5.6 CHLOROTHALONIL (081) AND METABOLITES R611965 AND SDS-3701

TOXICOLOGY

R611965 (3-carbamyl-2,4,5-trichlorobenzoic acid, formerly known as SDS-46851) is a chlorothalonil metabolite that is formed in the soil and taken up through the roots by crops. The present Meeting evaluated R611965 for the first time.

Chlorothalonil (Chemical Abstracts Service [CAS] No. 1897-45-6) and SDS-3701, a chlorothalonil metabolite that is found in plants, soil and ruminants, were last evaluated by the Joint FAO/WHO Meeting on Pesticide Residues (JMPR) in 2009.

The present Meeting evaluated the newly submitted studies on R611965 at the request of the 2009 JMPR, to address the toxicological relevance of this soil degradation product.

All critical studies complied with good laboratory practice (GLP).

Biochemical aspects

Following a single oral dose of R611965 at 10 or 1000 mg/kg body weight (bw) in rats, at least 16–27% is absorbed (based on urinary excretion within 48–96 h). Excretion is rapid, with 90% being excreted within 48–96 h, predominantly in faeces (68–77% of the dose). Biliary excretion was not assessed. Seven days after administration, less than 0.3% of the administered dose was found in tissues and carcass; highest levels were observed in liver. No obvious sex differences in kinetics were observed.

Toxicological data

The acute oral toxicity of R611965 in rats is low (median lethal dose [LD_{50}] > 5000 mg/kg bw). No data on acute dermal or inhalation toxicity, eye or skin irritation or skin sensitization were available.

Repeated-dose toxicity studies showed that R611965 had low oral toxicity in mice, rats and dogs. The overall no-observed-adverse-effect level (NOAEL) in short-term (28 and 90 days) and chronic studies (18 months) in mice was 1022 mg/kg bw per day, the highest dose tested in an 18-month carcinogenicity study. In rats, the overall NOAEL in short-term (14, 30 and 90 days) and chronic studies (2 years) was 200 mg/kg bw per day, based on bilateral retinal atrophy observed at 500 mg/kg bw per day in a 2-year combined chronic toxicity and carcinogenicity study.

In a 90-day study in dogs, the NOAEL was 50 mg/kg bw per day, based on reduced body weight gain and watery stools in both sexes at 500 mg/kg bw per day.

In an 18-month study in mice and a 2-year study in rats, no carcinogenic effects of R611965 were observed. The Meeting concluded that R611965 is not carcinogenic in rodents.

R611965 was tested in an adequate range of studies of genotoxicity in vitro and in vivo. There was no evidence for genotoxicity. The Meeting concluded that R611965 is unlikely to be genotoxic.

In view of the lack of genotoxicity and the absence of carcinogenicity in mice and rats, the Meeting concluded that R611965 is unlikely to pose a carcinogenic risk to humans.

In one-generation and two-generation studies of reproductive toxicity with R611965 in rats, the overall NOAEL for parental, reproductive and offspring toxicity was 20 000 ppm, equal to 911 mg/kg bw per day, the highest dose tested.

In a study of developmental toxicity in rats, the NOAEL for maternal and developmental toxicity was 2000 mg/kg bw per day, the highest dose tested. In a study of developmental toxicity in rabbits, a NOAEL for maternal toxicity could not be determined. The lowest-observed-adverse-effect level (LOAEL) for maternal toxicity was 250 mg/kg bw per day, the lowest dose tested, on the basis of abortions, clinical signs (increased incidences of few or no faeces, soft faeces, anorexia and thinness) and slightly reduced body weight gain. The NOAEL for fetal toxicity was 500 mg/kg bw per day, based on a decreased number of live fetuses and decreased fetal weight observed at 1000 mg/kg bw per day.

No neurotoxicity studies with R611965 were available. In acute and repeated-dose oral studies in mice, rats, rabbits and dogs in which R611965 was administered in the diet, by gavage or by capsule, no neurotoxic signs were observed.

No data on R611965 in humans were provided.

The Meeting concluded that the existing database on R611965 was sufficient to characterize the potential hazards to fetuses, infants and children.

Toxicological evaluation

The Meeting noted that the soil metabolite R611965 is considerably less toxic than the parent compound chlorothalonil (e.g., NOAELs of 200 versus 1.8 mg/kg bw per day in 2-year rat studies, respectively). R611965 is not acutely toxic by the oral route. The metabolite induced adverse effects in only a few repeated-dose oral toxicity studies in rats and dogs, at levels of 250–500 mg/kg bw per day. In the majority of the repeated-dose studies in rodents, no effects were observed at doses of 911–2000 mg/kg bw per day.

In view of the lower toxicity of the metabolite R611965 in comparison with the parent compound chlorothalonil (acceptable daily intake [ADI] = 0–0.02 mg/kg bw; acute reference dose [ARfD] = 0.6 mg/kg bw), the Meeting considered it unnecessary to derive a separate ADI and ARfD for this metabolite, for risk management purposes.

An addendum to the toxicological monograph was prepared.

Levels relevant for risk assessment

Species	Study	Effect	NOAEL	LOAEL
Mouse	Eighteen-month study of carcinogenicity	Carcinogenicity	1022 mg/kg bw per day[a]	—
Rat	Two-year study of toxicity and carcinogenicity[b]	Toxicity	200 mg/kg bw per day	500 mg/kg bw per day
		Carcinogenicity	1000 mg/kg bw per day[a]	—
	One- and two-generation studies of reproductive toxicity[b]	Parental toxicity	20 000 ppm, equal to 911 mg/kg bw per day[a]	—
		Offspring toxicity	20 000 ppm, equal to 911 mg/kg bw per day[a]	—
		Reproductive toxicity	20 000 ppm, equal to 911 mg/kg bw per day[a]	—
	Developmental toxicity[c]	Maternal toxicity	2000 mg/kg bw per day[a]	—
		Fetotoxicity	2000 mg/kg bw per day[a]	—
Rabbit	Developmental toxicity[c]	Maternal toxicity	—	250 mg/kg bw per day[d]
		Fetotoxicity	500 mg/kg bw per day	1000 mg/kg bw per day

Species	Study	Effect	NOAEL	LOAEL
Dog	Ninety-day study [e]	Toxicity	50 mg/kg bw per day	500 mg/kg bw per day

[a] Highest dose tested.

[b] Dietary administration.

[c] Gavage administration.

[d] Lowest dose tested.

[e] Capsule administration.

Estimate of acceptable daily intake for humans

Unnecessary

Estimate of acute reference dose

Unnecessary

Information that would be useful for the continued evaluation of the compound

Results from epidemiological, occupational health and other such observational studies of exposures in humans

Critical end-points for setting guidance values for exposure to chlorothalonil metabolite R611965

Absorption, distribution, excretion and metabolism in mammals	
Rate and extent of absorption	Rapid; at least 16–27% at 10 and 1000 mg/kg bw (rat)
Distribution	Highest concentration in liver (rat)
Potential for accumulation	Low (rat)
Rate and extent of excretion	90% excretion within 48–96 h (rat)
Metabolism in animals	No data
Toxicologically significant compounds (in animals, plants and the environment)	R611965
Acute toxicity	
LD_{50}, oral, rat	> 5000 mg/kg bw
LD_{50}, dermal, rat	No data
LC_{50}, inhalation, rat	No data
Dermal irritation	No data
Ocular irritation	No data
Dermal sensitization	No data
Short-term studies of toxicity	
Target/critical effect	Body weight, clinical signs (dog)
Lowest relevant oral NOAEL	50 mg/kg bw per day (dog)
Lowest relevant dermal NOAEL	No data
Long-term studies of toxicity and carcinogenicity	
Target/critical effect	Bilateral retinal atrophy (rat)

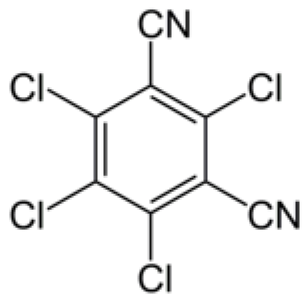
Lowest relevant NOAEL	200 mg/kg bw per day (rat)
Carcinogenicity	Not carcinogenic
Genotoxicity	
	Not genotoxic
Reproductive toxicity	
Reproduction target/critical effect	No reproductive effects (rats)
Lowest relevant reproductive NOAEL	20 000 ppm, equal to 911 mg/kg bw per day, highest dose tested (rats)
Developmental target	Decreased number of live fetuses, decreased fetal weight in the presence of maternal toxicity (rabbits); not teratogenic
Lowest relevant developmental NOAEL	500 mg/kg bw per day (rabbits)
Neurotoxicity/delayed neurotoxicity	
Neurotoxicity	No data; no indication of neurotoxic potential in acute and repeated-dose oral studies
Medical data	
	No data

RESIDUE AND ANALYTICAL ASPECTS

Chlorothalonil is a non-systemic fungicide first evaluated by JMPR in 1974 and a number of times subsequently. It was recently reviewed for toxicology by the 2009 JMPR within the periodic review programme of the CCPR. For the parent substance an ADI of 0–0.02 mg/kg bw and an ARfD of 0.6 mg/kg bw were established. In addition to the parent substance an ADI of 0–0.008 mg/kg bw and an ARfD of 0.03 mg/kg bw were established for the metabolite SDS-3701. In the 2010 JMPR chlorothalonil was scheduled for periodic review for residues. The 2010 JMPR evaluated newly submitted studies on the metabolite R611965 at the request of the 2009 JMPR to address the toxicological relevance of this soil degradation product.

CCPR, at its Forty-first Session in 2009, noted that one manufacturer would submit residue data to JMPR for the consideration by the 2010 JMPR. Additional information on the uses in okra and papaya were submitted by the COLEACP (Comité de Liaison Europe-Afrique-Caraïbes-Pacifique). Information on GAP was also provided by Australia, the Ivory Coast, Japan and the Netherlands.

This evaluation is based on the latest FAO specifications for chlorothalonil, limiting the amount of the impurity hexachlorobenzene (HCB) to a maximum of 0.04 g/kg. There may be implications for HCB in animal commodities, if chlorothalonil were to contain higher levels of this impurity.



The following abbreviations are used for the metabolites discussed below:

chlorothalonil	tetrachloroisophthalonitrile
SDS-3701	2,5,6-trichloro-4-hydroxyisophthalonitrile
R611965	3-carbamyl-2,4,5-trichlorobenzoic acid
R417888	2-carbamyl-3,5,6-trichloro-4-cyanobenzenesulfonic acid
R611966	2,4,5-trichloro-3-cyano benzamide

Animal metabolism

The Meeting received animal metabolism studies with [^{14}C]chlorothalonil and [^{14}C]SDS-3701 in rats, lactating goats and laying hens. In all studies carbon atoms in the ring structure were substituted with ^{14}C. In general the metabolism of chlorothalonil is very limited giving only SDS-3701 as the detectable residue beside the unchanged parent.

