

5.23 TRIAZOPHOS (143)

RESIDUE AND ANALYTICAL ASPECTS

Triazophos is an organophosphorus insecticide used to control insect pests on a wide range of crops. It was originally evaluated for residues by the 1983 JMPR and re-evaluated four times in 1986, 1990, 1992 and 1993, with subsequent revisions in 1984 and 1991. It was scheduled for periodic re-evaluation by the 2007 JMPR.

The manufacturer submitted data on physical and chemical properties, metabolism and environmental fate, methods of residue analysis, use patterns, residues resulting from supervised trials on cotton and stability of residues during storage and processing. The government of Thailand provided GAP information and supervised trial data for soya bean (immature seeds).

Animal metabolism

The Meeting received information on the metabolism of triazophos in rats and dogs, but no information on the distribution, excretion or fate of triazophos in livestock and poultry. As both the rat and dog studies were described in detail in the toxicological evaluation of the 2002 JMPR, the studies were not reported here.

Plant metabolism

The Meeting received plant metabolism studies for triazophos on cotton and rice. Both studies included foliar application as well as uptake via water and/or soil.

When [^{14}C]triazophos was applied to leaves of cotton plants, the radioactivity was at first present on the leaf surface but quickly penetrated into the leaf itself, with little translocation into other parts of the plant. The predominant component of the radioactivity was parent triazophos. After field application of ^{14}C -triazophos prior to boll opening, only very low residues of triazophos and its metabolites were present in cotton fibre and seeds. In both trials, the residues consisted of unchanged triazophos, 1-phenyl-3-hydroxy-1, 2, 4-triazole and an unidentified compound. Only traces of the P=O analogue of triazophos (O, O-diethyl-O-1-phenyl-1H-1,2,4-triazol-3-yl phosphate) were detectable on the leaves and stem. In general, triazophos penetrated quickly into deeper layers of the treated leaves but was not translocated in significant amounts into other parts of the plant or roots.

In uptake studies via both soil and a hydroponic medium, parent triazophos was the predominant component of the applied radioactivity, with most of the radioactive residues being present in the plant root, compared to the whole plant, or remaining in the soil or hydroponic medium. Again, most of the extracted radioactivity was composed of parent triazophos, although both the P=O analogue and 1-phenyl-3-hydroxy-1, 2, 4-triazole were also found. The results of field applications showed that only low levels of triazophos and its metabolites are likely to be present in cotton fibre and seeds if the last application takes place prior to boll opening.

Greenhouse grown rice plants were treated with [^{14}C]triazole at the growth stages of either stem elongation or heading. Initially the majority of the applied radioactivity was present on the surface of the rice plants, however by 8 weeks after the application, radioactivity was found in the rice panicles. Little radioactivity was found in rice grain. The major component of the extracted radioactivity was parent triazophos in rice panicles, husks, grain and whole plant. The 1-phenyl-3-hydroxy-1, 2, 4-triazole was also present in whole plant (< 10% of applied radioactivity) and very low levels were in rice grain (0.02% of applied radioactivity). The P=O analogue was also present, but in amounts lower than triazophos or the triazole (< 1% of applied radioactivity).

In addition, uptake studies were conducted in rice, with application of ^{14}C -triazophos to water or soil and water. As with the cotton study a large proportion of the applied radioactivity remained in the soil or soil and water medium, with little radioactivity present in either the whole plant or the

panicle. Again parent triazophos was the major component of the radioactivity, although the 1-phenyl-3-hydroxy-1, 2, 4-triazole and the P=O analogue were also detected.

In conclusion, the results from the field study show that very little of the applied radioactivity is present in rice grain following multiple applications under field conditions.

Uptake from soil by leek plants

The Meeting received information on the uptake of triazophos from soil by leek plants.

Plots of loamy soil and sandy soil were treated with [^{14}C]triazophos at application rates equivalent to 0.48 and 0.96 kg ai/ha. Leek plants were present in the treated plots. At 90 days after application, samples of soil, taken at various depths, and leek plants were collected for determination of radioactivity. No detectable radioactivity was found in the leek plants. In the soil samples up to 2.2% of the applied radioactivity was found (0–10 cm depth), with lower concentrations (< 0.2% of applied radioactivity) present at 10–20 cm and 20–30 cm depths. The radioactivity was predominantly composed of parent triazophos and 1-phenyl-3-hydroxy-1, 2, 4-triazole.

