TRIAZAPHOS (143)

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EXPLANATION

Triazophos is an organophosphorus insecticide and acaricide and shows a broad-spectrum activity against a wide range of insect pests after soil or foliar treatment of crops. Triazophos was first evaluated by the JMPR in 1982 for toxicology and in 1983 for residues. Since then, triazophos has been evaluated several times. Triazophos has been evaluated within the periodic review programme by the 2002 JMPR for toxicological aspects and by the 2007 JMPR for residue aspects. The 2002 JMPR established an ADI of 0–0.001 mg/kg bw and ARfD of 0.001 mg/kg bw. The 2007 JMPR confirmed its previous residue definition: triazophos (for compliance with the MRL and for estimation of dietary intake). The 2007 JMPR evaluated the triazophos residues in food and withdrew its previous recommendations except for cotton seed, cotton seed oil and soya bean (immature seeds). The 2010 JMPR evaluated additional residue data on rice and soya bean (immature seeds).

The 2010 JMPR Meeting estimated a maximum residue level of 2 mg/kg in/on husked rice (brown rice), and a median residue of 0.421 mg/kg based on 15 trials conducted in China in 2008 and 2009. Triazophos was applied at the target rate of 3–4× 0.506 kg ai/ha (ME formulation) or 3–4× 0.45 kg ai/ha (EC formulation) with a 28 day PHI each. No recommendation of MRL was made because the short-term intake from residues in rice was 260 % of the ARfD for children and general population. There was no alternative GAP to be considered. The JMPR 2010 considered studies on the effect of processing (polishing, cooking, frying) desirable to obtain more realistic information on residue levels in food actually consumed. It was listed by the Forty-fourth Session of CCPR for the 2013 JMPR for reconsideration of MRL for rice.

China submitted processing data from rice, which were evaluated by the present Meeting.

RESIDUE ANALYSIS

Analytical methods

The Meeting received additional information on the analytical method used in the processing study on rice.

In the analytical method used in the rice processing study, rice commodities of 20.0 g were immersed in 40 mL water for 30 min and extracted with 80 mL acetone by shaking for 30 min. The filtered solution was evaporated to 50 mL and extracted with ethyl acetate. The extract was evaporated at 40 ℃ to remove the ethyl acetate. Triazophos (parent) was determined with GC-FPD. The recoveries were within 70%–120% at 0.004–3.0 mg/kg for rice (paddy, husked, polished). Precision (RSD) was less than 20% at each level. The valid LOQ was 0.004mg/kg for each commodity [Lifen, 2011].

Stability of pesticide residues in stored analytical samples

No storage stability studies were submitted for rice or its processed commodities.

Storage stability studies were provided to the 2007 Meeting demonstrating the stability of residues in stored samples of cotton fibre, cotton seed, oranges, carrots and soil. No significant decrease of triazophos was observed in analytical samples of cotton fibre, cotton seed, oranges and carrots stored at ≤ -18 °C for up to 24 months. Therefore storage stability for rice commodities is covered up to 24 months.

FATE OF RESIDUES IN STORAFE AND PROCESSING

In processing

The Meeting received a processing study on rice.

Paddy rice plants were treated in the field in two locations in China in 2011 [Lifen, 2011]. In each location, two pre-harvest applications of 0.45 kg ai/ha with an interval of 10 days were conducted with an EC formulation. Rice plants were harvested at maturity at DAT 28 and 35. The rice plants were left to dry for 10 days in the field. Dried rice grains (10 kg) from each plot were processed into husked and polished rice in two locations in China (Hebei and Zhejiang).

Husked rice: Replicate 1 kg samples of dried rice grains were processed into husked rice (Longgu rice huller), resulting in 0.83 kg husked rice and 0.16–0.17 kg hulls.

Polished rice: A 3 kg sample of dried rice grains was processed into husked rice (Longgu rice huller). Then replicate 400 g samples of husked rice were processed into polished rice using a local-made rice polisher. Three polish times were used (50, 60 and 70 sec). Processing resulted in 330–335 g polished rice and 58-64 g rice bran (50 sec), 321–329 g polished rice and 64–71 g rice bran (60 seconds) and 306–307 g polished rice and 80–82 g rice bran (70 sec).

Polished rice 1 step: In reality, most of the rice grain is stored in China as rice grains (i.e. un-husked rice), then husked and milled together in one step before selling in the market. So a second processing experiment was conducted where replicate 10 kg dried rice grain samples were processed into polished rice in one step using a local-made rice polisher.

