5.10 EMAMECTIN BENZOATE (247)

TOXICOLOGY

As a result of a question raised by the 78th Meeting of JECFA in 2013 (see section 3.2.1), the present Meeting re-evaluated the acute toxicity of emamectin benzoate.

Toxicological evaluation

The Meeting agreed to withdraw the ARfD of 0.03 mg/kg bw, established in 2011, and established an ARfD of 0.02 mg/kg bw, on the basis of the absence of clinical signs of neurotoxicity after 7 days of treatment with 1.5 mg/kg bw in 5-week and 14-week studies in dogs, and applying a safety factor of 100. The Meeting considered that application of an additional safety factor was not necessary because clinical signs did not occur at 1.5 mg/kg bw given for 7 days and because in a 5-week special neurotoxicity study, using a limited number of dogs, no signs of neuropathology were observed after 7 days of treatment with 1.5 mg/kg bw per day.

An addendum to the toxicological monograph was not prepared.

RESIDUE AND ANALYTICAL ASPECTS

Emamectin benzoate is a insecticide derivative of abamectin. Emamectin benzoate was first evaluated by the JMPR in 2011 for toxicology and residues. The 2011 Meeting established an ADI of 0–0.0005 mg/kg bw, expressed as emamectin benzoate. The ARfD was re-evaluated by the 2014 JMPR which reduced the ARfD to 0.02 mg/kg bw expressed as emamectin benzoate. The 2011 Meeting defined the residue as emamectin B1a benzoate for plant and animal commodities for compliance with the MRL and for estimation of dietary intake. Since the molecular weight difference between emamectin B1a benzoate and emamectin benzoate (consisting of 90% emamectin B1a benzoate and 10% emamectin B1b benzoate) is marginal, residues are not corrected for molecular weight. The 2011 Meeting considered the residue not fat soluble.

Emamectin benzoate was scheduled by the Forty-fifth Session of the CCPR (2013) for the evaluation of additional maximum residue levels by the 2014 JMPR. The manufacturer submitted additional supervised residue trials on almonds, pecans and rape, which were evaluated by the present Meeting.

Methods of Analysis

The Meeting received description and validation data for an analytical method for emamectin B1a and B1b benzoate and its 8,9-ZMa isomer in rape commodities for use in supervised residue trials. The analytical method is based on extraction with acidified acetonitrile and analysis by HPLC-MS/MS. The Meeting considered the method valid in the range 0.005–0.05 mg/kg emamectin B1a in rape seeds.

The analytical method for the determination of residues in almonds, pecans and almond hulls was considered valid by the 2011 Meeting.

Stability of pesticide residues in stored analytical samples

Storage stability studies were provided to the 2011 Meeting demonstrating the stability of emamectin B1a benzoate for at least 27 months at -20 ºC or lower in stored plant commodities with high water

content, 18 months in plant commodities with high starch content and at least 9 months in plant commodities with high oil content.

All crop commodities from supervised residue trials were analysed within the verified storage stability period. Oilseeds and rape forage were stored at -2 ºC. Since parent is shown to be stable for a long period of time, trials where temperatures during storage were raised to -2 °C, were not rejected.

Results of supervised residue trials on crops

The Meeting received supervised trials data for emamectin benzoate on rape forage, tree nuts, rape seed and almond hulls. In addition, the 2011 JMPR trials on lettuces were re-evaluated by the present Meeting because of an ARfD exceedance for leaf lettuce.

Lettuce

The International Estimated Short Term Intake (IESTI) for emamectin benzoate was recalculated as the ARfD was changed from 0.03 to 0.02 mg/kg bw and a revised IESTI calculation model was available at the 2014 Meeting. The IESTI for the diets submitted to the JMPR represented 0–190% of the ARfD (0.02 mg/kg bw, expressed as emamectin benzoate) for children. The ARfD is exceeded for leaf lettuce (total, i.e., raw and processed commodities) in the diet for children.

At the 2011 JMPR, maximum residue levels for head lettuce, leaf lettuce and Cos lettuce were recommended based on head lettuce data, of 1 mg/kg respectively. The present Meeting re-evaluated the separate datasets for head lettuce, Cos lettuce and leaf lettuce that were available to the 2011 JMPR. The leaf lettuce dataset was considered insufficient to recommend a maximum residue level (n=1–3, depending on the GAP used). The Cos lettuce dataset could however be used to propose a maximum residue level for leaf lettuce and Cos lettuce. The Meeting decided to retain the previous recommendation for head lettuce (current Codex MRL of 1 mg/kg) based on head lettuce data and to propose a new maximum residue level for Cos lettuce and leaf lettuce, based on the Cos lettuce data.

