting (Annex 3). The ADI for S-methoprene is 0–0.05 mg/kg bw and the calculated IEDIs were 10–60% of the maximum ADI (0.05 mg/kg bw). The Meeting concluded that long-term dietary exposure to residues of methoprene, resulting from the uses considered by the current JMPR, are unlikely to present a public health concern.

### *Short-term dietary exposure*

The 2001 JMPR decided that an ARfD is unnecessary. The Meeting therefore concluded that the short-term dietary exposure of methoprene residues is unlikely to present a public health concern.

## REFERENCES

Code	Author	Year	Title, Institution, Report reference
CAP No. 414	Thornton, K.	1999	Procedure for the Analysis of (S)-Methoprene in RF9811 EC Using Capillary Column Gas Chromatography with Flame Ionization Detection. CAP No. 414. Unpublished.
CAP No. 427.05	Witte, J. and Hunter, C. J.	2001	Procedure for the analysis of (S)-Methoprene in grain-based feed and molasses based liquid formulations using reverse-phase High Performance Liquid Chromatography with Diode Array Detection. CAP No. 427.05. Unpublished.
4657	Haas, K. L. and Witte, J.	2014	Methoprene: Residues on Confectionary Sunflower Seeds. Wellmark International. Study No. 4657. Unpublished.