5.13 DINOTEFURAN (255)

TOXICOLOGY

Dinotefuran is the ISO-approved common name for (*EZ*)-(*RS*)-1-methyl-2-nitro-3-(tetrahydro-3-furylmethyl)guanidine (IUPAC) (CAS No. 165252-70-0), a novel neonicotinic insecticide used in various crops. Dinotefuran acts as an agonist at the insect nicotinic acetylcholine receptor and exhibits broad insecticidal activity via ingestion and contact. Dinotefuran has not been evaluated previously by JMPR and was reviewed at the present Meeting at the request of CCPR.

All critical studies were certified as complying with GLP.

Biochemical aspects

In rats given ^{14}C-tetrahydrofuran-labelled or ^{14}C-guanidine-labelled dinotefuran orally by gavage, absorption was rapid and accounted for at least 88% of the total administered radioactivity after a single low dose (50 mg/kg bw) or high dose (1000 mg/kg bw). The maximum plasma concentrations of radioactivity were reached after approximately 0.5 and 2 hours after administration of the low and high doses, respectively, whereas the half-lives in plasma ranged from 4 to 15 hours for the low and high doses, respectively. Radioactivity was widely distributed throughout the body. Elimination of the radioactivity was mainly via urine (≥ 88% of the administered dose), whereas elimination via faeces accounted for 1–3% after oral administration and 1% after intravenous administration. Residues in tissues 168 hours after a single oral or intravenous dose as well as after repeated oral dosing accounted for less than 0.5% of the administered radioactivity, and the concentrations in most tissues were below the limit of detection (0.001 ppm).

Metabolism of dinotefuran in rats was limited, with more than 90% of the dose being eliminated as unchanged parent molecule, which was also the major component in plasma, milk, bile and most tissues collected 4–8 hours after administration. About 20 metabolites were identified; the metabolic routes included hydroxylation on the tetrahydrofuran ring, followed by further oxidation, reduction and acetylation. Other routes of metabolism involved desmethylation, nitro-reduction and hydrolysis.

Toxicological data

The LD_{50} in rats treated orally with dinotefuran was 2450 mg/kg bw. The dermal LD_{50} in rats was greater than 2000 mg/kg bw, and the inhalation LC_{50} in rats was greater than 4.09 mg/L. Dinotefuran was not a skin irritant in rabbits, was slightly irritating to the eye of rabbits and was not a skin sensitizer in the maximization test in guinea-pigs.

Although dinotefuran is neurotoxic in insects, neurotoxicity in mammals was not a critical effect after repeated exposure. No specific target organs were clearly identified in any species following short-term or long-term oral exposure, despite the administration of very high doses of up to 10 635, 3156 and 862 mg/kg bw per day for 13 weeks in mice, rats and dogs, respectively. In all species, the NOAELs were based on decreases in body weight and/or body weight gain as the critical effect. At higher dose levels, a number of minor effects on clinical chemistry parameters, without histopathological correlates, occurred in all species and comprised increased serum albumin concentration and reduced urinary pH in mice, increased serum cholesterol and urea nitrogen concentrations and reduced serum glucose and protein concentrations in rats, and reduced urinary pH in dogs.

In a 4-week study in mice, the NOAEL was 5000 ppm (equal to 901 mg/kg bw per day), based on reduced body weight gain at 25 000 ppm (equal to 4612 mg/kg bw per day) and above. In a 13-week study in mice, the NOAEL was 25 000 ppm (equal to 4442 mg/kg bw per day), based on reduced body weight and body weight gain at 50 000 ppm (equal to 10 635 mg/kg bw per day).

In a 4-week study in rats, the NOAEL was 5000 ppm (equal to 390 mg/kg bw per day), based on reduced body weight gain and increased serum cholesterol in males at 25 000 ppm (equal to

1814 mg/kg bw per day) and above. In a 13-week study in rats, the NOAEL was 500 ppm (equal to 38 mg/kg bw per day), based on reduced body weight and body weight gain at 5000 ppm (equal to 384 mg/kg bw per day) and above in females.