The 2011 Meeting agreed to combine the dataset for indoor and field grown Cos lettuce matching the Italian GAP (3 foliar spray applications, interval 7 days, 14.2 g ai/ha with a 3 day PHI) to represent residues in field and indoor grown Cos lettuce. This resulted in the following dataset: 0.030, 0.033, 0.042, 0.052, 0.10, 0.11, 0.30 and 0.33 mg/kg (n=8).

The present Meeting agreed that the dataset for Cos lettuce matching Italian GAP could be used to support a maximum residue level recommendation for Cos lettuce and leaf lettuce. The Meeting decided to withdraw its previous recommendations for Cos lettuce and leaf lettuce of 1 mg/kg and estimated a new maximum residue level 0.7 mg/kg for Cos lettuce and leaf lettuce. The Meeting estimated an STMR of 0.076 mg/kg and a HR of 0.33 mg/kg.

Tree nuts

The 2011 JMPR Meeting was unable to estimate a maximum residue level for almonds or pecans as the dataset was considered insufficient. Additional trials were submitted to the present Meeting and these were combined with the trials evaluated by the 2011 JMPR.

Field trials involving almonds were performed in the USA.

Critical GAP for tree nuts in the USA is for three foliar spray applications at 16.8 g ai/ha (maximum of 50.4 g ai/ha per season, interval 7 days) and a PHI of 14 days, with adjuvant. In almond trials from the USA (3 × 17 g ai/ha; interval 7 days and a 14 day PHI, applied with adjuvant) matching US GAP emamectin B1a benzoate residues in almonds (nutmeat) were: < 0.001 (4) mg/kg (including 1 value from the 2011 JMPR).

Field trials involving pecans were performed in the USA.

Critical GAP for tree nuts in the USA is for three foliar spray applications at 16.8 g ai/ha (maximum of 50.4 g ai/ha per season, interval 7 days) and a 14 day PHI, with adjuvant. In pecan trials from the USA (3 × 17 g ai/ha; interval 7 days and PHI 14 days, with adjuvant) matching US GAP emamectin B1a benzoate residues in pecans (nutmeat) were < 0.001 (5) mg/kg (including 1 value from the 2011 JMPR).

The Meeting agreed that the dataset for almonds and pecans matching USA GAP could be used to support a maximum residue level recommendation for tree nuts, and estimated a maximum residue level of 0.001* mg/kg in/on tree nuts and estimated an STMR of 0.001 mg/kg and an HR of 0.001 mg/kg.

Rape seed

Field trials involving rape were performed in Australia. Rape seeds were harvested using three different techniques: natural desiccation, herbicide desiccation, and wind-rowing. In natural desiccation seeds were collected after the plants had dried off naturally. Herbicide desiccation involves the use of a herbicide to dry off the green plant followed by seed collection up to 15 days later. Wind-rowing involves the cutting of the green crop and laying it in the rows to dry, followed by seed collection up to 15 days later. Since no residues were found in rape seeds in any of these trials, the impact of the harvest technique could not be assessed. Therefore, trials matching cGAP were selected irrespective of the harvest technique. Trials where the seeds were collected at the day of cutting (wind-rowing technique) or at the day of desiccation (herbicide desiccation technique) were excluded, since in this case the seeds were harvested from the green plant and such samples are not representative for maximum residue level derivation.

Critical GAP for rape in Australia is for two foliar spray applications at 5.1 g ai/ha with an unspecified interval and PHI 14 days. In rape trials from Australia (2 × 5.3–6.1 g ai/ha; interval 6–9 days and PHI 13–17 days, with adjuvant) matching this GAP emamectin B1a benzoate residues in rape seeds were < 0.005 (6) mg/kg. Trials at higher dose rate and shorter PHI (2× 11–13 g ai/ha, interval 5–8 days and PHI 5–8 days) confirmed the non-residue situation: < 0.005 (4) mg/kg.

The Meeting agreed that the dataset for rape matching Australian GAP could be used to support a maximum residue level recommendation for rape seeds, and estimated a maximum residue level of 0.005* mg/kg in/on rape seed and estimated an STMR of 0 mg/kg. An HR is not considered necessary, since bulking/blending of the seeds is likely for a pre-harvest application.

Almond hulls

The 2011 JMPR Meeting was unable to estimate a maximum residue level for almond hulls as the dataset was considered insufficient. Additional trials were submitted to the present Meeting and these were combined with the trials evaluated in the 2011 JMPR report.

