

LAMBDA-CYHALOTHRIN (146)

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

EXPLANATION

Lambda-cyhalothrin consists of two of the four enantiomers of cyhalothrin. It was first evaluated by JMPR in 1984 (T, R) and periodic re-evaluation conducted in 2007 (T) and 2008 (R). A group of ADI for cyhalothrin and lambda-cyhalothrin was established as 0–0.02 mg/kg bw and an ARfD was estimated at 0.02 mg/kg bw. In 2008 the Meeting agreed that the residue definition for compliance with MRLs and for estimation of dietary intake for plant and animal commodities should be cyhalothrin, sum of isomers. It was listed by the 46th Session of the CCPR (2014) for the evaluation by the 2015 JMPR for additional MRLs.

The residue studies were submitted by the manufacturer and member countries for additional MRLs for basil (Thailand) and coffee.

RESIDUE ANALYSIS*Analytical methods*

The Meeting received information on the analytical method (POPIT MET.044 Rev.31) for the determination of residues of lambda-cyhalothrin in plant materials (Reigada, 2009).

Lambda-cyhalothrin is extracted from samples with acetone/hexane (1:1 v/v). For coffee, deionised water is added to achieve phase separation and the upper (organic) phase is removed and evaporated to dryness. The evaporated residue is diluted with hexane and purified with a silica SPE column. The solvent is evaporated and the residue is dissolved in the internal standard (dicyclohexyl phthalate) and quantification was achieved by GC-ECD.

The LOQ is 0.01 mg/kg for lambda-cyhalothrin in coffee beans.

Table 1 Recovery results obtained for the determination of lambda-cyhalothrin from coffee beans

Commodity	Fortification level (mg/kg)	N	Recovery range (%)	Mean recovery (%)	% RSD
Coffee beans	0.01	7	79–97	89	7.6
	0.1	5	83–110	100	13

Stability of pesticide residues in stored analytical samples

Information on the freezer storage stability of lambda-cyhalothrin residues in plant commodities was submitted to the 2008 JMPR. Lambda-cyhalothrin residues were stable in the commodities apple and cabbage for 16 months and were stable for 26 months in peach, cabbage, pea, potato, rape seeds, wheat grain, sugar beet roots and cotton seed.

The periods of freezer storage between sampling and analysis for the residue trials of coffee beans submitted to the current Meeting were covered by the period of the freezer storage stability studies.

USE PATTERN

The Meeting received labels from Brazil and Thailand. The authorised uses relevant to the supervised residue trials data submitted to the current Meeting are summarized in Table 2.

Table 2 Registered uses of lambda-cyhalothrin relevant to the residue evaluation by the current Meeting

Crop	Country	Formulation		Application				PHI, days	
		Type	Conc. of lambda-cyhalothrin	Method	kg ai/ha	kg ai/hL	L/ha		No. max
Seed for beverages and sweets									
Coffee	Brazil	CS	50 g/L	Foliar	0.005		100–150	2	1 (45 days interval)
Herbs									
Basil	Thailand	CS	25 g/L	Foliar		0.0025		^a	7

^a Apply when infested

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on lambda-cyhalothrin supervised field trials for the following crops.

Group	Commodity	Table
Seed for beverages and sweets	Coffee beans	3
Herbs	Basil	4

The lambda-cyhalothrin formulation was applied by foliar treatment. Each of the field trial sites generally consisted of an untreated control plot and 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. Date of analyses and duration of residue sample storage were also provided. 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.

Conditions of the supervised residue trials were generally well reported in detailed field reports. Most field reports provided data on the sprayers used, plot size, field sample size and sampling date.

Seed for beverages and sweets

Coffee beans

Four residue field trials for coffee were carried out in Brazil (Marconi, 2009: M09068). Coffee plants were treated twice with the 50 g/L CS formulation at a rate of 0.005 kg ai/ha. The first application was done 50 days before harvest time followed by one application 45 days after the first application. The water volume used was 250 L/ha.