In a 13-week feeding study in dogs, a NOAEL could not be identified; the LOAEL was 1600 ppm (equal to 58 mg/kg bw per day) in females, based on a reduction in feed consumption, body weight and body weight gain at all doses administered. In males, the NOAEL was 8000 ppm (equal to 307 mg/kg bw per day), based on a reduction in feed and water consumption, body weight and body weight gain at 24 000–40 000 ppm (equal to an average dose of 862 mg/kg bw per day). In a 1-year feeding study in dogs, the NOAEL was 640 ppm (equal to 22 mg/kg bw per day) in females, based on a reduction in feed consumption, body weight and body weight gain at 3200 ppm (equal to 108 mg/kg bw per day) and above. In males, the NOAEL was 3200 ppm (equal to 111 mg/kg bw per day), based on a reduction in body weight gain at 16 000 ppm (equal to 559 mg/kg bw per day).

Long-term studies of toxicity and carcinogenicity were conducted in mice and rats. In a 78-week study of carcinogenicity in mice, there was no evidence for carcinogenicity up to the highest dose tested (25 000 ppm, equal to 3694 mg/kg bw per day). The NOAEL for toxicity was 2500 ppm (equal to 345 mg/kg bw per day), based on reduced body weight and body weight gain at 25 000 ppm.

In a 104-week study of toxicity and carcinogenicity in rats, there was no evidence for carcinogenicity up to the highest dose tested (20 000 ppm, equal to 991 mg/kg bw per day). The NOAEL for toxicity was 2000 ppm (equal to 100 mg/kg bw per day), based on a reduction in body weight, body weight gain and feed consumption at 20 000 ppm.

The Meeting concluded that dinotefuran is not carcinogenic in mice or rats.

Dinotefuran was tested for genotoxicity in vitro and in vivo in an adequate range of assays. It was not found to be genotoxic.

The Meeting concluded that dinotefuran is unlikely to be genotoxic.

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

In a two-generation study of reproductive toxicity in rats, the NOAEL for reproductive toxicity was 10 000 ppm (equal to 822 mg/kg bw per day), the highest dose tested, whereas a reduced number of implantations, increased post-implantation loss and reduced litter size were observed in a range-finding study at 20 000 ppm (equal to 1340 mg/kg bw per day). The NOAEL for parental toxicity was 3000 ppm (equal to 241 mg/kg bw per day), based on a reduction in feed consumption, body weight and spleen weight at 10 000 ppm. The NOAEL for offspring toxicity was 3000 ppm, based on reduced pup weight gain during lactation and reduced spleen weight at 10 000 ppm.

In a developmental toxicity study in rats, the NOAEL for maternal toxicity was 300 mg/kg bw per day, based on decreased weight gain and feed consumption and increased water consumption at 1000 mg/kg bw per day. The NOAEL for developmental toxicity was 1000 mg/kg bw per day, the highest dose tested.

In a developmental toxicity study in rabbits, acute clinical signs (hypoactivity, prone position, panting, erythema, tremor) were observed in dams at 300 mg/kg bw per day from the start of treatment at gestation day 6 until gestation day 13; the NOAEL was 125 mg/kg bw per day. Also in dams, a reduction in body weight gain was noted at 125 mg/kg bw per day and above, with a NOAEL of 52 mg/kg bw per day. The NOAEL for developmental toxicity was 300 mg/kg bw per day, the highest dose tested.

The Meeting concluded that dinotefuran was not teratogenic in rats or rabbits.

In an acute neurotoxicity study in rats, the NOAEL was 750 mg/kg bw, based on a transient decrease in motor activity at 1500 mg/kg bw. There was no evidence for neuropathological effects up to the highest dose tested (1500 mg/kg bw).

In a 13-week neurotoxicity study in rats, a transient decrease in motor activity was observed in females at 50 000 ppm (equal to 3806 mg/kg bw per day), which is well above the limit dose. The

NOAEL for the study was 5000 ppm (equal to 327 mg/kg bw per day), based on reduced body weight gain and feed consumption at 50 000 ppm.