In the 2009 Evaluation for toxicology it was reported that "in rats given a single oral dose of chlorothalonil at 1.5–50 mg/kg bw, absorption was about 31%, with 17–21% being excreted in the bile and about 8–12% being excreted in the urine. In rats, the highest tissue concentrations were found in the kidney, probably due to binding to kidney proteins. Chlorothalonil is metabolized via initial glutathione conjugation and subsequent enzymatic processing of the di-and triglutathion substituents via the mercapturic acid and cysteine conjugate β-lyase pathways yielding N-acetyl cysteine, cysteinyl-glycine and S-methyl-derivates."

For lactating goats five animals were dosed with parent [^{14}C]-chlorothalonil at rates of 3 or 30 ppm in the diet over a period of 8 consecutive days. TRR found in muscle and fat were at a comparable level of 0.004 mg/kg for the low dose animals and 0.03–0.038 mg/kg for the high dose animals. In milk TRR levels up to 0.015 mg/kg and 0.19 mg/kg were found for the two dose groups. Highest TRR levels were found in liver and kidney and concentrations equivalent to 0.085 and 0.24 mg/kg, respectively, for the low dose animals and 0.73 to 2.3 mg/kg, respectively, for the high dose animals. The only metabolite identified was SDS-3701 found at 30–58% in milk, 3–6% in liver and 2–3% in kidney of the TRR. Muscle and fat were not further identified. Although no other specific metabolites could be identified, complex mixtures of components were found in the samples with a molecular weight of 46000–54000 Da.

In a comparable study animals were dosed with 0.2 or 2 ppm SDS-3701 for 9 consecutive days. TRR levels found in the various tissues and milk for the low and high does animals were: muscle 0.02/0.13 mg/kg, fat 0.02/0.08 mg/kg, liver 0.07/0.77 mg/kg, kidney 0.26/1.35 mg/kg and milk 0.15/1.0 mg/kg. For all matrices > 90% of the radioactivity could be released and was identified as unchanged SDS-3701.

For laying hens the animals were dosed with [^{14}C]-chlorothalonil at rates of 2, 6 or 20 ppm over 21 consecutive days. In the eggs collected over the length of the study a plateau of the TRR was observed after 13–17 days at a level of 0.035–0.047 mg/kg for the 20 ppm dose group. In all tissues, except liver, TRR levels were below the LOQ of the LSC method (0.01 mg/kg). In liver TRR levels of 0.098 and 0.05 mg/kg were found for the 6 and 20 ppm dose group, respectively. Further analysis on the composition of radioactivity was not conducted.

A comparable study was conducted using [^{14}C]-SDS-3701 at dose rates of 0.1, 0.3 and 1.0 ppm over 21 consecutive days. In egg white, pectoral muscle, adductor muscle and fat, no TRRs above the LOQ of 0.01 mg/kg were found in any dose group. TRR in cardial muscle were < 0.01 mg/kg for the 0.1 ppm group, 0.55 mg/kg for the 0.3 ppm dose group and 0.15 mg/kg for the 1.0 ppm dose group. TRR in skin gave a single high result for the 1.0 ppm dose group of 37 mg/kg, but no detectable residues for the 0.1 and 0.3 ppm group were found. Egg yolk and liver gave detectable TRRs for all dose groups (0.1, 0.3 and 1.0 ppm) at levels of 0.044, 0.12 and 0.42 mg/kg for egg yolk and 0.056, 0.27 and 0.78 mg/kg for liver, respectively. Further identification of the radioactivity was conducted for egg yolk, revealing that > 80% of the TRR consisted of unchanged SDS-3701.

Plant metabolism

The Meeting received plant metabolism studies with [^{14}C]-chlorothalonil in lettuce, tomatoes, carrots, celery and snap beans. Parent substance labelled in the phenyl-ring was used in all of these studies.

Generally in all matrices, unchanged chlorothalonil was identified as the major residue. The only metabolite identified was SDS-3701, which was present in amounts of < 10% of the TRR in edible parts and up to 12% of the TRR in non-edible parts of the plants. The remaining radioactivity consisted of numerous polar metabolites at individual levels too low for further investigation. Translocation within the plants was very limited.

In a study on lettuce the plants were treated four times at dose rates equivalent to 1.75 kg ai/ha. Lettuce samples were taken after 1, 3, 7, 10, 14 and 21 days. The mean TRRs were 118 mg/kg at PHI 1 day, increasing to 170 mg/kg at PHI 3 days and 158 mg/kg after 21 days. Identification of the radioactivity revealed at least 87% (88–155 mg/kg) of unchanged chlorothalonil in the extract. The only other metabolite identified was SDS-3701, found in amounts of 2% of the TRR (1.5–3.1 mg/kg). Polar water-soluble residue, which did not partition into diethyl ether, accounted for between 4.7 and 7.0% TRR (approximately 5–11 mg/kg).

For tomatoes the metabolism of chlorothalonil was investigated following three applications at rates of 2.3 kg ai/ha each made to plants in growth chambers. Samples of fruit and vines were collected after 1, 7 and 14 days. TRR levels in the fruit declined from 2.6 mg/kg after 1 day to 0.6 mg/kg after 14 days. In vines TRRs stayed relatively stable at levels between 12.7–20.6 mg/kg. Extraction of fruit showed that 56–75% of the total residue was present in the dichloromethane rinse. The major identified component of the total organosoluble fraction was parent chlorothalonil, which accounted for 56–76% and 41–73 % of the total residue in fruit and vines respectively. The metabolite SDS-3701 was identified as a minor component of the organosoluble fractions but represented < 4% of the residue in fruit and a maximum of 8% of the residue in vines.

In a study on carrots, treated three times at rates of 1.6 kg ai/ha each, samples of roots and foliage were collected 1, 7, 14 and 21 days after the final treatment. TRR levels in roots were relatively stable ranging from 0.012 to 0.12 mg/kg. In foliage TRR was measured at 9.7–40.2 mg/kg. In roots collected after 21 days, about 45% of the TRR (0.023 mg/kg) was identified as chlorothalonil. SDS-3701 was found at amounts of 3.9% of the TRR (0.002 mg/kg). In the foliage a large part of the radioactivity remained unextracted (39.1–45.9%). Chlorothalonil levels decreased from 13.7% of the TRR (1.85 mg/kg) down to 4% (0.1 mg/kg). In parallel SDS-3701 residues increased from 3.4% of the TRR (0.49 mg/kg) to 12.1% (0.3 mg/kg) at day 21.

The metabolism of chlorothalonil in celery was investigated using 12 applications of 2.5 kg ai/ha at intervals of 6–8 days. Samples of stalks and foliage were collected 7 and 21 days after the final treatment. Total radioactive residues found in stalks were 0.7 to 4.6 mg/kg. In the foliage much higher TRR levels of 52–263 mg/kg were detected. The only substance identified was unchanged chlorothalonil at levels of 10–55% of the TRR in the stalks and 42–80% of the TRR in foliage. Unextracted residues were in the range of 21-35% of the TRR for stalks and 8–24% of the TRR for foliage. Further treatment using hydrolytic enzymes and hydrochloric acid released about 30% of the unextracted residues, but further identification was not possible due to a complex mixture of components.

For snap beans, grown outdoor, the metabolism of chlorothalonil was investigated following four, weekly applications, at rates of 2.5 kg ai/ha each. Samples of beans and foliage were collected after 7 and 28 days. The TRRs in the foliage (154 mg/kg at PHI 7 days; 90 mg/kg at PHI 28 days) were higher than those in the edible beans (mean of 1.0 mg/kg at PHI 7 days; 1.8 mg/kg at PHI 28 days). Analysis of the organosoluble fractions by HPLC showed that chlorothalonil was the only significant component in both the bean and foliage samples. Further analyses indicated the probable presence of SDS-3701 and R611965, however levels were too low for definitive identification or quantification (LOQ 0.02 mg/kg and 0.03 mg/kg for SDS-3701 and R611965 respectively).

Environmental fate in soil

The Meeting received information on photolysis on soil, aerobic soil metabolism and residues in rotational crop (confined and field studies).

The photolysis of chlorothalonil and its metabolite SDS-3701 was investigated in two soil types using artificial irradiation. Both substances were stable with more than 97% of the applied radioactivity still being extractable.

Aerobic soil metabolism was investigated in four soils using [^{14}C]-chlorothalonil. The parent compound was found to be degraded quickly with estimated half-life times of less than 1.9 days. Several metabolites could be identified. Primary degradation products were SDS-3701 (6.3–25.3% of the dose), R417888 (5.8–14.1% of the applied dose) and R611965 (2.0–13.2% of the applied dose). Mineralisation after 120 days was relatively low at 6.3–23.8% of the applied dose.

In a confined rotational crop study radio labelled chlorothalonil was applied to soil at a rate equivalent to approx. 12 kg ai/ha. Follow crops (lettuce, carrots and wheat) were planted after 30 or 88 days and grown to the point of commercial harvest. After 30 days TRR levels in lettuce (3.3 mg/kg), carrots (1.0 mg/kg for roots, 2.2 mg/kg for tops) and wheat grain (3.3 mg/kg) were of the same magnitude, while in wheat straw higher TRRs of 51.9 mg/kg were found. After the 88 day plant back interval (PBI) TRRs in lettuce (1.0 mg/kg) and carrot (0.9 mg/kg for roots, 3.2 mg/kg for tops) remained more or less unchanged while in wheat higher radioactive residue levels were found in comparison to the 30 day PBI (21.6 mg/kg in grain, 63.8 mg/kg in straw).

Identification of the radioactivity revealed no unchanged parent substance in the radioactive residue. In the organosoluble fraction 37.3–63.1% of the TRR consisted of R611965, while up to 2.5% of the TRR were identified as SDS-3701. In the aqueous fraction the amounts were up to 16.9% of the TRR being R611965 and up to 11.9% SDS-3701.

Field crop rotation studies using chlorothalonil were conducted in the USA. At three location soil was treated with eight application of 2.5 kg ai/ha each. Follow crops (spinach, snapbeans, carrots and wheat) were planted 14 to 450 days after the final application. All samples collected at the point of commercial harvest were analysed for residues of SDS-3701 and R611965.

Residues of SDS-3701 were found at relatively low levels, ranging from < 0.01 mg/kg in legume vegetables and cereals grains up to 0.19 mg/kg in leafy vegetables. In root and tuber vegetables (tubers and tops) as well as in straw of cereal grains SDS-3701 residues were between 0.03 mg/kg and 0.08 mg/kg.

A second set of studies investigated the residues of chlorothalonil, SDS-3701 and R611965 following treatments of primary crops according to US GAP at 12 locations. Application rates involved 3–12 treatments at rates of 1.2–2.5 kg ai/ha each. As follow crops a large spectrum of crop groups (root and tuber vegetables, bulb vegetables, fruiting vegetables, legume vegetables, leafy and brassica vegetables, pulses, oilseeds and cereals) were selected.

In the follow crops residues of chlorothalonil and SDS-3701 were not found above the LOQs in most cases. Single results at or slightly above the LOQ of 0.01–0.02 mg/kg were found occasionally. For peanut vines one result of 0.22 mg/kg chlorothalonil was found. At another location pea fodder and bean hay contained chlorothalonil at levels of 0.06 mg/kg and 0.09 mg/kg, respectively and SDS-3701 of 0.07 mg/kg and < 0.02 mg/kg, respectively.