Coffee cherries were collected 0, 1, 7, 14 and 21 days after the last application. After collection, coffee cherries were placed in the sun to dry and coffee beans were separated from the shells with electric machinery. Residues of lambda-cyhalothrin in green coffee beans were determined according to the method POPIT MET.044 Rev31. The LOQ was 0.01 mg/kg.

Table 3 Lambda-cyhalothrin residues on coffee beans from supervised trials in Brazil

Coffee country, year (variety)	Application					DALA Days	Residues, mg/kg	Ref	
	Form	kg ai/ha	water, L/ha	Growth stage ^a					no.
				Appli.	Coll.				
GAP, Brazil	CS	0.005	100–150			2	1		
Brazil, 2009 Monte Carmelo/MG (Mundo Novo) M09068-JJB1	SC	0.005	250	79 87	87 87 88 89 89	2	0 1 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	
Brazil, 2009 Indianópolis/MG (Catuaí) M09068-JJB2	CS	0.005	250	79 87	87 87 88 89 89	2	0 1 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	
Brazil, 2009 Careagú/MG (Catuaí) M09068-JJB3	CS	0.005	250	85 88	88 88 88 88	2	0 1 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	
Brazil, 2009 Bandeirantes/PR (IAPAR 59) M09068-LZF	CS	0.005	250	81 89	89 89 89 89	2	0 1 7 14 21	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	

Portion analysed: Beans

^a Code of BBCH scale

Herbs

Basil

Four field residue trials were carried out with lambda-cyhalothrin on basil in Thailand using the 25 g/L CS formulation. The basil plants were treated with two foliar applications at a target concentration of 0.025 kg ai/hL. The application interval was 6 or 7 days. The residue analysis was performed within 24 hours after sample collection.

The on-line method applied for the determination of lambda-cyhalothrin residues was based on extraction with a mixture of acetone, dichloromethane and sodium chloride water solution. The concentrated extract is cleaned up on silica gel column and detection with GC-ECD (Steinwandter, 1985). The recoveries for lambda-cyhalothrin ranged from 86–114% at fortification level of 0.02 mg/kg, 85–105% at 0.05 mg/kg, 94–110% at 0.1 mg/kg and 91–98% at 1.0 mg/kg. The LOQ for lambda-cyhalothrin was 0.01 mg/kg.

Table 4 Lambda-cyhalothrin residues on basil from supervised trials in Thailand

Basil country, year (variety)	Application				DALA Days	Residues, mg/kg*	Ref.
	Form	kg ai/ha	kg ai/hL	no.			
GAP, Thailand	CS		0.0025		7		
Thailand, 2011 Nakhon Pathom (Sweet basil)	CS	0.019	0.0025	2	0 1 3 5 8 10 14	1.8, 2.0, 2.5 mean 2.1 1.4, 1.9, 2.5 mean 1.9 0.30, 0.30, 0.39 mean 0.33 0.14, 0.19, 0.20 mean 0.18 0.07, 0.08, 0.09 mean 0.08 0.02, 0.03, 0.03 mean 0.03 0.01, 0.01, 0.02 mean 0.01	LCY-BS-01 Palakul, 2011
Thailand, 2011 Dunneonsaduak, Ratchaburi (Sweet basil)	CS	0.019	0.0025	2	0 1 3 5	1.2, 1.3, 1.3 mean 1.3 0.67, 0.71, 0.85 mean 0.74 0.34, 0.36, 0.45 mean 0.38 0.27, 0.29, 0.31 mean 0.29	LCY-BS-02 Phaikaew, 2011