In a dose range–finding developmental neurotoxicity and immunotoxicity study in rats, there was no evidence for developmental neurotoxicity or immunotoxicity up to the highest dose tested (10 000 ppm, equal to 1043 mg/kg bw per day). The NOAEL for maternal toxicity was 10 000 ppm (equal to 670 mg/kg bw per day), the highest dose tested, whereas the NOAEL for offspring toxicity was 3000 ppm (equal to 311 mg/kg bw per day), based on reduced body weight and body weight gain at 10 000 ppm.

In a developmental neurotoxicity study in rats, there was no evidence for developmental neurotoxicity up to the highest dose tested (10 000 ppm, equal to 784 mg/kg bw per day). The NOAEL for maternal toxicity was 3000 ppm (equal to 237 mg/kg bw per day), based on reduced body weight gain at 10 000 ppm.

In 4-week immunotoxicity studies in mice and rats, there was no evidence for immunotoxicity up to the highest dose tested (7000 ppm in mice, equal to 1053 mg/kg bw per day; 14 000 ppm in rats, equal to 992 mg/kg bw per day). The NOAELs for systemic toxicity were 2800 and 5600 ppm (equal to 405 and 425 mg/kg bw per day, respectively) in mice and rats, respectively, based on decreased body weight gain at 7000 and 14 000 ppm, respectively.

There were no reports of adverse health effects in manufacturing plant personnel. Also, there were no reports of poisonings with dinotefuran.

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

Toxicological evaluation

The Meeting established an ADI for dinotefuran of 0–0.2 mg/kg bw, based on the NOAEL of 22 mg/kg bw per day for reduced body weight/body weight gain in female dogs in a 1-year toxicity study and application of a safety factor of 100.

The Meeting established an ARfD for dinotefuran of 1 mg/kg bw, based on the NOAEL of 125 mg/kg bw for acute clinical signs observed in dams after a single dose of 300 mg/kg bw in a developmental toxicity study in rabbits. A 100-fold safety factor was applied.

A toxicological monograph was prepared.

Levels relevant to risk assessment

Species	Study	Effect	NOAEL	LOAEL
Mouse	Eighteen-month study of toxicity and carcinogenicity[a]	Toxicity	2500 ppm, equal to 345 mg/kg bw per day	25 000 ppm, equal to 3694 mg/kg bw per day
		Carcinogenicity	25 000 ppm, equal to 3694 mg/kg bw per day[b]	—
Rat	Two-year study of toxicity and carcinogenicity[a]	Toxicity	2000 ppm, equal to 100 mg/kg bw per day	20 000 ppm, equal to 991 mg/kg bw per day
		Carcinogenicity	20 000 ppm, equal to 991 mg/kg bw per day[b]	—
	Two-generation study of reproductive toxicity[a]	Reproductive toxicity	10 000 ppm, equal to 822 mg/kg bw per day[b]	—
		Parental toxicity	3000 ppm, equal to 241 mg/kg bw per day	10 000 ppm, equal to 822 mg/kg bw per day
		Offspring toxicity	3000 ppm, equal to 241 mg/kg bw per day	10 000 ppm, equal to 822 mg/kg bw per day
	Developmental toxicity study[c]	Maternal toxicity	300 mg/kg bw per day	1000 mg/kg bw per day
		Embryo and fetal toxicity	1000 mg/kg bw per day[b]	—
Rabbit	Developmental toxicity study[c]	Maternal toxicity	125 mg/kg bw per day[d] 52 mg/kg bw per day[e]	300 mg/kg bw per day 125 mg/kg bw per day

Species	Study	Effect	NOAEL	LOAEL
		Embryo and fetal toxicity	300 mg/kg bw per day[b]	—
Dog	Thirteen-week and 1-year studies of toxicity[a,f]	Toxicity	640 ppm, equal to 22 mg/kg bw per day	1600 ppm, equal to 58 mg/kg bw per day

[a] Dietary administration.
[b] Highest dose tested.
[c] Gavage administration.
[d] NOAEL for acute clinical signs.
[e] NOAEL for maternal toxicity.
[f] Two studies combined.

