

## 5.32 SPIROTETRAMAT (234)

### RESIDUE AND ANALYTICAL ASPECTS

Spirotetramat was evaluated for the first time by the JMPR in 2008 for toxicology and residues. The Meeting derived an ADI of 0–0.05 mg/kg bw and an ARfD of 1.0 mg/kg bw and recommended maximum residue levels for a range of crops. In 2011 and 2012, the JMPR recommended additional maximum residue levels. The residue is defined as follows.

For compliance with the MRL for plant commodities: *spirotetramat plus spirotetramat enol, expressed as spirotetramat*.

For dietary intake estimation for plant commodities: *spirotetramat plus the metabolites enol, ketohydroxy, enol glucoside, and monohydroxy, expressed as spirotetramat*.

For compliance with the MRL and for dietary intake estimation for animal commodities: *spirotetramat enol, expressed as spirotetramat*.

The residue is not fat soluble.

The present Meeting evaluated supervised field trial data for various crops including their analytical methods, stability of frozen sample and stability tests, and processing studies.

#### *Methods of analysis*

Analytical methods used in raw agricultural commodities from field trials were suitable for quantifying spirotetramat residues including the metabolites spirotetramat enol, spirotetramat ketohydroxy, spirotetramat monohydroxy and spirotetramat enol glucoside in the various plant commodities. The methods were based on LC-MS/MS and the reference method used was evaluated by the Meeting in 2008 and 2011. The limits of quantitation for the raw commodities are 0.01 mg/kg (parent equivalents) for each analyte and 0.05 mg/kg for total spirotetramat equivalents.

For the processed products of pineapple and coffee bean, overall, the method performance was not acceptable. In pineapple juice and processing by-products, average recoveries of enol glucoside (0.01 mg/kg as parent equivalents) were not in the allowable range.

In roasted coffee bean, a limit of quantitation for enol glucoside was as high as 0.05 mg/kg. For freeze-dried coffee, the LOQ levels for spirotetramat enol, -ketohydroxy and -monohydroxy were 0.1 mg/kg, i.e., the fortification levels were not sufficiently low enough, further, some recoveries of parent and enol glucoside at the indicated LOQ level were outside the acceptable range, as a result the method performance was not considered satisfactory.

#### *Stability of residues in stored analytical samples*

Storage stability studies were performed with banana with peel, peeled banana, green coffee bean, roasted coffee bean and freeze-dried coffee. They indicated that the residues were stable during the frozen storage intervals of field trial samples. Stabilities of residues in commodities not assessed by the present Meeting are covered by the storage stability data evaluated by the 2008 JMPR, which demonstrated stability of all analytes for up to 2 years for a diverse range of commodities.

#### *Results of supervised residue trials on crops*

The Meeting received supervised residue trial data for the foliar application of spirotetramat as a suspension concentrate formulation (SC) to a variety of crops, i.e., blueberries, cranberry, banana, pineapple, pomegranate, blue onion, spring onion, watercress, globe artichoke and coffee.

In the discussions below, spirotetramat plus enol residues considered first for the estimation of maximum residue levels followed by total residues (spirotetramat plus the metabolites enol, ketohydroxy, monohydroxy, and enol glucoside, expressed as spirotetramat) for estimation of STMR and HR values for the dietary risk assessments.

### *Berries and other small fruits*

#### *Blueberries*

In Canada, spirotetramat is registered at a rate of 0.20 kg ai/ha, a 7-day retreatment interval, a total seasonal rate of 0.44 kg, and a 7-day PHI. Eleven residue trials were conducted in the USA (7) and Canada (4) with three applications at a rate of 0.17–0.19 kg ai/ha, total seasonal rate of 0.52–0.56 kg ai/ha, 5–8 days retreatment intervals and 6–8 days PHIs. Of the trials, two were not considered independent as they were conducted at the same site, with the same variety at very close dates of application.

Residues of spirotetramat plus enol from the trials were (n=10): 0.14, 0.17, 0.21, 0.31, 0.37, 0.39, 0.53, 0.53, 0.68 and 0.69 mg/kg.

Total residues of spirotetramat from the trials were (n=10): 0.38, 0.44, 0.45, 0.49, 0.60, 0.66, 0.69, 1.1, 1.2 and 1.6 mg/kg.

The Meeting estimated a maximum residue level of 1.5 mg/kg and an STMR of 0.63 mg/kg and an HR of 1.6 mg/kg for bush berries as blueberry is a representative crop of the subgroup.

#### *Cranberry*

In Canada, spirotetramat is registered for the use on cranberry at a rate of 0.20 kg ai/ha, a 7-day retreatment interval, a total seasonal rate of 0.44 kg, and a 7-day PHI. Six residue trials were conducted in the USA and Canada with three applications at a rate of 0.17–0.19 kg ai/ha, total seasonal rate of 0.52–0.55 kg ai/ha, 6–8 days retreatment intervals and 7–8 days PHIs, approximating the Canadian GAP.