Basil country, year (variety)	Application				DALA Days	Residues, mg/kg*	Ref.
	Form	kg ai/ha	kg ai/hL	no.			
					7 8 10 14	0.20, 0.20, 0.21 mean 0.20 0.13, 0.14, 0.14 mean 0.14 0.04, 0.06, 0.06 mean 0.05 0.01, 0.01, 0.02 mean 0.01	
Thailand, 2011 Ratchaburi (Holly basil)	CS	0.017	0.0023	2	0 1 3 5 7 8 10 14	3.6, 4.0, 4.0 mean 3.9 0.93, 0.99, 1.1 mean 1.0 0.32, 0.53, 0.62 mean 0.49 0.17, 0.21, 0.35 mean 0.24 0.16, 0.16, 0.18 mean 0.17 0.08, 0.09, 0.10 mean 0.09 0.06, 0.06, 0.08 mean 0.07 0.03, 0.04, 0.04 mean 0.04	LCY-BS-03 Akcaboot, 2011
Thailand, 2014 Nakornprathom (Holly basil)	CS	0.019	0.0025	2	0 1 3 5 7 8 10 14	2.4, 2.8, 3.8 mean 3.0 2.5, 2.6, 2.8 mean 2.7 0.93, 0.96, 1.2 mean 1.0 0.49, 0.72, 0.75 mean 0.65 0.34, 0.38, 0.40 mean 0.37 0.30, 0.34, 0.36 mean 0.33 0.16, 0.21, 0.23 mean 0.20 0.10, 0.11, 0.11 mean 0.11	LCY-BS-04 Buasri, 2011

Portion analysed: whole commodity

APPRAISAL

Lambda-cyhalothrin consists of two of the four enantiomers of cyhalothrin. It was first evaluated by JMPR in 1984 (T, R) and subsequently under the periodic re-evaluation programme in 2007 (T) and 2008 (R). A group ADI for cyhalothrin and lambda-cyhalothrin was established at 0–0.02 mg/kg bw and a group ARfD, 0.02 mg/kg bw. In 2008 the Meeting agreed that the residue definition for compliance with the MRL and for estimation of dietary intake for plant and animal commodities should be cyhalothrin, sum of isomers. It was listed by the Forty-sixth Session of the CCPR (2014) for the evaluation by the 2015 JMPR for additional MRLs.

The residue studies were submitted by the manufacturer and member countries for additional MRLs for basil (Thailand) and coffee.

Methods of analysis

The Meeting received new information on the analytical method (POPIT MET.044 Rev.31) for the determination of residues of lambda-cyhalothrin in plant materials including coffee beans. Lambda-cyhalothrin is extracted from samples with acetone/hexane (1:1 v/v). For coffee beans, deionised water is added to achieve phase separation and the upper (organic) phase is removed and evaporated to dryness. The evaporated residue is diluted with hexane and purified with a silica SPE column. The solvent is evaporated and the residue is dissolved in the internal standard (dicyclohexyl phthalate) and quantification is achieved by GC-ECD. The LOQ is 0.01 mg/kg for lambda-cyhalothrin in coffee beans.

For the determination of lambda-cyhalothrin in basil, a method² available from the scientific literature was used. The recoveries for lambda-cyhalothrin in basil tested concurrently with the analysis of trial samples ranged between 85 and 114%. The LOQ is 0.01 mg/kg for lambda-cyhalothrin in basil.

² H. Steinwandter, 1985, Universal 5-min on-line method for extracting and isolating pesticide residues and industrial chemicals

Residues resulting from supervised residue trials on crops

The Meeting received supervised trial data for the foliar application of lambda-cyhalothrin on coffee and basil. Residue trial data was made available from Brazil and Thailand.

Labels were available from Brazil and Thailand describing the registered uses of lambda-cyhalothrin.

Coffee beans

Data were available from supervised trials on coffee in Brazil.

The GAP of Brazil is maximum two foliar applications at a maximum rate of 0.005 kg ai/ha with a PHI of 1 day.

Lambda-cyhalothrin residues in green coffee beans from independent trials in Brazil matching GAP were (n=4): < 0.01 (4) mg/kg.

Based on the residues for coffee beans from trials in Brazil, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg and an STMR value of 0.01 mg/kg for lambda-cyhalothrin in coffee beans.