Estimate of acceptable daily intake for humans

0–0.2 mg/kg bw

Estimate of acute reference dose

1 mg/kg bw

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

Results from epidemiological, occupational health and other such observational studies of human exposure

Critical end-points for setting guidance values for exposure to dinotefuran

Absorption, distribution, excretion and metabolism in mammals	
Rate and extent of oral absorption	Rapid; ≥ 88%
Dermal absorption	No data
Distribution	Widely distributed; highest concentrations in kidney and urine
Potential for accumulation	None
Rate and extent of excretion	≥ 93% within 168 h (≥ 88% in urine; 1–3% in faeces; 1–6% in cage rinse)
Metabolism in animals	Limited (> 90% eliminated as parent); hydroxylation on the tetrahydrofuran ring, followed by oxidation, reduction and acetylation; other routes include desmethylation, nitro-reduction and hydrolysis
Toxicologically significant compounds in animals, plants and the environment	Dinotefuran
Acute toxicity	
Rat, LD_{50}, oral	2450 mg/kg bw
Rat, LD_{50}, dermal	> 2000 mg/kg bw
Rat, LC_{50}, inhalation	> 4.09 mg/L (4 h, nose-only exposure)
Rabbit, dermal irritation	Not irritating
Rabbit, ocular irritation	Slightly irritating
Dermal sensitization	Not sensitizing (maximization test)
Short-term studies of toxicity	
Target/critical effect	Reduced body weight gain
Lowest relevant oral NOAEL	22 mg/kg bw per day (1-year study in dogs)
Lowest relevant dermal NOAEL	1000 mg/kg bw per day (28-day study in rats)
Lowest relevant inhalation NOAEC	0.22 mg/L (28-day study in rats)
Long-term studies of toxicity and carcinogenicity	
Target/critical effect	Reduced body weight gain
Lowest relevant NOAEL	100 mg/kg bw per day (2-year study in rats)
Carcinogenicity	Not carcinogenic in mice or rats
Genotoxicity	
	Not genotoxic

Reproductive toxicity	
Target/critical effect	No reproductive toxicity; reduced pup weight gain and reduced spleen weight at parentally toxic dose
Lowest relevant reproductive NOAEL	822 mg/kg bw per day (highest dose tested)
Lowest relevant parental NOAEL	241 mg/kg bw per day
Lowest relevant offspring NOAEL	241 mg/kg bw per day
Developmental toxicity	
Target/critical effect	No evidence for developmental toxicity (rats and rabbits)
Lowest relevant maternal NOAEL	52 mg/kg bw per day (rabbits)
Lowest relevant embryo/fetal NOAEL	300 mg/kg bw per day (rabbits) (highest dose tested)
Neurotoxicity	
Acute and subchronic neurotoxicity	No specific signs of acute or subchronic neurotoxicity at highest dose tested (acute: 1500 mg/kg bw; subchronic: 3806 mg/kg bw per day)
Developmental neurotoxicity	No evidence for developmental neurotoxicity at highest dose tested (784 mg/kg bw per day)
Other toxicological studies	
Immunotoxicity	No evidence for immunotoxicity at highest dose tested (1053 mg/kg bw per day in mice; 992 mg/kg bw per day in rats)
Developmental immunotoxicity	No evidence for developmental immunotoxicity at highest dose tested (670 mg/kg bw per day)
Medical data	
	No adverse health effects reported in manufacturing plant personnel

Summary

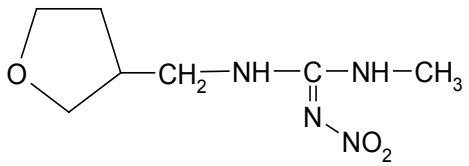
	Value	Study	Safety factor
ADI	0–0.2 mg/kg bw	One-year study of toxicity in dogs	100
ARfD	1 mg/kg bw	Developmental toxicity study in rabbits (acute clinical signs in dams)	100

RESIDUE AND ANALYTICAL ASPECTS

Residue and analytical aspects of dinotefuran were considered for the first time by the present Meeting. The residue evaluation was scheduled for the 2012 JMPR by the Forty-third Session of the CCPR (ALINORM 11/34/24)

Dinotefuran is an insecticide used for the control a range of sucking insects, such as whiteflies, plant bugs, leafhoppers and mealybugs, in vegetables, fruit, paddy rice and turf. The formulated products can be applied to foliage, soil, nursery boxes and to paddy water by spray, drench, broadcast and 'pricking-in-hole' treatment. The Meeting received information on identity, animal and plant metabolism, environmental fate in soil, rotational crops, analytical methods, storage stability, use patterns, supervised trials, farm animal feeding studies and fate of residues in processing.