Residues of R611965 above the LOQ of 0.03 mg/kg were detected more frequently. While in most trials R611965 residue levels were below 0.3 mg/kg single high results were found for turnip tops (0.59 mg/kg), oat straw (2.95 mg/kg), spinach (0.8 mg/kg), winter squash (1.05 mg/kg) and potatoes (0.64 mg/kg).

A field dissipation study conducted at locations in Canada and the USA confirmed the results from the aerobic soil metabolism. After 3 to 10 subsequent applications of chlorothalonil, residues in soil declined to less than 50% of the initial residue within the first 30 days, reaching the LOQ of 0.01 mg/kg after approximately 120 days. Residues of SDS-3701 were detectable for the whole study period of up to 540 days, but its levels in soil were relatively low mostly around 0.02–0.05 mg/kg. In the study conducted in the USA higher residues of SDS-3701 were found in the first 30 days after the final treatment, ranging from 0.05 mg/kg up to 0.23 mg/kg.

The Meeting concluded that parent chlorothalonil degrades quickly within the first 100 days after treatment. No significant transfer into follow crops was observed. SDS-3701 was present for a period of more than one year, but at levels between the LOQ and 0.1 mg/kg in soil as well as in follow crops. Following treatment with chlorothalonil higher residues of the soil metabolite R611965 were found, being the major residue in soil as well as in rotational crops.

Methods of analysis

The Meeting received information on analytical methods for the determination of chlorothalonil, SDS-3701 and R613636 in plant matrices and SDS-3701 in bovine tissues, milk and eggs.

Methods for plant matrices involve extraction and homogenisation with acetone:5M sulphuric acid solution (95:5 v/v). After centrifugation and further clean-up (e.g., by SPE extraction) the extracts are analysed either by gas- or liquid-chromatography in combination with electron-capture- or mass-selective detection (MS or MS/MS for R613636 only: m/z 282.91 to 239.75 and 282.91 to 42.1). Using MS-techniques LOQs of 0.01 mg/kg were achieved for all plant matrices. A specific method submitted for the determination of celery using GC-ECD was validated at 0.03 mg/kg. The Meeting concluded that a LOQ of 0.01 mg/kg for chlorothalonil, SDS-3701 and R613636 achievable with the analytical methods available. Analytical recovery data were satisfactory in plant commodities. Residue methods were tested by independent laboratories unfamiliar with the analysis and were found to have satisfactory recoveries and no background interferences.

The Meeting noted that in some matrices (e.g., lettuce, celery and cabbage) careful treatment during the homogenisation may be required for parent chlorothalonil to avoid a loss of extractable residues during the sample preparation due to enzymatic degradation. A study was submitted showing the stability of chlorothalonil residues in fortified samples prior to homogenisation following addition of sulphuric acid (0.1M) at 10% v/w. The 1997 JMPR reported that homogenisation of frozen samples under addition of dry ice or inactivation of the cell structure by microwaving before the sample preparation also improves the extraction rate.

In animal matrices one method for analysis of SDS-3701 was reported also using extraction and homogenisation with acetone:5M sulphuric acid (95:5 v/v) from muscle, liver and kidney, with acetonitrile:5M sulphuric acid (95: 5 v/v) from fat, with acetonitrile from milk and with acetonitrile:water (3:1 v/v) from eggs. SDS-3701 residues are analysed by high performance liquid chromatography with triple quadrupole mass spectrometric detection (LC-MS/MS, m/z 244.9 to 181.9). The LOQ achieved in the validations was 0.01 mg/kg for all matrices.

Although no data on analytical multi-residue method for plant commodities were submitted to Meeting it is noted that chlorothalonil parent substance is validated within existing QuEChERS-Multimethods.

Stability of residues in stored analytical samples

Information was received on the freezer storage stability of chlorothalonil in plant commodities and SDS-3701 in animal commodities.

In plant commodities two types of data were used. The first data set consisted of incurred residues in different samples from one treated field trial plot, which were analysed up to 7 years after harvest. The variation within the results indicated a sampling uncertainty much higher than possible from degradation during freezer storage. Therefore it was consluded that this information could not be used for further investigation on the freezer storage stability of chlorothalonil.

In fortified samples stored up to 12 months no significant degradation (> 70% remaining) was observed in peach, strawberries, orange, potato, carrot, onion, cabbage, leek, lentil tomato, melon, sugarbeet and barley forage. In peas and barley straw less than 70% of the initial concentration of chlorothalonil was found after 6 months or more.

For animal commodities the freezer storage stability of SDS-3701 was investigated in fortified bovine tissues and milk for up to 12 months. In muscle, fat and milk recoveries were stable (> 70%) for the whole test period. In liver samples analytical recoveries were 63% after 9 months and 67% after 12 months, indicating a possible degradation of the residue when stored longer than 6 months.

Definition of the residue

In animals chlorothalonil is quickly metabolised with SDS-3701 being the only metabolite in all matrices. Separation between skim milk and cream in livestock feeding studies gave comparable residue levels in both compartments. The same result can be found in muscle and fat, giving slightly higher residues in fat at the lowest dose group but comparable residue levels in these tissues at higher dosing.

The Meeting concluded that the residue definition (risk assessment and enforcement) for chlorothalonil in animal matrices is SDS-3701 only. The residue in not considered fat-soluble.

The residue following use of chlorothalonil in crops is predominantly unchanged chlorothalonil. In all metabolism studies the unchanged parent compound was the major residue, mainly located on the surface of the plants. The only other metabolite identified was SDS-3701 in amounts of less than 3% of the TRRs.

In soil, the degradation of chlorothalonil happens relatively quickly with an estimated half-life of less than 2 days. Significant metabolites identified in soil metabolism and in rotational crops were SDS-3701 and R611965. The residue in follow crops mainly consists of R611965 (up to 50% of the TRR), while SDS-3701 remained at levels between 0.01 and 0.05 mg/kg. Unchanged parent substance was found at or below the LOQ in most cases.

The Meeting concluded that parent chlorothalonil is a representative marker in all plant commodities and decided to set the residue definition for enforcement purposes in plant commodities to be parent chlorothalonil only.

For dietary intake purposes the metabolite SDS-3701 was identified to be of higher acute and chronic toxicity than the parent substance (maximum ADI value of 0.008 mg/kg bw, ARfD of 0.03 mg/kg bw), but follows a different toxicological endpoint. Although found at low levels following direct treatment, in follow crops or after processing, the low toxicological reference values require an independent additional dietary intake assessment. Therefore the Meeting decided to consider SDS-3701 separately in the residue definition for the estimation of the dietary intake.

The soil metabolite R611965 was identified to be the major residue in follow crops found in a broad variety of commodities. The 2010 Meeting of the JMPR concluded that R611965 is considerably less toxic (e.g., NOAEL = 200 mg/kg bw per day; 2-year-rat study) than the parent compound chlorothalonil (e.g., NOAEL 1.8 mg/kg bw per day; 2-year-rat study). R611965 is not acutely toxic by the oral route. The Meeting decided that the contribution of R611965 to the overall dietary intake of plant and animal commodities arising from residues in follow crops is insignificant in comparison to chlorothalonil and that its inclusion in the residue definition for risk assessment purposes was not required.

Definition of the residue (for compliance with MRL) for plant commodities: *chlorothalonil*

Definitions of the residue (for estimation of dietary intake) for plant commodities:

- *chlorothalonil*
- *SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile), all considered separately*

Definition of the residue (for compliance with MRL and for estimation of dietary intake) for animal commodities: *SDS-3701 (2,5,6-trichloro-4-hydroxyisophthalonitrile)*

The residue is not fat-soluble.

Results of supervised trials on crops

The Meeting received supervised residue trials data for chlorothalonil on peaches, plums, blueberries, cranberries, currants, grapes, strawberries, bananas, mangoes, papaya, bulb onions, spring onions, leek, cauliflower, Brussels sprouts, head cabbage, courgettes, cucumbers, melons, winter squash, okra, peppers, tomatoes, sweet corn, carrots, potatoes, asparagus, celery, green beans, pulses, soya beans, maize, almonds, pistachios and peanuts.

In trials where duplicate field samples from replicated or unreplicated plots were taken at each sampling time and analysed separately, the higher residue was taken as the best estimate of the residue from the plot. Supervised field trials conducted with different formulations on identical varieties, locations and dates were not considered as independent. The highest result according to the corresponding GAP was selected in these cases.

Labels (or translation of labels) were available from Australia, Brazil, Costa Rica, Cyrpus, Ireland, Ivory Coast, Japan, Moldavia, Slovenia, Spain, the Netherlands, the United Kingdom and the United States of America describing the registered uses of chlorothalonil.

The NAFTA calculator was used as a tool in the estimation of the maximum residue level from the selected residue data set obtained from trials conducted according to GAP. As a first step, the Meeting reviewed all relevant factors related to each data set in arriving at a best estimate of the maximum residue level using expert judgement. Then, the NAFTA calculator was employed. If the statistical calculation spreadsheet suggested a different value from that recommended by the JMPR, a brief explanation of the deviation was supplied. Some common factors that may lead to rejection of the statistical estimate include when the number of data points in a data set is < 15 or when there are a large number of values < LOQ.

The Meeting noted that in several commodities (e.g., lettuce, celery, cabbage) careful treatment for chlorothalonil during sample preparation may be required to ensure a deactivation of enzymes at or before the homogenisation process, otherwise possibly resulting in a reduced rate of extraction. It was concluded that trials not following this procedure can not be considered valid for a recommendation by the JMPR, but the results may be taken into account as additional information for the evaluation.

In this section the assessment of residues resulting from uses of chlorothalonil on plants for the purpose of estimating maximum residue levels, STMR and HR values are reported. The estimation of STMR and HR values for SDS-3701 in crops being subject to crop rotation is described in the section for residues in follow crops.

Stone fruits

The use of chlorothalonil on peaches, nectarines and plums is registered in Cyprus with up to 4 applications at rates of 1.5 kg ai/ha (0.15 kg ai/hL) with a PHI of 15 days.

Three supervised field trials conducted in Southern Europe according to this GAP was submitted, but these trials did not involve appropriate treatment of the samples during homogenisation so as to avoid a loss of extractable residues.

The Meeting decided that the data submitted for the use of chlorothalonil on stone fruits was not sufficient for the estimation of maximum residue levels and HR or STMR values.

The Meeting withdraws its previous recommendation for chlorothalonil in cherries of 0.5 mg/kg and in peaches of 0.2 mg/kg.

Blueberries

Chlorothalonil is registered on blueberries in the USA with application rates of 3.4 kg ai/ha with a PHI of 42 days. Supervised field trials conducted in the USA according to this GAP were submitted.

The corresponding chlorothalonil residues in fruits were (n = 2): 0.1 and 0.32 mg/kg. Residues of SDS-3701 were: < 0.01 and < 0.01 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.55 and 0.65 mg/kg. Residues of SDS-3701 were: < 0.01 and 0.042 mg/kg.