Methods of analysis

The Meeting received information on methods capable of determining residues of triazophos in plant materials and animal commodities, using GC with N or P selective detectors. The limits of quantitation were typically 0.02 mg/kg for plant commodities and 0.01 for animal commodities. Reported recoveries were within acceptable limits of 70–110%.

Stability of residues in stored analytical samples

Studies were provided to the 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 $\leq -18^\circ\text{C}$ for up to 24 months.

Residue definition in Plants

The results of the plant metabolism studies on cotton and rice, including foliar application and uptake from soil and water, indicate that parent triazophos is the major component of the recovered radioactivity, with the P=O analogue (O, O-diethyl-O-1-phenyl-1H-1, 2, 4-triazol-3-yl phosphate) and 1-phenyl-3-hydroxy-1, 2, 4-triazole also being present.

Analytical methods for plant matrices determine triazophos only.

On the basis of the metabolism in plants and the analytical methodology submitted, the Meeting confirmed the previous residue definition for the purposes of compliance monitoring and for estimation of dietary intake.

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

Results of supervised trials on crops

Cotton

Data were received from ten field trials for triazophos on cotton; nine trials were conducted in nine regions of India and a single trial was conducted in Brazil. In 2005 in India, 5 sprays were applied at 0.87 kg ai/ha (or 0.435 kg ai/hL) and in Brazil in 2001, 3 sprays were applied at 0.80 kg ai/ha (i.e., 0.27 kg ai/hL) or 1.60 kg ai/ha (i.e., 0.53 kg ai/hL). The GAP in India is 0.63 to 0.84 kg ai/ha with a 21 day PHI and 1–5 applications. In Brazil, the GAP is 0.3 to 0.8 kg ai/ha with a 28 day PHI and 1–3 applications.

The Meeting was informed that in India, as cotton plants do not mature simultaneously, harvest usually occurs over three separate picks, with the majority of cotton collected from first two

with an average interval of 10 days between these picks. The raw cotton from, the different picks, is generally pooled prior to sale. Following sale the raw cotton is ginned where the separation of lint and seed occurs. As a consequence the Meeting considered the supervised trials reported from India as representing local practice for the use of triazophos in cotton. In trials from India the cotton samples from two picks (at 21–23 days and 31–33 days after the last application) were pooled and processed by ginning to separate the lint and seeds. Cotton seed oil was then extracted from cotton seeds using n-hexane in soxhlet extractor, the solvent was removed by rotary evaporation with the resultant oil used for analysis.

Residues of triazophos measured in nine trials conducted according to the GAP in India were 0.020, 0.021 (2), 0.023, 0.028, 0.042, 0.054, 0.059 and 0.060 mg/kg in cotton seed and 0.042, 0.044, 0.085, 0.088, 0.13, 0.17, 0.26, 0.31 and 0.78 mg/kg in cotton seed oil.

From one trial matching GAP in Brazil the residue of triazophos in cotton seed was 0.03 mg/kg; residues in cotton seed oil were not determined. Residues from the trial conducted at double rate reached a maximum of 0.2 mg/kg in cotton seed.

Based on the 10 trials with GAP in India and Brazil, residues were 0.020, 0.021 (2), 0.023, 0.028, 0.03, 0.042, 0.054, 0.059 and 0.060 mg/kg in cotton seed and 0.042, 0.044, 0.085, 0.088, 0.13, 0.17, 0.26, 0.31 and 0.78 mg/kg in cotton seed oil.

The Meeting estimated an STMR of 0.029 mg/kg for triazophos in cotton seed and 0.13 mg/kg in cotton seed oil, and an HR of 0.060 mg/kg for triazophos in cotton seed and 0.78 mg/kg in cotton seed oil. The Meeting recommended a maximum residue level of 0.2 mg/kg in cotton seed and 1 mg/kg in cotton seed oil (crude) for triazophos.

The Meeting also recommended the withdrawal of the current MRL of 0.1 mg/kg for triazophos in cotton seed.