Residues of spirotetramat plus enol from the trials were (n=6): < 0.02, 0.023, 0.025, 0.046, 0.058 and 0.12 mg/kg.

Total residues of spirotetramat from the trials were (n=6): < 0.05, 0.054, 0.055, 0.076, 0.088 and 0.15 mg/kg.

The Meeting estimated a maximum residue level of 0.2 mg/kg and an STMR of 0.066 mg/kg and an HR of 0.15 mg/kg for cranberry.

### *Assorted tropical and sub-tropical fruits-inedible peel*

#### *Banana*

Five residue trials were conducted using five applications in Hawaii, USA, according to the USA GAP (rate of 0.28 kg ai/ha, 14-day retreatment interval, total seasonal rate of 1.4 kg ai/ha, and 1-day PHI). In one trial, application was made on bagged banana. For the other four trials, banana bunches were not bagged, however, residues in pulp were not analysed, except one trial.

From the trials, residues of spirotetramat plus enol in unbagged whole banana were (n=4): 0.16, 0.55, 1.0, 1.4 and 1.7 mg/kg.

From the trials, total residues of spirotetramat in unbagged whole banana were (n=4): 0.2, 0.62, 1.2, 1.4 and 1.8 mg/kg.

In the one trial, residues in pulp were 0.14 mg/kg (0.55 mg/kg for whole) for spirotetramat plus enol and 0.19 mg/kg (0.62 mg/kg for whole) for total spirotetramat.

The Meeting could not estimate a maximum residue level for banana as the number of trials was considered insufficient.

#### *Pineapple*

Five trials were conducted in Hawaii, USA with two applications, according to the USA GAP (rate of 0.18 kg ai/ha, 14-day retreatment interval, total seasonal rate of 0.36 kg ai/ha, and 1-day PHI). In these trials the preparation of samples did not comply with the relevant FAO guidelines, i.e., samples underwent cutting/quartering at the field site.

As the handling of samples did not comply with the relevant FAO guidelines on sample preparation, the Meeting decided that residue data could not be used for the estimation of a maximum residue level.

#### *Pomegranate*

Four trials were conducted in the USA with two applications, complying with the GAP of the USA (rate of 0.18 kg ai/ha, 14-day retreatment interval, 0.36 kg ai/ha/12-month, and a 1-day PHI). In these trials the preparation of samples did not comply with the relevant FAO guidelines, i.e., samples underwent cutting/quartering at the field site. As a result the residue data could not be used in estimating a maximum residue level.

#### *Bulb vegetables,*

##### *Onion, bulb*

Twelve trials were performed in Canada and USA with two applications, according to the USA GAP (rate of 0.09 kg ai/ha, 7-day retreatment interval, total seasonal rate of 0.18 kg ai/ha, and 3-day PHI). Two trials were not independent as they were conducted at the same site with the same variety with the same dates of application.

Residues of spirotetramat plus enol from the trials were (n=11): < 0.02, < 0.02, < 0.02, 0.026, 0.046, 0.051, 0.057, 0.058, 0.075, 0.095 and 0.28 mg/kg.

Total residues of spirotetramat from the trials were (n=11): < 0.05, < 0.05, < 0.05, 0.056, 0.076, 0.081, 0.087, 0.088, 0.11, 0.13 and 0.32 mg/kg.

Based on the residue values, the Meeting estimated a maximum residue level of 0.4 mg/kg.

The 2011 JMPR recommended a maximum residue level of 0.4 mg/kg, an STMR of 0.11 mg/kg and an HR of 0.27 mg/kg, based on the residues from trials in Australia matching GAP (2 applications at 0.048 kg ai/ha with a PHI of 7 days).

The Meeting therefore confirmed its previous maximum residue level recommendation of 0.4 mg/kg for onion, bulb.

##### *Spring onion*

Two trials were performed in Canada with two applications, matching the USA GAP (rate of 0.09 kg ai/ha, 7-day retreatment interval, total seasonal rate of 0.18 kg ai/ha, and 7-day PHI). The residues were 0.093 and 0.24 mg/kg as spirotetramat plus enol, 0.16 and 0.32 mg/kg as total residues.

The Meeting considered the number of trials insufficient to estimate a maximum residue level.

*Watercress*

Three trials were performed in the USA with two applications, according to GAP of the country (rate of 0.22 kg ai/ha, 7-day retreatment interval, total seasonal rate of 0.45 kg ai/ha, and 3-day PHI).

Two trials were not independent as they were conducted at the same site with the same variety, with dates of application 13 days apart. In addition, in one trial, two methods of application were utilized, i.e., using a backpack sprayer and overhead mini-sprinkler in a separate plot. These treatments were considered replicates of the trial. As a result one residue value was selected from each of the trials.

Residues from the trials were 0.26 and 0.32 mg/kg for spirotetramat plus enol, 0.51 and 0.56 mg/kg for total residues. The Meeting could not estimate a maximum residue level due to insufficient residue data.