The Meeting concluded that the available information on chlorothalonil in blueberries was not sufficient for a recommendation.

Cranberries

The use of chlorothalonil on cranberries is registered in the USA with application rates of 5.5 kg ai/ha with a PHI of 50 days and a maximum annual rate of 17 kg ai/ha. Supervised field trials conducted in the USA according to this GAP were submitted.

The corresponding chlorothalonil residues in fruits were: 0.79 and 3.7 mg/kg. Residues of SDS-3701 were: < 0.01 and 0.06 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.75, 1.4, 2.9 and 4.3 mg/kg. Residues of SDS-3701 were: < 0.01(4) mg/kg.

The Meeting concluded that the overall information on chlorothalonil in cranberries are not sufficient for a recommendation and withdraws its previous recommendation for chlorothalonil in cranberries of 5 mg/kg,

Currants and gooseberries

For currants chlorothalonil is registered in the United Kingdom with up to 4 application of 2.5 kg ai/ha each with a PHI of 28 days. Supervised field trials conducted in the United Kingdom according to this GAP were submitted.

The corresponding chlorothalonil residues in fruits were: 0.99, 1.9, 3.5 and 5.0 mg/kg. Residues of SDS-3701 were not analysed.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 5.6 and 10 mg/kg. Residues of SDS-3701 were not analysed.

The Meeting recognized that additional information from two supervised residue trials in currants homogenised without measures to inhibit enzymic activity are available, resulting in higher residues than the field trial data considered as valid. Since the valid dataset available is sufficient for a recommendation of a maximum residue level for currants on its own, the Meeting decided to take the additional informative data into account for its recommendation also, including the probability of higher residues in its estimate.

The Meeting recommends a maximum residue level for chlorothalonil in currants (black, red, white) of 20 mg/kg and concluded to extrapolate the data from currants to gooseberries also. To accommodate for the uncertainty involved with the additional data, the Meeting decided to base the dietary risk assessment (chronic and acute) on the maximum residue level also.

The value derived from use of the NAFTA Calculator was 12.5 mg/kg. The Meeting considered a value of 20 mg/kg as more appropriate in view of the additional information based on currant samples with possible extraction loss.

The Meeting withdraws its previous recommendations for chlorothalonil currants (black, red, white) of 5 mg/kg.

Strawberry

Chlorothalonil is registered on strawberries grown indoor or outdoor in Cyprus and Slovenia with application rates of 1.5 kg ai/ha with a PHI of 7 days. Supervised field trials conducted in Southern Europe according to these GAPs were submitted.

For strawberries grown in the field (outdoor) the corresponding chlorothalonil residues were (n = 8): 1.9, 1.9, 2.0, 2.1, 2.2, 2.4, 2.5 and 3.0 mg/kg.

Residues of SDS-3701 were not analysed.

On protected strawberries the corresponding chlorothalonil residues in fruits were (n = 8): 0.64, 0.68, 1.0, 1.1, 1.3, 1.4, 2.3 and 2.4 mg/kg.

Residues of SDS-3701 were not analysed.

Based on the use of chlorothalonil in field the Meeting estimated a maximum residue level, an STMR and an HR value for strawberries of 5, 2.05 and 3 mg/kg, respectively.

The value derived from use of the NAFTA Calculator was 3.2 mg/kg. The Meeting considered a higher value of 5 mg/kg for its recommendation taking into account that the small variation within the data probably results in an underestimation of the MRL by statistical methods.

Grapes

In Moldavia the use of chlorothalonil on grapes is registered with four applications of 1 kg ai/ha and a PHI of 21 days. Corresponding supervised field trials conducted in Europe were submitted.

Residues of chlorothalonil in grapes were (n = 8): 0.34, 0.48, 0.71, 0.92, 0.99, 1.1, 1.4 and 1.6 mg/kg.

Residues of SDS-3701in grapes were not analysed.

The Meeting decided to recommend a maximum residue level for grapes of 3 mg/kg, and estimated an STMR and an HR value of 0.955 mg/kg and 1.6 mg/kg, respectively, for chlorothalonil, based on the use of chlorothalonil on grapes in Moldavia.

The value derived from use of the NAFTA Calculator was 2.9 mg/kg, providing good correlation with the Meetings recommendation.

The Meeting withdraws its previous recommendation for chlorothalonil in grapes of 0.5 mg/kg.

For SDS-3701 in grapes supervised field trials data from Europe are available which were conducted according to GAP reported for Moldavia. Residues were < 0.01, < 0.01 and 0.15 mg/kg. Although these trails were not considered valid for the evaluation of chlorothalonil residue due to a possible loss of residue during the extraction, enzymic degradation is not reported for SDS-3701. The Meeting therefore decided that the data may be used for the estimation of an STMR of 0.01 mg/kg and an HR of 0.15 mg/kg for SDS-3701 in grapes.

Bananas

For bananas chlorothalonil is registered in Brazil with application rates of 1 kg ai/ha with a PHI of 0 days. Supervised field trials conducted in the Middle America involved treatment of bagged bananas at application rates of at least 1.7 kg ai/ha.

The Meeting concluded that the data on bananas are not corresponding to the GAP and therefore a recommendation on a maximum residue levels is not possible.

The Meeting withdraws its previous recommendation of a maximum residue level of 0.01* mg/kg (including a footnote: "Based on trials with bagged bananas").

Mangoes

The use of chlorothalonil on mangoes is registered in the USA with application rates of 2.9 kg ai/ha with a PHI of 21 days. One supervised field trial conducted in the USA according to this GAP was submitted, but no appropriate treatment of the samples during homogenisation to avoid a loss of extractable residues was applied.

The Meeting decided that the data submitted for the use of chlorothalonil on mangoes are not sufficient for the estimation of maximum residue levels, HR or STMR values.

Papaya

For papaya chlorothalonil is registered in the Ivory Coast with 6 applications of 1.4 kg ai/ha with a PHI of 3 days. Supervised field trials conducted in the Ivory Coast according to this GAP were submitted.

The corresponding chlorothalonil residues in fruits were (n = 2): 1.2 and 3.6 mg/kg.

In Brazil chlorothalonil is registered for the use on papaya with up to 7 treatments at spray concentrations of 0.21 kg ai/hl each with a PHI of 7 days. Supervised field trials conducted in Brazil according to this GAP were submitted.

The corresponding chlorothalonil residues in whole fruits were (n = 10): 0.74, 1.3, 1.6, 1.9, 4.5, 4.9, 5.1, 9.4, 10 and 13 mg/kg. In the pulp residues were (n = 2): 0.49 and 0.64 mg/kg. The ratio of the residue levels between whole fruit and pulp in two trials was 0.49 and 0.09.

Residues of SDS-3701 in whole papaya fruits were (n = 4): < 0.01(3) and 0.01 mg/kg. In the pulp residues were (n = 2): < 0.01 and < 0.01 mg/kg.

Based on the data for whole fruits treated according to Brazilian GAP the Meeting estimated a maximum residue level of 20 mg/kg for chlorothalonil in papayas. The NAFTA procedure suggested a maximum residue level of 30 mg/kg, based on the UCL 95 Median. For the estimation the Meeting also considered additional information on the decline of residues starting from day 0, which indicate a stable level of overall residues in papaya fruits independent of the PHI with residues all below the estimated maximum residue level by the Meeting of 20 mg/kg.

Since supervised field trial data are very limited on chlorothalonil residues in papaya pulp, the Meeting decided to apply the higher ratio of 0.49 for residue concentrations between whole fruit and pulp to the median and highest residue found for the whole fruit. Under consideration of metabolism data suggesting that the application of chlorothalonil results in surface residues, the ratio of 0.49 is considered as an overestimation of the likely residue in papaya pulp. Based on this approach the Meeting estimated an STMR value of 2.3 mg/kg (0.49 × 4.7 mg/kg) and an HR value of 6.4 mg/kg (0.49 × 13 mg/kg) for chlorothalonil in papaya pulp.

Based on the data following direct treatment of papayas the Meeting estimated an STMR and an HR value of 0.01 mg/kg for SDS-3701.

Bulb onions

For bulb onions chlorothalonil is registered in the United Kingdom with 2 application of 1 kg ai/ha each with a PHI of 14 days. Supervised field trials conducted according to this GAP were submitted, but these trials did not involve appropriate treatment of the samples during homogenisation to avoid a loss of extractable residues.

The Meeting concluded that the data submitted for the use of chlorothalonil on bulb onions are not sufficient for a recommendation and withdraws its previous recommendation for chlorthalonil of 0.5 mg/kg.

Leek

For leek chlorothalonil is registered in the Netherlands with 5 application of 1.5 kg ai/ha each with a PHI of 14 days. Supervised field trials from Northern France and the United Kingdom, conducted according to GAP were submitted.

The corresponding chlorothalonil residues in whole plants (bulb and leaves) were (n = 6): 8.2, 11, 15, 18, 21 and 22 mg/kg.

Residues of SDS-3701 were not analysed.

An additional GAPs for the use of chlorothalonil on leek was reported from Spain involving up to 4 applications with 1.5 kg ai/ha each and a PHI of 10 days. Supervised field trials conducted in Italy according to this GAP were submitted.

The corresponding chlorothalonil residues in whole plants (bulb and leaves) were (n = 2): 4.7 and 7 mg/kg.

Residues of SDS-3701 were not analysed.

Based on the dataset for the use of chlorothalonil on leek in Northern Europe the Meeting considered a value of 40 mg/kg appropriate as a maximum residue level for leek. The value derived from the NAFTA calculator agreed with the estimate of 40 mg/kg made by the present Meeting (after rounding (NAFTA = 37 mg/kg)).

The Meeting estimated a maximum residue level, and STMR and an HR value of 40 mg/kg, 17.5 mg/kg and 22 mg/kg, respectively.

Spring onions

The use of chlorothalonil on spring onions is registered in United Kingdom with 2 application of 1 kg ai/ha each with a PHI of 14 days. Supervised field trials conducted in United Kingdom according to this GAP were submitted.

The corresponding chlorothalonil residues in spring onions were (n = 4): 0.17, 0.77, 0.9 and 7.5 mg/kg.

Residues of SDS-3701 were (n = 4): < 0.01, < 0.01, 0.01 and 0.05 mg/kg.

Additional supervised field trials on spring onions conducted in Italy were submitted, but no corresponding GAP was reported for chlorothalonil.

For spring onions the value derived from the NAFTA calculator was 8.75 mg/kg, based on the UCL95 Median. The Meeting estimated a maximum residue level, and STMR and an HR value of 10 mg/kg, 0.835 mg/kg and 7.5 mg/kg for spring onions, respectively, and decided to extrapolate this recommendation to Chinese onions and Welsh onions also.

Brussels sprouts

The use of chlorothalonil on Brussels sprouts is registered in the United Kingdom with 2 applications at rates of 1.5 kg ai/ha each with a PHI of 7 days. Supervised field trials conducted with several formulations in Northern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues were: 0.22, 0.44, 0.65, 1.2, 1.5(3), 1.6 and 2.8 mg/kg.