All samples (rice grains, husk, husked rice, polished rice, rice bran) were stored at -20 °C and were analysed within 30 days of storage. Samples were analysed using a GC-FPD method. Results are summarized in table 1. The average values for the rice grains (RAC) were 3.71 and 3.15 mg/kg in Hebei at 28 and 35 days PHI, respectively, and 4.14 and 4.86 mg/kg in Zhejiang at 28 and 35 days, respectively at 2× 0.45 kg ai/ha with an interval of 10 days.

Table 1 Residues of triazophos after processing

Location, year, (variety)	Treatment	DAT	Processing location	processed products	residues, mg/kg	PF	reference
Zhanggeqian Village, Hebei, China, 2011, (Kenyu38)	2× 0.45 kg ai/ha; Interval 10 days	28	Hebei	rice grain rice, husked rice, polished, 50 sec rice, polished, 60 sec rice, polished, 70 sec rice, polished, 1 step	3.59 0.80 0.12 0.10 0.082 0.15	- 0.22 0.033 0.028 0.023 0.042	[Lifen, 2011]
Zhanggeqian Village, Hebei, China, 2011, (Kenyu38)	2x 0.45 kg ai/ha; Interval 10 days	28	Hebei	rice grain rice, husked rice, polished, 50 sec rice, polished, 60 sec rice, polished, 70 sec rice, polished, 1 step	3.70 0.75 0.11 0.11 0.088 0.15	- 0.20 0.030 0.030 0.024 0.041	[Lifen, 2011]
Zhanggeqian Village, Hebei, China, 2011, (Kenyu38)	2x 0.45 kg ai/ha; Interval 10 days	28	Hebei	rice grain rice, husked rice, polished, 50 sec rice, polished, 60 sec rice, polished, 70 sec rice, polished, 1 step	3.83 0.78 0.13 0.10 0.088 0.14	- 0.20 0.034 0.026 0.023 0.037	[Lifen, 2011]
Zhanggeqian Village, Hebei,	2x 0.45 kg ai/ha;	35	Hebei	rice grain rice, husked	3.08 0.73	- 0.24	[Lifen, 2011]

Location, year, (variety)	Treatment	DAT	Processing location	processed products	residues, mg/kg	PF	reference
China, 2011, (Kenyu38)	Interval 10 days			rice, polished, 50 sec rice, polished, 60 sec rice, polished, 70 sec rice, polished, 1 step	0.12 0.082 0.075 0.11	0.039 0.027 0.024 0.036	
Zhanggeqian Village, Hebei, China, 2011, (Kenyu38)	2x 0.45 kg ai/ha; Interval 10 days	35	Hebei	rice grain rice, husked rice, polished, 50 sec rice, polished, 60 sec rice, polished, 70 sec rice, polished, 1 step	3.11 0.71 0.10 0.080 0.074 0.12	- 0.23 0.032 0.026 0.024 0.039	[Lifen, 2011]
Zhanggeqian Village, Hebei, China, 2011, (Kenyu38)	2x 0.45 kg ai/ha; Interval 10 days	35	Hebei	rice grain rice, husked rice, polished, 50 sec rice, polished, 60 sec rice, polished, 70 sec rice, polished, 1 step	3.25 0.73 0.10 0.082 0.078 0.13	- 0.22 0.031 0.025 0.024 0.040	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	28	Zhejiang	rice grain rice, husked rice, polished, 60 sec	4.74 1.43 0.37	- 0.30 0.078	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	28	Zhejiang	rice grain rice, husked rice, polished, 60 sec	3.02 0.81 0.34	- 0.27 0.11	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	28	Zhejiang	rice grain rice, husked rice, polished, 60 sec	5.27 1.61 0.43	- 0.31 0.19	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	28	Zhejiang	rice grain rice, husked	4.41 1.38	- 0.31	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	28	Zhejiang	rice grain rice, husked	2.95 0.78	- 0.26	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	28	Zhejiang	rice grain rice, husked	4.43 1.23	- 0.28	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	35	Zhejiang	rice grain rice, husked rice, polished, 60 sec	4.83 1.06 0.36	- 0.22 0.075	[Lifen, 2011]
Zhuji county, Zhejiang, China 2011 (Zheyou 1)	2x 0.45 kg ai/ha; Interval 10 days	35	Zhejiang	rice grain rice, husked rice, polished, 60 sec	4.76 0.98 0.38	- 0.21 0.080	[Lifen, 2011]
Zhuji county, Zhejiang, China	2x 0.45 kg ai/ha;	35	Zhejiang	rice grain rice, husked	4.98 0.96	- 0.19	[Lifen, 2011]

Location, year, (variety)	Treatment	DAT	Processing location	processed products	residues, mg/kg	PF	reference
2011 (Zheyou 1)	Interval 10 days			rice, polished, 60 sec	0.33	0.066	

Table 2 gives on overview of processing factors in rice grains into husked rice and polished rice. Since the maximum residue level recommendation was given for husked rice (brown rice), also the processing factors from husked rice to polished rice are indicated. Several processing studies were conducted on polished rice. The processing study in Zheijang resulted in significantly higher processing factors for polished rice than in Hebei. Therefore only the processing data from Zhejiang were taken.

