

5.26 PHORATE (112)

RESIDUE AND ANALYTICAL ASPECTS

Phorate is a systemic organophosphate contact insecticide and acaricide that inhibits acetylcholinesterase activity. Residue and analytical aspects of phorate were evaluated by the JMPR in 1977, 1984, 1990, 1991, 1992 and 2005. The evaluation of 2005 was a periodic review. The toxicological review was conducted in 2004, which established an ADI of 0–0.0007 mg/kg bw and an ARfD of 0.003 mg/kg bw. The residue definition for phorate, both for enforcement and for risk assessment for animal and plant commodities, is: Sum of the parent, its oxygen analogue, and their sulfoxides and sulfones, expressed as phorate. The total residue is not fat-soluble.

During the 2005 periodic review of phorate, the JMPR noted that the acute dietary intake of potato by children aged up to 6 years amounted to 120% of the ARfD. This value represents the IESTI for potato, microwaved with peel. The CCPR decided therefore in 2006 not to advance the maximum residue level in the Codex step system. The CCPR in 2007 was informed that the manufacturers would provide additional data for processed potato in 2008 for evaluation by the 2009 JMPR.

The 2009 JMPR reviewed a new processing study in potatoes to facilitate a refinement of the risk assessment. The Meeting decided however that the experiment in which frozen potatoes with peel were microwaved did not reflect common practice. The Meeting also could not confirm that the extensive weight loss noted in the study did not result in an unusual loss of phorate residues. The Meeting therefore decided to not use the results of the new processing study, and confirmed its previous recommendations.

Following the registration of phorate in Mexico, information on a new Mexican (alternative) GAP was provided by the manufacturer to enable the assessment of existing and proposed MRLs on potatoes.

Methods of analysis

The Meeting received description and validation data for an analytical method used in the study report.

The method was validated for the determination of phorate and its related metabolites (phorate sulfoxides, phorate oxon, phorate sulfone and phorate oxon sulfoxides) after oxidation to a common fully oxidized moiety, phorate oxon sulfone, in potatoes. Phorate-related residues were determined by gas chromatography with flame photometric detection (GC-FPD) with a LOQ of 0.048 mg/kg.

Stability of pesticide residues in stored analytical samples

The Meeting received no new data on the stability of residues in potatoes. The stability of phorate residues in potatoes was confirmed for 706 days in study data submitted to the 2005 Meeting of the JMPR.

Results of supervised residue trials on crops

The Meeting received supervised trials data for phorate-related residues on potatoes.

Potatoes

Field trials involving phorate treatment on potatoes were conducted in Mexico in 2011. A phorate granular formulation was applied in-furrow at planting, at a rate of 2.55 kg ai/ha.

The GAP in Mexico for phorate on potatoes is for a single in-furrow application at planting at 1.95–2.55 kg ai/ha at PHI 90 days. All field trials conducted in Mexico matched the critical GAP. Total phorate-related residues in potato were: < 0.048, < 0.048, < 0.048, < 0.048, < 0.048, < 0.048, 0.048, 0.17 mg/kg (n=8).

The Meeting estimated a maximum residue limit of 0.3 mg/kg. The Meeting estimated an STMR value of 0.048 mg/kg and an HR value of 0.17 mg/kg. The Meeting agreed to withdraw the previous recommendation of 0.5 mg/kg and to replace it by the recommendation of 0.3 mg/kg based on alternative GAP from Mexico.

Fate of residues during processing

The Meeting did not receive new information on the fate of phorate-related residues during processing of potatoes.

The 2005 JMPR estimated processing factors (median or best estimate) for potato as indicated below. The 2009 JMPR reviewed a new study of processing but decided not to use the results. Using the HR and the STMR for potato (0.17 mg/kg and 0.048 mg/kg respectively), the Meeting estimated HR-Ps and STMR-Ps for their processed commodities as listed below.

Commodity	Processing factors	STMR-P mg/kg	HR-P mg/kg
Potato chips	< 0.07	0.0034	
Potato granules	2.4	0.12	
Peeled potatoes	0.265	0.013	0.045
Potatoes boiled with peel	0.13	0.006	0.022
Potatoes boiled without peel	0.11	0.005	0.019
Potatoes baked with peel	0.28	0.013	0.048
Potatoes baked without peel	0.27	0.013	0.046
French fries	0.38	0.018	
Raw potato peels	0.68	0.033	
Potatoes microwaved with peel	0.36	0.017	0.061

Livestock dietary burden

The Meeting noted that the potato median and highest residues and potato processed commodity median residues did not result in a significant change in livestock dietary burden, therefore having no impact on the 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: *sum of the parent, its oxygen analogue, and their sulfoxides and sulfones, expressed as phorate.*

The Meeting considers the residue not fat-soluble.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDI) of phorate, based on the STMRs estimated for commodities, for the five GEMS/Food regional diets, were in the range of 10 to 40% of the maximum ADI (0.0007 mg/kg bw), see Annex 3. Since raw potatoes with peel are not consumed in significant amounts, the highest STMR for potato processed commodities (i.e., 0.018 mg/kg for French fries) was used in the IEDI calculations. The Meeting concluded that the long-term intake of residues of phorate resulting from the uses that have been considered by JMPR are unlikely to present a public health concern.

Short-term intake

The International Estimated Short Term Intake (IESTI) for phorate was calculated for food commodities for which maximum residue levels were estimated and for which consumption data was available. The results are shown in Annex 4.

The IESTI for potatoes using alternative GAP from Mexico represented 0–100% of the ARfD (0.003 mg/kg bw) for children. Since raw potatoes with peel are not consumed in significant amounts, the highest HR for potato processed commodities (i.e., 0.061 mg/kg for microwaved potatoes with peel) was used for the aggregate total large portion values. When the total for raw and processed potatoes is refined using data from other countries, potato microwaved with peel represents 0–60% of the ARfD and potato dried (granules/flakes) represents 0–70% of the ARfD for children. The Meeting concluded that the short-term intake of residues of phorate resulting from the uses that have been considered by the JMPR are unlikely to present a public health concern.