Residues of SDS-3701 were (n = 7): < 0.01(5), 0.01 and 0.01 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.18, 0.28, 0.45, 0.47, 0.53, 0.92 and 1.1 mg/kg. Residues of SDS-3701 were not analysed.

For Cyprus chlorothalonil is registered for Brussels sprouts with 4 applications of 1.5 kg ai/ha each with a PHI of 7 days. Supervised field trials conducted in the Southern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in Brussels sprouts were (n = 4): 0.73, 0.81, 0.95 and 1.3 mg/kg.

Residues of SDS-3701 were (n = 4): < 0.01(3) and 0.02 mg/kg.

Based on the dataset for the use of chlorothalonil on Brussels sprouts in United Kingdom the Meeting considered a value of 6 mg/kg appropriate as a maximum residue. The value derived from the NAFTA calculator was 6.3 mg/kg.

The Meeting estimated a maximum residue level, and STMR and an HR value of 6 mg/kg, 1.5 mg/kg and 2.8 mg/kg, respectively.

The Meeting withdraws its previous recommendation for chlorothalonil in Brussels sprouts of 5 mg/kg.

Cabbages, Head

No trials matching GAP for chlorothalonil residues in head cabbage were submitted to the Meeting.

The Meeting withdraws its previous recommendation for chlorothalonil in head cabbage of 1 mg/kg.

Flowerhead brassica

For cauliflower chlorothalonil is registered in the United Kingdom with 2 application of 1.5 kg ai/ha each with a PHI of 7 days. Supervised field trials conducted in the United Kingdom according to this GAP were submitted.

The corresponding chlorothalonil residues in cauliflowers were: 0.07, 0.09, 0.11, 0.2, 0.5 and 0.84 mg/kg.

Residues of SDS-3701 were (n = 4): < 0.01(4) mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.45, 0.47, 0.8, 2.1 and 2.3 mg/kg. Residues of SDS-3701 were not analysed.

In Cyprus the use of chlorothalonil on cauliflower is registered with up to 4 application with 1.5 kg ai/ha each with a PHI of 7 days. Supervised field trials conducted in the Southern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in cauliflowers were (n = 4): 0.09, 0.19, 0.39 and 0.52 mg/kg.

Residues of SDS-3701 were (n = 4): < 0.01(4) mg/kg.

The Meeting recognized that additional information from supervised residue trials in cauliflowers homogenised without measures to inhibit enzymic activity are available, resulting in higher residues than the field trial data considered as valid. Since the valid dataset available is sufficient for a recommendation of a maximum residue level for cauliflower on its own, the Meeting decided to take the additional informative data into account for its recommendation also, including the probability of higher residues in its estimate.

The Meeting recommends a maximum residue level for chlorothalonil in flowerhead brassica of 5 mg/kg. To accommodate for the uncertainty involved with the additional data, the Meeting decided to base the dietary risk assessment (chronic and acute) on the maximum residue level also.

The Meeting withdraws its previous recommendation for chlorothalonil in cauliflower of 1 mg/kg.

Cucumber, gherkins and summer squash

The use of chlorothalonil on cucumbers (outdoor) is registered in Spain with 3 application of 2.25 kg ai/ha each with a PHI of 3 days. Supervised field trials conducted in Italy did not match the PHI registered.

In the USA the use of chlorothalonil on cucumbers (outdoor) is registered with application rates of 2.5 kg ai/ha with a PHI of 0 days. Supervised field trials conducted in the USA according to this GAP were submitted.

The corresponding chlorothalonil residues in cucumbers were (n = 5): 0.14, 0.25, 0.41, 0.79 and 1.3 mg/kg.

For chlorothalonil on protected cucumbers a registered use from the Netherlands was reported involving 3 application with 2.25 kg ai/ha with a PHI of 3 days. One supervised field trials conducted in Germany according to this GAP was submitted.

The corresponding chlorothalonil residue in cucumbers was: 0.36 mg/kg.

Based on the dataset for cucumbers from the US the Meeting estimated a maximum residue level, an STMR and an HR for chlorothalonil in cucumbers of 3 mg/kg, 0.41 mg/kg and 1.3 mg/kg, respectively. The result from the NAFTA-calculator was 3.4 mg/kg, providing good compliance with the Meetings estimation. The Meeting also decided to extrapolate its recommendations for cucumbers to gerkins and summer squash.

The Meeting withdraws its previous recommendation for chlorothalonil in cucumbers and summer squash of 5 mg/kg.

Melons, except Watermelon

The use of chlorothalonil on melons (outdoor) is registered in Cyprus with 4 application of 1.5 kg ai/ha each with a PHI of 3 days. Supervised field trials conducted in Southern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in melons (whole fruits) were: 0.31, 0.57, 0.6, 0.6 and 1.0 mg/kg.

Residues of chlorothalonil in melon pulp were (n = 5): < 0.01, < 0.01, 0.04, 0.2 and 0.21 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.018, 0.03, 0.039, 0.043, 0.1, 0.12, 0.18, 0.19, 0.31, 0.32, 0.39 and 0.87 mg/kg in the whole fruit. Residues of SDS-3701 were not analysed.

For chlorothalonil on protected melon a registered use from Cyprus with 4 application of 1.5 kg ai/ha each and a PHI of 3 days was reported. Supervised field trials conducted in Southern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in melons (whole fruits) were: 0.13, 0.21, 0.27, 0.31, 0.52 and 0.58 mg/kg.

Residues of chlorothalonil in melon pulp were (n = 5): < 0.01, < 0.01, 0.04 and 0.05 mg/kg.

Based on the data for field melon from Southern Europe the Meeting confirms the maximum residue level of 2 mg/kg for melons, except watermelons and estimated an STMR and an HR value 0.04 mg/kg and 0.21 mg/kg in the pulp, respectively.

The MRL derived from use of the NAFTA Calculator was 1.5 mg/kg. Due to the low number of results the Meeting concluded that the results of the NAFTA-calculator are not reliable and should not be used for a recommendation.

Winter squash

For chlorothalonil on winter squash a registered use from the USA involving applications with 2.5 kg ai/ha and a PHI of 0 days was reported. One supervised field trial conducted according to this GAP was submitted, but it did not involve appropriate treatment of the samples during homogenisation to avoid a loss of extractable residues.

The Meeting concluded that the data submitted for the use of chlorothalonil on winter squash is not sufficient for a recommendation and withdraws its previous recommendation for chlorthalonil of 5 mg/kg.

Okra

For okra chlorothalonil is registered in the Ivory Coast with 2 application of 1.0 kg ai/ha each with a PHI of 2 days. Supervised field trials conducted in the Ivory Coast according to this GAP were submitted, but did not involve appropriate treatment of the samples during homogenisation to avoid a loss of extractable residues. The corresponding chlorothalonil residues in okras were (n = 4): 0.06, 0.15, 0.82 and 1.0 mg/kg.

The Meeting concluded that the data submitted for the use of chlorothalonil on okra is not sufficient for a recommendation.

Peppers

For peppers supervised field trials involving chlorothalonil from Brazil were submitted matching the GAP of 0.2 kg ai/hL with a PHI of 7 days.

Corresponding residues in bell peppers were (n = 4): 1.1, 1.5, 1.7 and 4.4 mg/kg.

The Meeting decided that the data submitted are not sufficient for a recommendation on maximum residue levels or for the estimation of STMR and HR values for chlorothalonil in peppers.

The Meeting withdraws it previous recommendation for peppers, sweet of 7 mg/kg and peppers, chili (dry) of 70 mg/kg.

Tomatoes

For tomatoes chlorothalonil is registered in the United States with applications of 2.4 kg ai/ha each with a PHI of 0 days. Supervised field trials conducted in the US according to this GAP were submitted, but they either did not involve appropriate treatment of the samples during homogenisation to avoid a loss of extractable residues or were not collected according to the recommended FAO sampling procedure. The corresponding chlorothalonil residues in tomato fruits were: 0.94, 1.0, 1.3, 1.3, 1.4, 1.4, 1.8, 1.9, 2.2, 2.7, 2.7, 5.3, 6.0 and 6.4 mg/kg, the corresponding SDS-3701 residues in tomato fruits were: < 0.03, < 0.03, 0.06 mg/kg.

The Meeting concluded that the data submitted for the use of chlorothalonil on tomatoes is not sufficient for an recommendation and withdraws its previous recommendation for chlorthalonil of 5 mg/kg.

Sweet corn

The use of chlorothalonil on sweet corn is registered in the United States with applications of 1.7 kg ai/ha each with a PHI of 14 days. Supervised field trials conducted in the US according to this GAP were submitted, but did not involve appropriate treatment of the samples during homogenisation to avoid a loss of extractable residues. The corresponding chlorothalonil residues in ears were: < 0.01(3) mg/kg, the corresponding SDS-3701 residues in ears were: < 0.01, < 0.01 and 0.01 mg/kg.

The Meeting concluded that the data submitted for sweet corn is not sufficient for a recommendation and withdraws its previous recommendation for chlorothalonil in sweet corn of 0.01* mg/kg.

Beans, shelled (legume vegetables)

For the use of chlorothalonil on legume vegetables supervised field trials in the United Kingdom on green beans without pods were submitted, but no corresponding GAP was reported.

The Meeting withdraws its previous recommendation for chlorothalonil in common beans (pods and/or immature seeds) of 5 mg/kg.

Pulses

For beans (pulses) chlorothalonil is registered in Spain with 2 application of 1.5 kg ai/ha each with a PHI of 15 days. Supervised field trials conducted in Southern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in dry seeds were (n = 7): 0.05, 0.05, 0.11, 0.19, 0.32, 0.52 and 0.68 mg/kg.

The corresponding SDS-3701 residues in dry seeds were (n = 7): < 0.01, < 0.01, 0.02(3), 0.04 and 0.04 mg/kg.

For chick peas (pulses) chlorothalonil is registered in Spain with 2 application of 1.5 kg ai/ha each with a PHI of 15 days. Supervised field trials were conducted in Southern Europe according to this GAP.

The corresponding chlorothalonil residues in dry seeds were: 0.1, 0.28, 0.34 and 0.62 mg/kg.

The corresponding SDS-3701 residues in dry seeds were (n = 4): < 0.01(3), 0.02 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.11, 0.11, 0.17, 0.29, 0.31, 0.39 and 0.44 mg/kg. Residues of SDS-3701 were not analysed.

The use of chlorothalonil on soya beans (pulses) is registered in the United States with applications of 1.9 kg ai/ha each with a PHI of 42 days. Supervised field trials conducted in the US according to this GAP were submitted.

The corresponding chlorothalonil residues in dry seeds were: < 0.01(3) and 0.019 mg/kg.

The Meeting decided to make a recommendation for the whole group of pulses based on the data on beans treated according to the submitted GAP from Spain and estimated a maximum residue level and an STMR value for pulses of 1 and 0.19 mg/kg, respectively.

The value derived from use of the NAFTA Calculator was 1.4 mg/kg, providing good compliance with the value estimated by the Meeting.

The Meeting withdraws its previous recommendation for chlorothalonil in beans (dry) of 0.2 mg/kg.