Basil

Data were available from supervised trials on basil in Thailand.

The GAP of Thailand is foliar applications when crop is infested at a maximum concentration of 0.0025 kg ai/hL with a PHI of 7 days.

Lambda-cyhalothrin residues in basil from independent trials in Thailand matching GAP were (n=4): 0.08, 0.17, 0.20 and 0.37 mg/kg.

Based on the residues for basil from trials in Thailand, the Meeting estimated a maximum residue level of 0.7 mg/kg, an STMR value of 0.19 mg/kg and an HR value of 0.40 (based on a highest residue of replicate samples) mg/kg for lambda-cyhalothrin in basil.

RECOMMENDATIONS

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

Definition of the residue for plant and animal commodities (for compliance with the MRL and for estimation of dietary intake): *Cyhalothrin, sum of isomers*

The residue is fat soluble.

CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	or HR or HR-P mg/kg
		New	Previous		
HH 0722	Basil	0.7		0.19	0.40
SB 0716	Coffee beans	0.01*		0.01	

DIETARY RISK ASSESSMENT**Long-term intake**

The International Estimated Daily Intakes (IEDIs) of lambda-cyhalothrin were calculated for the 17 GEMS/Food cluster diets using STMRs/STMR-Ps estimated by the 2008 JMPR and the current Meeting (Annex 3). The ADI is 0-0.02 mg/kg bw and the calculated IEDIs were 2-9% of the maximum ADI (0.02 mg/kg bw). The Meeting concluded that the long-term intakes of residues of

lambda-cyhalothrin, arising from the uses considered by the current Meeting, are unlikely to present a public health concern.

Short-term intake

The International Estimated Short-Term Intakes (IESTI) of lambda-cyhalothrin were calculated for food commodities and their processed commodities using HRs/HR-Ps or STMRs/STMR-Ps estimated by the current Meeting (Annex 4). The ARfD is 0.02 mg/kg bw and the calculated IESTIs were a maximum of 2% of the ARfD. The Meeting concluded that the short-term intake of residues of lambda-cyhalothrin, when used in ways that have been considered by the JMPR, is unlikely to present a public health concern.

REFERENCES

Code	Author	Year	Title, Institution, Report reference
POPIT MET.044.Rev31	Reigada, J	2009	Determination of Residues of Lambda-Cyhalothrin in Vegetable Samples through GC/μECD Syngenta Crop Protection AG, Basel, CH, POPIT MET.044.Rev31 Not GLP, not published Syngenta File No PP321_11675
M09068	Marconi, F & Terada, R	2009	Magnitude of Residues of Lambda-Cyhalothrin in coffee—Brazil, 2008–09 Syngenta Crop Protection Ag, Basel, CH, Syngenta Proteção de Cultivos Ltd.a, São Paulo, Brazil, M09068 GLP, not published Syngenta File No A12688B_10000
On-line method	Steinwandter	1985	Universal 5-min on-line method for extracting and isolating pesticide residues and industrial chemicals Published
LCY-BS-01	Somsamai Palakul	2011	Report on pesticide residue trial. Pesticide Research Group, Agricultural Production Science Research, Development Office, Department of Agriculture, Thailand. Trial No.: LCY-BS-01. Unpublished.
LCY-BS-02	Yongyuth Phaikaew	2011	Report on pesticide residue trial. Pesticide Research Group, Agricultural Production Science Research, Development Office, Department of Agriculture, Thailand. Trial No.: LCY-BS-02. Unpublished.
LCY-BS-03	Piyasak Akcaboot	2011	Report on pesticide residue trial. Pesticide Research Group, Agricultural Production Science Research, Development Office, Department of Agriculture, Thailand. Trial No.: LCY-BS-03. Unpublished.
LCY-BS-04	Wittaya Buasri	2011	Report on pesticide residue trial. Pesticide Research Group, Agricultural Production Science Research, Development Office, Department of Agriculture, Thailand. Trial No.: LCY-BS-04. Unpublished.