Table 2 Overview of processing factors for triazophos

processed products	individual processing factors	n	RSD	Mean or best estimate
rice grains–husked	0.19, 0.20, 0.20, 0.21, 0.22, 0.22, 0.22, 0.23, 0.24, 0.26, 0.27, 0.28, 0.30, 0.31, 0.31	15	17%	0.24 (mean)
rice grains–polished	0.037, 0.039, 0.039, 0.040, 0.041, 0.042 (Hebei) 0.066, 0.075, 0.080, 0.11, 0.19 (Zhejiang)	6 5	4.4% 49%	0.080 (median from Zhejiang)
rice grains–husked to polished	0.16, 0.17, 0.18, 0.18, 0.19, 0.20 (Hebei) 0.27, 0.34, 0.34, 0.39, 0.42 (Zhejiang)	6 5	7.9% 16%	0.35 (mean from Zhejiang)

APPRAISAL

Triazophos is an organophosphates insecticide and acaricide and shows broad-spectrum activity against a wide range of insect pests via soil or foliar treatment of crops. Triazophos was first evaluated by the JMPR in 1982 for toxicology and in 1983 for residues and has been evaluated several times since. Triazophos was evaluated within the periodic review programme by the 2002 JMPR for toxicology and by the 2007 JMPR for residues. The 2002 Meeting established an ADI of 0–0.001 mg/kg bw and an ARfD of 0.001 mg/kg bw. The 2007 JMPR confirmed its previous residue definition: *triazophos* (for compliance with the MRL and for estimation of dietary intake). The 2007 JMPR evaluated the triazophos residues in food and withdrew its previous recommendations except for cotton seed, cotton seed oil and soya bean (immature seeds). The 2010 JMPR evaluated additional residue data on rice and soya bean (immature seeds).

The 2010 JMPR Meeting estimated a maximum residue level of 2 mg/kg in/on husked rice (brown rice), and a median residue of 0.421 mg/kg based on 15 trials conducted in China in 2008 and 2009. Triazophos was applied at the target rate of either 3–4 × 0.506 kg ai/ha (ME formulation) or 3–4× 0.45 kg ai/ha (EC formulation) both with PHIs of 28 days. No maximum residue level recommendation could be made because the estimated short-term intake from residues in rice was 260% of the ARfD for children and general population. There was no alternative GAP available. The 2010 JMPR considered that studies on the effect of processing (polishing, cooking, frying) to be desirable as they would enable a more realistic estimation of residue levels in food actually consumed. Triazophos was listed by the Forty-fourth Session of CCPR for the 2013 JMPR for reconsideration of residues in rice.

China submitted processing data for rice, which were evaluated by the present Meeting.

Methods of analysis

The Meeting received a description and validation data for an analytical method of triazophos on processed commodities of rice. The analytical method was based on extraction with acetone and

determination of triazophos with GC-FPD. The Meeting considered the method valid in the range 0.003–3.0 mg/kg triazophos in rice grains, husked rice, polished rice and rice bran.

Stability of residues in stored analytical samples

No storage stability data were received for rice or its processed commodities. Storage stability studies were provided to the 2007 Meeting which demonstrated stability of residues in stored samples of cotton fibre, cotton seed, oranges, carrots and soil for a period of up to 24 months. The Meeting agreed that these studies covered storage stability for rice commodities.

Results of supervised residue trials on crops

The 2010 JMPR Meeting estimated a maximum residue level of 2 mg/kg in/on husked rice (brown rice), and a median residue of 0.421 mg/kg based on 15 trials in/on paddy rice conducted in China in 2008 and 2009.

An additional two trials on paddy rice were submitted to the present Meeting. The trials were conducted in China with 2 applications at 0.45 kg ai/ha instead of 3 applications at 0.45 kg ai/ha (cGAP in China). Since the residues were higher compared to the JMPR 2010 data, the Meeting decided to include the mean value per location (3.7 and 4.9 mg/kg) from these trials with the JMPR 2010 data. This resulted in the following dataset: 0.059, 0.059, 0.060, 0.087, 0.13, 0.34, 0.35, 0.42, 0.51, 0.68, 0.76, 0.81, 0.89, 1.0, 1.2, 3.7, 4.9 mg/kg (n=17).