Root and tuber vegetables

For carrots chlorothalonil is registered in Spain with 3 application of 1.5 kg ai/ha each with a PHI of 15 days. Supervised field trials conducted in Southern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in carrots were (n = 6): < 0.01, 0.01, 0.02, 0.02, 0.05 and 0.06 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.08 and 0.19 mg/kg. Residues of SDS-3701 were not analysed.

The use of chlorothalonil on potatoes is registered in the United Kingdom with 5 applications of 1.5 kg ai/ha each with a PHI of 7 days. Supervised field trials conducted in Northern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in potato tubers were: < 0.01(7) and 0.01 mg/kg.

In Cyprus chlorothalonil is registered on potatoes with 3 applications of 1.5 kg ai/ha each with a PHI of 10 days. Supervised field trials conducted in Southern Europe according to this GAP were submitted.

The corresponding chlorothalonil residues in potato tubers were: < 0.01(4) mg/kg.

The Meeting recognized that additional information from supervised residue trials in carrots homogenised without measures to inhibit enzymic activity are available, resulting in higher residues than the field trial data considered as valid. Since the valid dataset available is sufficient for a recommendation of a maximum residue level for root and tuber vegetables on its own, the Meeting decided to take the additional informative data into account for its recommendation also, including the probability of higher residues in its estimate.

The Meeting recommends a maximum residue level for chlorothalonil in root and tuber vegetables of 0.3 mg/kg. To accommodate for the uncertainty involved with the additional data, the Meeting decided to base the dietary risk assessment (chronic and acute) on the maximum residue level also.

The Meeting withdraws its previous recommendations for chlorothalonil in carrots of 1 mg/kg and in potatoes of 0.2 mg/kg.

Asparagus

For asparagus chlorothalonil is registered in the United States with application of 3.4 kg ai/ha each with a PHI of 190 days. Supervised field trials conducted in the US according to this GAP were submitted, but did not involve appropriate treatment of the samples during homogenisation to avoid a loss of extractable residues. The corresponding chlorothalonil residues in asparagus spears were (n = 6): < 0.01(5), 0.033 mg/kg, the corresponding SDS-3701 residues were (n = 6): < 0.01(6) mg/kg.

The Meeting concluded that the data submitted for asparagus is not sufficient for a recommendation for chlorothalonil.

Celery

The use of chlorothalonil on celery is registered in the United States with applications of 2.5 kg ai/ha each with a PHI of 7 days. Supervised field trials conducted in the US according to this GAP were submitted.

The corresponding chlorothalonil residues in celery stalks were: 0.06, 2.0, 3.3 and 7.5 mg/kg.

The corresponding SDS-3701 residues in celery stalks were: 0.02 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR value for celery of 20, 2.65 and 7.5 mg/kg, respectively.

The value derived from use of the NAFTA Calculator was 28 mg/kg. Under consideration of additional trial data conducted at higher application rates the Meeting concluded that the value derived by the calculator was probably an overestimation of the maximum residue level due to a small dataset matching GAP.

The Meeting withdraws its previous recommendations for chlorothalonil in celery of 10 mg/kg and in celery leaves of 3 mg/kg.

Barley

No information on chlorothalonil residues in barley were submitted to the Meeting.

The Meeting withdraws its previous recommendation for chlorothalonil in barley of 0.1 mg/kg.

Maize

The use of chlorothalonil on maize is registered in the United States with applications of 1.7 kg ai/ha each with a PHI of 14 days. No supervised field trials matching this GAP were submitted.

Wheat

No information on chlorothalonil residues in wheat were submitted to the Meeting.

The Meeting withdraws its previous recommendation for chlorothalonil in wheat of 0.1 mg/kg.

Almonds

The use of chlorothalonil on almonds is registered in the United States with applications of 3.4 kg ai/ha each with a PHI of 150 days. Supervised field trials conducted in the US according to this GAP were submitted.

The corresponding chlorothalonil residues in nutmeat were: < 0.03 and < 0.03mg/kg.

The corresponding SDS-3701 residues in nutmeat were: < 0.03 and < 0.03 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of < 0.01(3), 0.01 and 0.01 mg/kg. Residues of SDS-3701 were < 0.01(6).

The Meeting concluded that the data submitted for almonds is not sufficient for a recommendation for chlorothalonil.

Pistachio nut

The use of chlorothalonil on pistachios is registered in the United States with applications of 2.5 kg ai/ha each with a PHI of 14 days. Supervised field trials were conducted in the US with application rates of 5 kg ai/ha and a PHI of 14 days.

The Meeting concluded that the data on pistachios are not corresponding to the GAP reported and therefore recommendations on a maximum residue levels are not possible.

Peanuts

The use of chlorothalonil on peanuts is registered in the United States with applications of 1.3 kg ai/ha each with a PHI of 14 days. Supervised field trials conducted in the US according to this GAP were submitted.

The corresponding chlorothalonil residues in nutmeat were (n = 12): < 0.01(9), 0.01, 0.02, 0.05 mg/kg.

The corresponding SDS-3701 residues in nutmeat were (n = 10): < 0.01(10) mg/kg.

The corresponding R611965 residues in nutmeat, taken up from the soil within the vegetation period, were (n = 10): < 0.03(4), 0.03, 0.03, 0.04, 0.05, 0.05, 0.06 mg/kg.

The Meeting estimated a maximum residue level and an STMR value for peanuts of 0.1 and 0.01 mg/kg, respectively.

Due to the high percentage of residue values below the LOQ the Meeting concluded that the NAFTA procedure is no applicable for the estimation of maximum residue levels in peanuts.

The Meeting withdraws its previous recommendation for chlorothalonil in peanuts of 0.05 mg/kg.

Sweet corn forage

Supervised field trials on sweet corn forage conducted in the United States were submitted, but the US GAP states that sweet corn may not be utilized as forage or silage.

Barley, straw and fodder

No information on chlorothalonil residues in barley were submitted to the Meeting.

The Meeting withdraws its previous recommendation for chlorothalonil in barley, straw and fodder, dry of 20 mg/kg.

Maize stover

Supervised field trials on maize stover conducted in the United States were submitted, but the US GAP states that sweet corn may not be utilized as forage or silage.

Wheat, straw and fodder

No information on chlorothalonil residues in wheat were submitted to the Meeting.

The Meeting withdraws its previous recommendation for chlorothalonil in wheat, straw and fodder, dry of 20 mg/kg.

Almond hulls

The use of chlorothalonil on almond is registered in the United States with applications of 3.4 kg ai/ha each with a PHI of 150 days. Supervised field trials conducted in the US according to this GAP were submitted.

The corresponding chlorothalonil residues in almond hulls were: < 0.03, < 0.03 mg/kg.

The corresponding SDS-3701 residues in almond hulls were: < 0.03 and < 0.03 mg/kg.

Additional information from supervised field trials conducted according to GAP, but not using homogenisation that involves enzyme deactivation, are available, giving residues of 0.03, 0.03, 0.09, 0.63, 0.91 and 1.1 mg/kg. Residues of SDS-3701 were < 0.01(6).

The Meeting concluded that the data submitted for almond hulls is not sufficient for a recommendation for chlorothalonil.

Residues following treatment with chlorothalonil in follow crops

Although residues of chlorothalonil are quickly degraded in soil, the toxicological relevant metabolite SDS-3701 may be taken up by succeeding crops. Information on the DT50 value is not available, but in field dissipation studies residues were found up to 540 days after treatment. It is likely that soil residues would require several years to reach plateau levels and residues in succeeding crops could be higher than those observed in the rotational crop following a single season of applications.

For the estimation of residues in follow crops all residues in field rotational crop studies were compared to the highest annual application rate of 20 kg ai/ha reported for celery from the United States. In the following table residues found in the different commodities were directly scaled based on the individual ratio of active substance applied in the respective trial to a theoretical annual rate of 20 kg ai/ha.

Since residues of parent chlorothalonil were very low giving results at or below the LOQ of the analytical method used, the Meeting concluded that no significant transfer of chlorothalonil into follow crops has to be expected. For dietary intake purposes only residues of SDS-3701 are considered.

The estimation of STMR and HR values was based on the data from follow crops or direct treatment resulting in the highest residue level in the respective crop group. For all permanent crops no significant transfer of SDS-3701 into commodities is expected.

Summary of SDS-3701 residues found in field rotational crop studies scaled to the highest annual rate of 20 kg ai/ha.

Group	No. of trials	Highest results per trial (mg/kg)	Mean in mg/kg	Median in mg/kg	Highest residue in mg/kg
SDS-3701					
Bulb vegetables	3	< 0.01(3)	< 0.01	< 0.01	< 0.01
Brassica vegetables	5	< 0.01, < 0.01, < 0.02(3)	< 0.02	< 0.02	< 0.02
Fruiting vegetables	6	< 0.01(5), < 0.02	< 0.01	< 0.01	< 0.02
Leafy vegetables	9	< 0.01(4), < 0.02, 0.04, 0.04, 0.05, 0.19	0.076	0.02	0.19
Legume vegetables	4	< 0.01(3), < 0.02	< 0.01	< 0.01	< 0.02
Pulses	5	< 0.01, < 0.01, < 0.02(3)	< 0.02	< 0.02	< 0.02
Root and tuber vegetables	12	< 0.01(3), < 0.02(5), 0.02, 0.03(3)	0.02	0.02	0.03
Stem vegetables	1	< 0.02	< 0.02	< 0.02	< 0.02

Group	No. of trials	Highest results per trial (mg/kg)	Mean in mg/kg	Median in mg/kg	Highest residue in mg/kg
Cereal grains	15	< 0.01(7), < 0.02(6), < 0.05, < 0.05	< 0.02	< 0.02	< 0.05
Oilseeds	5	< 0.01, < 0.02(3), < 0.05	0.02	0.02	0.05
Legumes hay and fodder	2	< 0.02, 0.14	0.08	0.08	0.14
Forage of cereal grains	2	< 0.02, 0.04	0.03	0.03	0.04
Straw and fodder of cereal grains	10	< 0.02, 0.02, < 0.03(4), < 0.04, 0.04, 0.04, 0.08	0.036	0.03	0.08
Root leaves and tops	8	< 0.01, 0.01, < 0.02, < 0.02, 0.02, 0.03, 0.04, 0.04	0.024	0.02	0.04

For dietary intake purposes of SDS-3701 in the group of berries and other small fruits, except grapes, residue data on blue- and cranberries are available giving residues of < 0.01(3) and 0.06 mg/kg. Crops within this group are normally not subject to crop rotation. Under consideration of plant metabolism data indicating an overall very low level of SDS-3701 in all plants following direct treatment, the Meeting concluded that the data on blue- and cranberries are also representative for other berries and small fruits, except grapes, and estimated an STMR value of 0.01 mg/kg and an HR value of 0.06 mg/kg for SDS-3701.

Residues in bulb vegetables grown as a rotational crop were < 0.01(3) mg/kg for SDS-3701. For spring onion supervised field trial data are available with SDS-3701 residues of < 0.01, < 0.01, 0.01 and 0.04 mg/kg.