The Meeting noted that the residues from the trials were covered by the previously recommended maximum residue level for leafy vegetables.

*Artichoke, globe*

Five trials were conducted in Canada and the USA with four applications, according to the USA GAP (rate of 0.15 kg ai/ha, 7-day retreatment interval, total seasonal rate of 0.56 kg ai/ha, and 3-day PHI).

Residues of spirotetramat plus enol from the trials were (n=5): 0.13, 0.20, 0.27, 0.47 and 0.49 mg/kg.

Total residues of spirotetramat from the trials were (n=5): 0.23, 0.34, 0.41, 0.60 and 0.70 mg/kg.

The Meeting estimated a maximum residue level of 1 mg/kg and an STMR of 0.41 mg/kg and an HR of 0.70 mg/kg for artichoke, globe.

*Coffee beans*

Five trials were conducted in Hawaii, USA with three applications, according to the GAP of that country (rate of 0.18 kg ai/ha, 21-day retreatment interval, total seasonal rate of 0.53 kg ai/ha, and 14-day PHI). Exceptionally, in one trial, a retreatment interval between the second and third application was 7 days due to an earlier ripening of coffee beans. The Meeting considered such a divergence from GAP would have little impact on the final residue level. Two trials were not considered independent as they were carried out at geographically close sites on the same variety within the same growing season.

Residues of spirotetramat plus enol from the four trials available were: 0.020, 0.028, 0.031 and 0.038 mg/kg; and 0.050, 0.059, 0.062 and 0.072 mg/kg for total residues of spirotetramat.

The Meeting considered the number of trials insufficient to estimate a maximum residue level.

*Animal feeds*

Residue information on animal feeds was not available for this Meeting.

*Fate of residues during processing*

One processing study for pineapple juice and pineapples processing by-products, roasted coffee bean and freeze-dried coffee were made available. However, the estimation of processing factors was not required as maximum residue levels could not be recommended for pineapple and coffee beans.

***Residues in animal commodities***

From the evaluations by the present Meeting, no feed items were added to the feed list evaluated by the 2011 JMPR. The Meeting retained the residue levels for animal commodities estimated by the 2011 and 2012 JMPR.

**RECOMMENDATIONS**

On the basis of the data from supervised trials, the Meeting concluded that the residue concentrations listed below are suitable for establishing MRLs and for assessing IEDIs and IESTIs.

*Definition of the residue (for compliance with MRL for plant commodities):* Spirotetramat and its enol metabolite, 3-(2,5-dimethylphenyl)-4-hydroxy-8-methoxy-1-azaspiro[4.5]dec-3-en-2-one, expressed as spirotetramat.

*Definition of the residue (for estimation of dietary intake) for plant commodities:* Spirotetramat, enol metabolite 3-(2,5-dimethylphenyl)-4-hydroxy-8-methoxy-1-azaspiro[4.5]dec-3-en-2-one, ketohydroxy metabolite 3-(2,5-dimethylphenyl)-3-hydroxy-8-methoxy-1-azaspiro[4.5]decane-2,4-dione, monohydroxy metabolite cis-3-(2,5-dimethylphenyl)-4-hydroxy-8-methoxy-1-azaspiro[4.5]decan-2-one, and enol glucoside metabolite glucoside of 3-(2,5-dimethylphenyl)-4-hydroxy-8-methoxy-1-azaspiro[4.5]dec-3-en-2-one, expressed as spirotetramat.

*Definition of the residue (for compliance with MRL and estimation of dietary intake) for animal commodities:* Spirotetramat enol metabolite, 3-(2,5-dimethylphenyl)-4-hydroxy-8-methoxy-1-azaspiro[4.5]dec-3-en-2-one, expressed as spirotetramat.

The residue is not fat-soluble.

**DIETARY RISK ASSESSMENT*****Long-term intake***

The ADI for spirotetramat is 0–0.05 mg/kg bw. The International Estimated Daily Intakes (IEDIs) for spirotetramat were estimated for the 13 GEMS/Food Consumption Cluster Diets using the STMR or STMR-P values estimated by the previous and present JMPR. The results are shown in Annex 3. The IEDIs ranged 2–20% of the maximum ADI. The Meeting concluded that the long-term intake of residues of spirotetramat from uses considered by the JMPR is unlikely to present a public health concern.

***Short-term intake***

The ARfD for spirotetramat is 1.0 mg/kg bw. The International Estimate Short Term Intakes (IESTIs) for difenoconazole were calculated for the food commodities for which STMRs or HRs were estimated by the present Meeting and for which consumption data were available. The results are shown in Annex 4. The IESTIs varied from 0–2% of the ARfD for children and 0–1% for general population.

The Meeting concluded that the short-term intake of residues of spirotetramat from other uses that have been considered by the present Meeting is unlikely to present a public health concern.