Soya bean

In six field trials conducted in Thailand during 1992 to 2006, 2 to 4 sprays of triazophos were applied at 0.1 kg ai/hL. The GAP in Thailand is 0.1 kg ai/hL with a 14 day PHI. Residues of triazophos in whole pod including immature seeds at 14–17 days after the last application were 0.05, 0.17, 0.31, 0.43, 0.52, and 0.60 mg/kg.

The Meeting recommended a maximum residue level of 1 mg/kg for triazophos in soya beans (immature seeds with the pod). The Meeting also estimated an STMR of 0.37 mg/kg and an HR of 0.60 mg/kg.

The Meeting recommended withdrawal of the previous recommendation of 0.05 mg/kg for triazophos in soya bean (dry).

Other commodities

No data on GAP and residues for triazophos was provided on broad bean (shelled), Brussels sprouts, cabbage (head), carrot, cauliflower, cereal grains, coffee beans, common bean, onion (bulb), pea, pome fruit, potato, strawberry and sugar beet. The Meeting recommended withdrawal of the previous recommendations made for these commodities.

Fate of residues during processing

Information regarding the magnitude of triazophos residues in different processed commodities of cotton was provided to the Meeting.

In three field trials conducted in the USA in cotton, residues were found in the processed non oily matrices and in the processed oil. No processing factors could be determined as residue concentrations in unprocessed cotton seed were not reported.

Residues in animal commodities

The Meeting received a feeding study on lactating Holstein cows. The dosing regime involved a 2-day pre-conditioning phase, one week prior to the dosing period, at a dose level of 100 mg triazophos per cow. During the following period of 7 days, one cow was dosed with 50 mg triazophos (2.38 ppm in the feed) and the second cow with 100 mg (4.76 ppm in the feed), the third cow received untreated feed. Neither the pre-conditioning at 100 mg per cow and day nor the dosing of 50 and 100 mg per cow and day resulted in any residues above the LOQ of 0.05 mg/kg for milk and 0.01 mg/kg for muscle, fat, kidney and liver. The Meeting noted that because of the lack of an appropriate 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 study.

The Meeting agreed to withdraw the previous recommendations for triazophos of 0.01 mg/kg in cattle meat and cattle milk.

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of triazophos has resulted in recommendations for MRLs and STMR values for raw and processed commodities. Consumption data were available for 2 food commodities and were used in the dietary intake calculations. The results are shown in Annex 3.

The IEDIs for the 13 GEMS/Food regional diets, based on estimated STMRs were in the range 0–20% of the maximum ADI of 0.001 mg/kg bw (Annex 3). The Meeting concluded that the long-term intake of residues of triazophos from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The IESTI for triazophos was calculated for the food commodities for which maximum residue levels and HRs were estimated and for which consumption data were available. The results are shown in Annex 4.

The IESTI calculated for cotton seed oil for the general population and children were 2% and 5% of the ARfD (0.001 mg/kg bw), respectively. The IESTI calculated for soya bean (immature seeds with the pod) for the general population and children were 140% and 230% of the ARfD, respectively (Annex 4). The Meeting concluded that the short-term intake of residues of triazophos from the consumption of cotton seed oil is unlikely to present a public health concern. The information provided to the JMPR precludes an estimate that the dietary intake would be below the ARfD for consumption for soya bean (immature seeds with pod) by the general population and children.

The Meeting noted that the pod is not normally consumed and that no residue data relating to residues in the edible portion of soya bean pods or alternative GAP were submitted for soya bean (immature seeds with pod).

5.24 ZOXAMIDE (227)

TOXICOLOGY

Zoxamide is the ISO approved name for (*RS*)-3,5-dichloro-*N*-(3-chloro-1-ethyl-1-methyl-2-oxopropyl)-4-methylbenzamide (CAS; CAS No. 156052-68-5). Zoxamide is a chlorinated benzamide fungicide acting against late blight (*Phytophthora infestans*) and powdery mildew (*Plasmopara viticola*). The mechanism of fungicidal action involves disruption of microtubule formation by binding to β -tubulin.

Zoxamide has not been evaluated previously by the JMPR and was reviewed at the present Meeting at the request of the CCPR.