Under consideration of higher residue data from supervised field trials the Meeting estimated an STMR and an HR value of 0.01 mg/kg and 0.04 mg/kg for SDS-3701 in bulb vegetables, respectively.

For brassica vegetables residues of SDS-3701 found in field rotational crop studies were < 0.01, < 0.01 and < 0.02(3) mg/kg. Additional supervised field trial data are available for Brussels sprouts (< 0.01(9), 0.01 and 0.02 mg/kg) and cauliflower (< 0.01(8) mg/kg). Under consideration of all data available the Meeting estimated an STMR and an HR value for SDS-3701 in brassica vegetables of 0.01 mg/kg and 0.02 mg/kg, respectively.

Residues in SDS-3701 in fruiting vegetables grown as a rotational crop were found in field crop rotation studies at levels of < 0.01(5) and < 0.02 mg/kg. In supervised field trials residues of SDS-3701 were investigated in winter squash (0.02 mg/kg) and tomatoes (< 0.03, < 0.03 and 0.06 mg/kg). Under consideration of all residue data available (< 0.01(5), < 0.02, 0.02, < 0.03, < 0.03 and 0.06 mg/kg) the Meeting estimated an STMR and an HR value of 0.015 mg/kg and 0.06 mg/kg, respectively, for fruiting vegetables (cucurbits and other than cucurbits).

In leafy vegetables SDS-3701 residues found in field rotational crops studies were < 0.01(4), < 0.02, 0.04, 0.04, 0.05 and 0.19 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR and an HR value of 0.02 mg/kg and 0.19 mg/kg, respectively, for SDS-3701 residues in leafy vegetables.

The Meeting decided to extrapolate the estimations for SDS-3701 from leafy vegetables to herbs.

For legume vegetables residues of SDS-3701 found in field rotational crop studies were < 0.01(3), < 0.02 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR and an HR value of 0.01 mg/kg and 0.02 mg/kg, respectively, for SDS-3701 residues in legume vegetables.

Residues in SDS-3701 in pulses grown as a rotational crop were found in field crop rotation studies at levels of < 0.01, < 0.01 and < 0.02(3) mg/kg. In supervised field trials residues of SDS-

3701 were investigated in beans (< 0.01, < 0.01, 0.02(3), 0.04 and 0.04 mg/kg) and chick peas (< 0.01(3), 0.02 mg/kg). Under consideration of all residue data available (< 0.01(7), < 0.02(3), 0.02(4), 0.04 and 0.04 mg/kg) the Meeting estimated an STMR value of 0.02 mg/kg.

In root and tuber vegetables SDS-3701 residues found in field rotational crops studies were < 0.01(3), < 0.02(5), 0.02 and 0.03(3) mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR and a HR value of 0.02 mg/kg and 0.03 mg/kg, respectively, for SDS-3701 residues in root and tuber vegetables.

Residues in SDS-3701 in stalk and stem vegetables grown as rotational crops were found in field crop rotation studies at levels of < 0.02 mg/kg. In supervised field trials residues of SDS-3701 were investigated in asparagus (< 0.01(6) mg/kg) and celery (0.02 mg/kg). Under consideration of all available residue data (< 0.01(6), < 0.02 and 0.02 mg/kg) the Meeting estimated an STMR value and a HR value of 0.01 mg/kg and 0.02 mg/kg, respectively.

For cereal grains residues of SDS-3701 found in field rotational crop studies were < 0.01(7), < 0.02(6), < 0.05, < 0.05 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR value of 0.02 mg/kg for SDS-3701 residues in cereal grains.

In oilseeds SDS-3701 residues found in field rotational crops studies were < 0.01, < 0.02(3), and < 0.05 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR value of 0.02 mg/kg for SDS-3701 residues in oilseeds.

Residues in SDS-3701 in legume hay and fodder grown as a rotational crop were found in field crop rotation studies at levels of < 0.02 and 0.04 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR and a highest residue value of 0.03 mg/kg and 0.04 mg/kg, respectively, for SDS-3701 residues in legume hay and fodder.

For forage of cereal grains residues of SDS-3701 found in field rotational crop studies were < 0.02 and 0.04 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR value of 0.03 mg/kg and a highest residue value of 0.04 mg/kg for SDS-3701 residues in forage of cereal grains.

For straw and fodder of cereal grains residues of SDS-3701 found in field rotational crop studies were < 0.02, 0.02, < 0.03(4), < 0.04, 0.04, 0.04, 0.08 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR value of 0.03 mg/kg and a highest residue of 0.08 mg/kg for SDS-3701 residues in straw and fodder of cereal grains.

In tops and leaves of root crops SDS-3701 residues found in field rotational crops studies were < 0.01, 0.01, < 0.02, < 0.02, 0.02, 0.03, 0.04 and 0.04 mg/kg. No information on SDS-3701 residues from supervised field trials was available. The Meeting estimated an STMR and a highest residue value of 0.02 mg/kg and 0.04 mg/kg, respectively, for SDS-3701 residues in tops and leaves of root crops.

Fate of residues during processing

The Meeting received information on the fate of incurred residues of chlorothalonil during the processing of grapes, strawberries, tomatoes, courgettes, cucumbers, winter squash, head cabbage, leek and French beans. Also information was provided on hydrolysis studies of chlorothalonil to assist with identification of the nature of the residue during processing.

The degradation of chlorothalonil was investigated under conditions representative of pasteurisation (pH 4, 90 °C for 20 minutes), baking, brewing and boiling (pH 5, 100 °C for 60 minutes) and sterilisation (pH 6, 120 °C for 20 minutes). Additional experiments were also performed at pH 4 at 120 °C and pH 6 at 90 °C for 20 minutes to investigate which of pH or temperature was the key variable in hydrolytic degradation of chlorothalonil.

At pH 4 chlorothalonil residues were relatively stable with > 90% remaining at 90 °C and 73% remaining at 120 °C.

For pH 5 at 100 °C a moderate degradation was observed in all samples leaving approx. 80% of the initial chlorothalonil. The major degradation product was identified as SDS-3701 at 19% of the initial residue.

For pH6 at 120 °C chlorothalonil is quickly degraded. Under addition of a sodium acetate buffer less than 4% of the chlorothalonil remained. Main degradation products were SDS-3701 (48%) and an artefact (28%, identified as 4-amino-2,5,6-trichloroisophthalonitrile). In sterile water without buffer approx. 26% of the chlorothalonil remained. SDS-3701 constituted 59% of the residue while no formation of the artefact was found.

In contrast to the results obtained from sterile buffer solutions processing studies involving background matrices gave much lower levels of SDS-3701 after the processing. The Meeting decided that besides the normal processing factors for chlorothalonil yield factors for the conversion of parent substance into SDS-3701 should be taken into account for the estimation of the dietary intake. Depending on the outcome the higher STMR-P or HR-P of SDS-3701 → SDS-3701 or chlorothalonil → SDS-3701 is used for the overall estimation of STMR-P and HR-P for SDS-3701 in the processed product. The resulting processing factors relevant for dietary intake of the estimation of maximum residue levels are summarized below:

Processing factors for chlorothalonil

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate	STMR (mg/kg)	STMR-P (mg/kg)	HR (mg/kg)	HR-P (mg/kg)
Grapes	Wine, red	Chlorothalonil: < 0.01(6), < 0.02, < 0.02	Chlorothalonil: < 0.01	0955	0.0096		
	Raisins	Chlorothalonil: 0.01, 0.51	Chlorothalonil: 0.26	0.955	0.248	1.6	0.416
	Juice, unpasteurized	Chlorothalonil: 0.02, 0.26	Chlorothalonil: 0.14	0.955	0.134		
	Pomace, wet	Chlorothalonil: 0.61, 1.9	Chlorothalonil: 1.3	0.955	1.24	1.6	2.08
	Pomace, dry	Chlorothalonil: 0.33, 1.5	Chlorothalonil: 0.78	0.955	0.745	1.6	1.25

Yield factors for SDS-3701 → SDS-3701

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate	STMR (mg/kg)	STMR-P (mg/kg)	HR (mg/kg)	HR-P (mg/kg)
Grapes	Wine, red	SDS-3701: < 0.11, < 1, < 1	SDS-3701: < 0.11	0.01	0.009		
	Raisins	SDS-3701: 0.57, 1	SDS-3701: 0.79	0.01	0.0079	0.15	0.1185
	Juice, unpasteurized	SDS-3701: < 0.25, < 0.29	SDS-3701: < 0.27	0.01	0.0027		
	Pomace, wet	SDS-3701: 0.86, 1.5	SDS-3701: 1.2	0.01	0.012	0.15	0.18
	Pomace, dry	SDS-3701: 2.8, 3.4	SDS-3701: 3.1	0.01	0.031	0.15	0.465

Yield factors of chlorothalonil → SDS-3701 during processing

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors chlorothalonil → SDS-3701	Median or best estimate	STMR chlorothalonil (mg/kg)	STMR-P SDS-3701 (mg/kg)
Grapes	Wine, red	< 0.004, < 0.02, < 0.26	< 0.02	0.955	0.0191
	Raisins	0.002, 0.004	0.003	0.955	0.00287
	Juice, unpasteurized	< 0.001, < 0.001	< 0.001	0.955	0.00096
	Pomace, wet	0.004, 0.006	0.005	0.955	0.00478
	Pomace, dry	0.01, 0.014	0.012	0.955	0.0115

Chlorothalonil

For processed grapes the Meeting estimated STMR-P values for chlorothalonil of 0.0096 mg/kg in wine, 0.134 mg/kg in juice and 1.24 mg/kg and 0.745 mg/kg in wet and dry grape pomace, respectively (chlorothalonil → chlorothalonil).

For raisins an STMR-P of 0.248mg/kg and an HR-P of 0.416 mg/kg were estimated (chlorothalonil → chlorothalonil). Since the processing of grapes into raisins is covered by the recommendation for a maximum residue level for the raw commodity, a separate recommendation for dried grapes is not necessary.

SDS-3701

For the effect of processing the Meeting selected the higher STMR-P or HR-P value for each commodity following either SDS-3701 → SDS-3701 or chlorothalonil → SDS-3701.

For processed grapes the Meeting estimated STMR-P values for SDS-3701 of 0.019 mg/kg in wine (chlorothalonil→ SDS -3701), 0.0079 mg/kg for raisins (SDS-3701→ SDS-3701), 0.0027 mg/kg in juice (SDS-3701→ SDS-3701) and 0.012 mg/kg and 0.031 mg/kg in wet and dry grape pomace (SDS-3701→ SDS-3701), respectively.

For raisins the Meeting estimated a HR-P of 0.12 mg/kg for SDS-3701 (SDS3701 → SDS - 3701).

Residues in animal commodities

Livestock dietary burden

The Meeting received a lactating dairy cow feeding study which provided information on likely SDS-3701 residues resulting in animal commodities and milk from chlorothalonil residues in the animal diet.