Based on the 17 trials conducted in China, the Meeting estimated a maximum residue level of 7 mg/kg in/on rice grain and a median residue of 0.51 mg/kg. As rice grains (i.e., rice with hulls) are not traded, the Meeting agreed that a maximum residue level recommendation for rice was not appropriate and decided to use the residue values for rice, to estimate maximum residue levels for husked rice and polished rice.

Fate of residues during processing

Information on the fate of triazophos during processing was provided for rice. In the table below, relevant processing factors for this commodity are summarized based on the residue definition of *triazophos*. Hydrolysis studies under cooking conditions or processing studies for cooking of rice were not submitted to the present or previous Meetings.

Using the $STMR_{RAC}$ obtained from triazophos use, the Meeting estimated STMR-Ps for processed commodities as listed below. An HR-P is not required for processed rice commodities.

Commodity	Processing factors (triazophos)	Max level = Max_{RAC}xPF	STMR-P = $STMR_{RAC}$xPF mg/kg
rice grains – husked, dry	0.24 (n=15, mean)	7 × 0.24 = 1.68	0.51 × 0.24 = 0.12
rice grains – polished, dry	0.080 (n=6, median)	7 × 0.080 = 0.56	0.51 × 0.080 = 0.041

The Meeting confirmed its previous recommendation of 2 mg/kg in/on husked rice, and estimated an STMR-P of 0.12 mg/kg.

The Meeting estimated a maximum residue level of 0.6 mg/kg in polished rice and an STMR-P of 0.041 mg/kg.

Residues in animal commodities

The 2007 JMPR concluded that because of the lack of appropriate animal livestock metabolism study, a residue definition for animal products could not be determined and therefore the Meeting could not make use of the results of the feeding studies. Consequently, the residues in animal products derived from the use of triazophos on rice and its processed commodities were not considered by the present Meeting.

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 limits and for use in dietary risk assessment.

Definition of residue (for compliance with the MRL and for estimation of dietary intake): *triazophos*.

CCN	Commodity name	MRL mg/kg	STMR or STMR-P mg/kg	Notes
CM 0649	Rice, husked	2	0.12	A public health risk cannot be excluded
CM 1205	Rice, polished	0.6	0.041	-

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDI) of for triazophos was calculated from recommendations for STMRs for raw and processed commodities in combination with consumption data for corresponding food commodities by the 2007, 2010 and 2013 JMPR. The IEDI of in the 13 GEMS/Food cluster diets, based on the estimated STMRs were in the range 1–40% of the maximum ADI of 0.001 mg/kg bw. The 2013 Meeting concluded that the long-term intake of residues of triazophos from uses considered by the 2007, 2010 and 2013 Meeting is unlikely to present a public health concern. The results are shown in Annex 3 of the 2013 Report.

Short-term intake

The International Estimated Short Term Intake (IESTI) for triazophos was calculated for rice and its processed commodities for which maximum residue levels were estimated and for which consumption data were available. For those processed commodities, where no processing data were available, the STMR-P for polished rice was used for rice flour, rice beer and rice wine, while the STMR-P for husked rice was used on all other processed commodities. Since husked rice and polished rice are not consumed raw, but in cooked form and consumption data are available for the cooked form, a default dilution factor of 0.4 was used to compensate for the swelling during cooking. A default dilution factor of 0.04, 0.19 and 0.15 was used on rice milk, rice beer, and rice wine respectively. The results are shown in Annex 4 of the 2013 Report.

The IESTI for rice and its processed commodities and based on the 2012 consumption data and an ARfD of 0.001 mg/kg bw represents 0–130% of the ARfD for cooked husked rice consumption of children of 1–6 years in Japan, and 0–100% of the ARfD for all other processed rice commodities by children or general population.

The Meeting concluded that the short-term intake of residues of triazophos resulting from its uses that have been considered by JMPR might present a public health concern. There was no alternative GAP to be considered and refinement of the dietary risk assessment by using processing factors for husked rice still showed a potential public health concern. Processing studies from rice (husked and polished) are desirable for further refinement of the exposure.

The 2002 Meeting established an ARfD of 0.001 mg/kg bw on the basis of the NOAEL of 0.0125 mg/kg bw per day in the 3-week study in humans and a safety factor of 10. Hence, further refinement is unlikely in the toxicological assessment.

REFERENCES

Code Author Year Title, Institute & report number, Submitting manufacturer and report code, GLP/Non-

			GLP. Published/Unpublished
-	W. Lifen	2011	Processing study of triazophos on rice Hebei Institute for the Control of Agrochemicals (Hebei ICA), China and Zhejiang University, China, no report number. Non-GLP, Unpublished. English translation of relevant parts of a Chinese report Original Chinese report available during the 2013 Meeting