Field trials involving almonds were performed in the USA. Three spray concentrations were tested in one trial: very concentrated (for aircraft equipment), concentrated (for airblast equipment) and dilute (for ground equipment). In this one trial, the highest residue was found for the concentrated spray concentration as used for airblast equipment: 0.088 mg/kg versus 0.057–0.059 mg/kg. Since one trial is not sufficient to conclude on the effect of spray concentration and a second trial, where a concentrate spray concentration was used, produced much lower residues (0.018 mg/kg), the Meeting decided to take the highest residue from each location irrespective of the spray concentration.

Critical GAP for tree nuts in the USA is for three foliar spray applications at 16.8 g ai/ha (maximum of 50.4 g ai/ha per season, interval 7 days) and PHI of 14 days, with adjuvant. In almond trials from the USA (3 × 17 g ai/ha; interval 7 days and PHI 14 days, with adjuvant) matching this GAP emamectin B1a benzoate residues in almond hulls were 0.018, 0.020, 0.043, 0.088 mg/kg (n=4),

as received (including 1 value from the 2011 JMPR). Since the dry weight for almond hulls is 90%, no dry weight correction is needed.

The Meeting agreed that the dataset for almond hulls matching USA GAP could be used to support a maximum residue level recommendation for almond hulls, and estimated a maximum residue level of 0.2 mg/kg in/on almond hulls and estimated a median residue of 0.0315 mg/kg. A highest residue is not considered necessary, since bulking/blending of the hulls is likely for use as feed commodity.

Rape forage

Field trials involving rape forage were performed in Australia. The only GAP available on rape is from Australia and this GAP contains a restriction not to use emamectin benzoate on rape grown as forage crop (i.e., rape forage). The Meeting decided not to use the trials.

Residues in animal commodities

The Meeting estimated the dietary burden of emamectin benzoate residues on the basis of the livestock diets listed in the FAO manual appendix IX (OECD feedstuff table). Calculation from highest residue, STMR (some bulk commodities) and STMR-P values provides the levels in feed suitable for estimating maximum residue levels, while calculation from STMR and STMR-P values from feed is suitable for estimating STMR values for animal commodities.

The 2014 JMPR Meeting recalculated the livestock dietary burden based on the uses presented by the 2011 JMPR and including the residue values for almond hulls from the 2014 JMPR Meeting. The maximum dietary burden for cattle for maximum residue level setting is not changed, while the mean dietary burden for cattle changed only marginally from 0.018 ppm in the 2011 JMPR Meeting to 0.021 ppm in the 2014 JMPR Meeting. Poultry is not exposed to emamectin benzoate through feed treated with emamectin benzoate. The Meeting therefore confirmed its previous recommendations for animal commodities.

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.

Definition of the residue for compliance with the MRL and for dietary risk assessment for plant and animal commodities: *emamectin B1a benzoate*

The Meeting considers the residue not fat soluble.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDI) for emamectin benzoate was calculated from recommendations for STMRs for raw and processed commodities in combination with consumption data for corresponding food commodities. The results are shown in Annex 3.

The IEDI of in the 17 GEMS/Food cluster diets, based on the estimated STMRs in the 2011 and 2014 JMPR represented 1–9% of the maximum ADI of 0.0005 mg/kg bw, expressed as emamectin benzoate. No conversion factor is needed to convert emamectin B1a benzoate residues to emamectin benzoate residues.

The Meeting concluded that the long-term intake of residues of emamectin benzoate from uses considered by the 2011 and 2014 Meeting is unlikely to present a public health concern.

Short-term intake

The International Estimated Short Term Intake (IESTI) for emamectin benzoate was recalculated due to the ARfD being changed from 0.03 to 0.02 mg/kg bw and the availability of a revised IESTI calculation model at the present Meeting. The IESTI was calculated from recommendations for STMRs and HRs for raw and processed commodities evaluated in the 2011 and 2014 JMPR Meeting in combination with consumption data for corresponding food commodities. The results are shown in Annex 4 to the 2014 Report.

The IESTI for the general population represented 0–30% of the ARfD (0.02 mg/kg bw, expressed as emamectin benzoate) and the IESTI for children represented 0–30% of the ARfD. No conversion factor is needed to convert emamectin B1a benzoate residues to emamectin benzoate residues.

The Meeting concluded that the short-term intake of residues of emamectin benzoate from uses considered by the 2011 and 2014 Meeting are unlikely to present a public health concern.