In this study lactating cows (4 per dose group) were administered daily doses of chlorothalonil and SDS-3701 via gelatine capsule. The dose levels of the animals were 1.5 ppm chlorothalonil/0.1 ppm SDS-3701 (0.5×), 3 ppm chlorothalonil/0.2 ppm SDS-3701 (1×), 9 ppm chlorothalonil/0.6 ppm SDS-3701 (3×) and 30 ppm chlorothalonil/2.0 ppm SDS-3701 (10×) over 28 consecutive days. Milk was collected over whole study period.. Samples of fat, muscle, kidney and liver were taken for analysis.

In milk SDS-3701 residues reached a plateau after approximately 7–10 days of dosing. Plateau levels found for the different dose groups were 0.03 mg/kg (0.5×), 0.07 mg/kg (1×), 0.21 mg/kg (3×) and 0.49 mg/kg (10×). Separation of skim milk and cream revealed comparable residue levels in the two fractions.

In tissues highest residues of SDS-3701 were found in kidney and liver. Residues in kidney were always higher than liver with 0.14 mg/kg (0.5×), 0.2 mg/kg (1×), 0.49 mg/kg (3×) and 0.95 mg/kg (10×) in comparison to 0.02 mg/kg (0.5×), 0.03 mg/kg (1×), 0.16 mg/kg (3×) and 0.45 mg/kg (10×). Residues in fat were at a comparable level to residues in liver, giving 0.02 mg/kg (0.5×), 0.04 mg/kg (1×), 0.06 mg/kg (3×) and 0.67 mg/kg (10×) in perirenal fat. In muscle SDS-3701 was found at low levels only: < 0.01 mg/kg (0.5×), 0.01 mg/kg (1×), 0.05 mg/kg (3×) and 0.15 mg/kg (10×).

For poultry matrices no feeding studies are available. In radio-labelled metabolism studies using [^{14}C]-chlorothalonil no TRR above the LOQ of 0.01 mg/kg were found in any dose group (2, 6 and 20 ppm) for muscle and fat. Eggs contained TRR levels between 0.035–0.047 mg/kg for the 20 ppm group. In liver TRR levels were < 0.01 mg/kg for the 2 ppm group, 0.098 mg/kg for the 6 ppm group and 0.05 mg/kg for the 20 ppm group.

Poultry metabolism studies using ^{14}C-SDS-3701 were conducted at dose levels of 0.1, 0.3 and 1 ppm. For the 0.1 ppm dose group, which corresponds to the highest estimated dietary burden for poultry of 0.094 ppm (poultry layer – EU), no TRR above the LOQ of 0.01 mg/kg was found for egg whites, muscle, fat and skin. In liver TRR were 0.056 mg/kg while in egg yolk a TRR of 0.044 mg/kg was found. At higher dose rates residues in eggs yolk and liver correlated to the dose increasement. In cardial muscle single high residue of 0.55 mg/kg for the 0.3 ppm group and 0.154 mg/kg for the 1.0 ppm group were found. In the pectoral and adductor muscles no residues above the LOQ were found for any dose group.

For both studies the hens were sacrificed after 6 hours after the final dosing.

Estimated maximum and mean dietary burdens of livestock

Dietary burden calculations based on chlorothalonil and SDS-3701 for beef cattle, dairy cattle, broilers and laying poultry are presented in Annex 6. The calculations were made according to the livestock diets from US/CAN, EU, Australia and Japan in the OECD Table (Annex 6 of the 2006 JMPR Report).

In the following table the estimated livestock dietary burden is presented for chlorothalonil and SDS-3701 simultaneously, since both substances were administered in combined doses to the test animals.

	Livestock dietary burden, chlorothalonil and SDS-3701, ppm of dry matter diet (chlorothalonil / SDS-3701)							
	US/CAN		EU		Australia		Japan	
	max.	mean	max.	mean	max.	mean	max.	mean
Beef cattle	0.46 / 0.112	0.46 / 0.09	1.24 / 0.25	1.24 / 0.17	2.06 / 0.31[a]	2.06 / 0.27 [b]	0.03 / 0.04	0.03 / 0.03
Dairy cattle	0.27 / 0.15	0.27 / 0.12	0.79 / 0.22	0.79 / 0.15	2.0 / 0.3	2.0 / 0.28	0.02 / 0.09	0.02 / 0.05
Poultry - broiler	0.04 / 0.02	0.04 / 0.02	0.42 / 0.069[c]	0.42 / 0.05[d]	0.15 / 0.02	0.15 / 0.02	0 / 0.02	0 / 0.01
Poultry - layer	0.04 / 0.02	0.04 / 0.02	0.38 / 0.09[e]	0.38 / 0.07[d,f]	0.15 / 0.02	0.15 / 0.02	0 / 0.01	0 / 0.01

[a] Highest maximum beef or dairy cattle burden suitable for MRL estimates for mammalian meat and milk

[b] Highest mean beef or dairy cattle burden suitable for STMR estimates for mammalian meat and milk

[c] Highest maximum poultry burden suitable for MRL estimated for poultry meat

[d] Highest mean poultry burden suitable for STMR estimates in poultry meat

[e] Highest maximum poultry burden suitable for MRL estimated for eggs

[f] Highest mean poultry burden suitable for STMR estimates in eggs

Animal commodities, MRL estimation

In the table below, dietary burdens for chlorothalonil and SDS-3701 are shown in round brackets (), feeding levels and residue concentrations from the feeding studies are shown in square brackets [] and estimated concentrations related to the dietary burden are shown without brackets. Since the corresponding dairy cattle feeding study chlorothalonil and SDS-3701 were administered simultaneously, both levels are listed for comparison. In view of SDS-3701 being the only residue of concern in livestock animals after administration of both chlorothalonil and SDS-3701, the combined dose was considered relevant for the estimation of residues in tissues and milk.

Dietary burden (ppm) Feeding level [ppm]	Milk	Muscle	Liver	Kidney	Fat
MRL	mean	highest	highest	highest	highest
MRL beef or dairy cattle (2.06 / 0.31) [1.5 chlorothalonil + 0.1 SDS-3701, 3 chlorothalonil + 0.2 SDS-3701]	0.05 [0.04, 0.07]	0.013 [< 0.01, 0.02]	0.033 [0.03, 0.04]	0.18 [0.14, 0.28]	0.05 [0.03, 0.07]
STMR	mean	mean	mean	mean	mean
STMR beef or dairy cattle (2.06 / 0.27) [1.5 chlorothalonil + 0.1 SDS-3701, 3 chlorothalonil + 0.2 SDS-3701]	0.05 [0.04, 0.07]	0.01 [< 0.01, 0.01]	0.03 [0.03, 0.03]	0.16 [0.14, 0.2]	0.025 [0.02, 0.04]

In lactating cows residues above the LOQ of the analytical method of 0.01 mg/kg are expected for all commodities. The Meeting estimated maximum residue levels for <u>mammalian meat</u> of 0.02 mg/kg, for <u>mammalian fat</u> of 0.07 mg/kg, for <u>milk</u> of 0.07 and for <u>edible offal (mammalian)</u>, based on kidney, of 0.2 mg/kg.

The Meeting estimated an STMR value for SDS-3701 in <u>whole milk</u> of 0.05 mg/kg.

For <u>mammalian meat</u> an STMR and an HR value of 0.01 mg/kg and 0.013 mg/kg were estimated by the Meeting. In <u>mammalian fat</u> the STMR and HR values were estimated at levels of 0.025 mg/kg and 0.05 mg/kg, respectively. For <u>edible offal (mammalian)</u> the Meeting estimated STMR and HR values of 0.16 mg/kg and 0.18 mg/kg, respectively, based on kidney.

For <u>poultry</u> a maximum dietary burden of 0.42 ppm was calculated for chlorothalonil. In absence of appropriate feeding studies the Meeting considered the available metabolism study with [^{14}C]-chlorothalonil dosed to laying hens for the estimation of SDS-3701 residues in poultry. In the lowest dose group of 2 ppm no detectable residues above the LOQ of 0.01 mg/kg were found in tissues or eggs, indicating an insignificant contribution to the overall residues of SDS-3701 in poultry matrices and eggs.

For the transfer of SDS-3701 into poultry matrices or eggs also no data from unlabelled feeding studies are available. Therefore the Meeting decided to estimating residues in poultry tissues and eggs based on the metabolism study on poultry, dose with [^{14}C]-SDS-3701 for a period of 21 days.

In this study for all matrices except egg yolk only TRR levels were reported. Under consideration of the results for egg yolk, revealing > 80% of the TRR being unchanged SDS-3701, the Meeting decided to directly use the TRR levels for the estimation of residues in poultry tissues and eggs.

Dietary burden (ppm) Feeding level [ppm]	Eggs [a]	Muscle	Liver	Fat
MRL				
	mean	highest	highest	highest
MRL boiler or layer poultry (0.09 SDS-3701) [0.1 SDS-3701]	0.04 [0.044]	< 0.01 [< 0.01]	0.05 [0.056]	< 0.01 [< 0.01]
STMR				
	mean	mean	mean	mean
STMR boiler or layer poultry (0.07) [0.1 SDS-3701]	0.031 [0.044]	< 0.01 [< 0.01]	0.039 [0.056]	< 0.01 [< 0.01]

[a] In the metabolism study pooled whites and yolk were analysed, without reporting of separate weights. The Meeting concluded to based it estimations for whole eggs on the critical values reported for yolk only

Under consideration of the results of the 0.1 ppm dose group the Meeting estimated maximum residue levels for SDS-3701 in poultry muscle, skin and fat of 0.01 mg/kg, 0.05 mg/kg for eggs and 0.07 mg/kg for poultry, edible offal of, based on liver.

For the estimation of the dietary intake the Meeting estimated STMR and HR values of 0.031 and 0.04 mg/kg for eggs, 0.039 and 0.05 mg/kg for poultry, edible offal of and 0.01 and 0.01 mg/kg for poultry muscle, skin and for fat.

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of chlorothalonil and SDS-3701 resulted in recommendations for MRLs and STMR values for raw and processed commodities. Where data on consumption were available for the listed food commodities, dietary intakes were calculated for the 13 GEMS/Food Consumption Cluster Diets. The results are shown in Annex 3.

The IEDIs for chlorothalonil in the thirteen Cluster Diets, based on the estimated STMRs were 9-40% of the maximum ADI (0.02 mg/kg bw). The Meeting concluded that the long-term intake of residues of chlorothalonil from uses that have been considered by the JMPR is unlikely to present a public health concern.

The IEDIs for SDS-3701 in the thirteen Cluster Diets, based on the estimated STMRs were 5-10% of the maximum ADI (0.008 mg/kg bw). The Meeting concluded that the long-term intake of residues of SDS-3701 from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The IESTI for chlorothalonil calculated on the basis of the recommendations made by the JMPR represented 0-100% of the ARfD (0.6 mg/kg bw) for children and 0–20% for the general population.

The Meeting points out that the IESTI of 100 % of the ARfD for children results from to the conservative assumption of residues in currants at the maximum residue level.

The IESTI for SDS-3701 calculated on the basis of the recommendations made by the JMPR represented 0–50% of the ARfD (0.03 mg/kg bw) for children and 0–20% for the general population.

The Meeting concluded that the short-term intake of residues of chlorothalonil or SDS-3701 resulting from uses that have been considered by the JMPR are unlikely to present a public health concern.