(*RS*)-1-methyl-2-nitro-3-(tetrahydro-3-furylmethyl) guanidine



Dinotefuran is a 1:1 mixture of the enantiomers.

In this appraisal, the following abbreviated names were used for the various metabolites.

UF	1-methyl-3-(tetrahydro-3-furylmethyl) urea
DN	1-methyl-3-(tetrahydro-3- furylmethyl) guanidium dihydrogen
446-DO	1-[4-hydroxy-2-(hydroxymethyl) butyl]-3-methyl-2-nitroguanidine
FNG	2-nitro-1-(tetrahydro-3-furylmethyl) guanidine
PHP	6-hydroxy-5-(2-hydroxyethyl)-1-methyl-1, 3-diazinane-2-ylidene-N-nitroamine
MNG	1-methyl-2-nitroguanidine
NG	Nitroguanidine
MG	1-methylguanidine
BCDN	3-(methylamino)-9-oxa-2-aza-4-azoniabicyclo [4.3.0] non-3-ene hydrogen
UF-DO	1-[4-hydroxy-2-(hydroxymethyl) butyl]-3-methylurea
DN-OH	1-(2-hydroxytetrahydro-3-furylmethyl)-3-methylguanidine (DN-2-OH) or 1-(3-hydroxytetrahydro-3-furylmethyl)-3-methylguanidine (DN-3-OH)

Animal metabolism

The Meeting received animal metabolism studies with dinotefuran in rats, lactating goats and laying hens. The metabolism and distribution of dinotefuran in animals were investigated using the [^{14}C-furanyl] and [^{14}C-guanidine]-labelled dinotefuran.

Metabolism in rats was summarized and evaluated by the WHO panel of the JMPR in 2012.

Lactating goats were dosed with ^{14}C-furanyl and ^{14}C-guanidine dinotefuran at a dose equivalent to approximately 10 ppm in the diet once daily for 5 consecutive days. Gelatin capsules containing ^{14}C-furanyl and ^{14}C-guanidine dinotefuran were administered orally via a balling gun. The majority of the dose was rapidly excreted in urine and faeces. Radioactive residues in the faeces, cage wash and urine accounted for 81.9% of the total administered dose.

Total ^{14}C residues in the milk accounted for 0.3% of the administered dose. Tissues contained approximately 1.1% of the administered dose. The remaining 16.6% of the administered radioactivity resided in the gastrointestinal tract and its contents.

The total radioactive residue (TRR) levels in milk reached a steady state of approximately 0.045 mg eq./kg by Day 2 of dosing. The residue levels detected in milk, liver, kidney, fat, muscle, blood and heart were 0.012–0.27 mg eq./kg and accounted for 0.01–0.73% of the administered dose.

Dinotefuran was the major component in milk (40.1% TRR, 0.018 mg/kg) with a number of minor metabolites (PHP, 446-DO, UF and FNG) detected but all were < 10% TRR and < 0.005 mg eq./kg. Bound residues were accounted for only 0.001 mg eq./kg in the post extraction solids (PES).

Dinotefuran was present as the major residue in muscle (0.018 mg/kg, 41.3% TRR), fat (0.002 mg/kg, 20.0% TRR), liver (0.017 mg/kg, 12.1% TRR) and kidney (0.035 mg/kg, 12.7% TRR). UF was also a major metabolite in muscle (0.006 mg eq./kg, 14.6% TRR). FNG was the major metabolite detected in the kidney (0.055 mg eq./kg, 20.1% TRR). No other individual compounds accounted for more than 10% of TRR in the tissues.

Laying hens were orally dosed with ^{14}C-furanyl and ^{14}C-guanidine dinotefuran at a dose equivalent to 10 ppm in the feed for 5 consecutive days. The majority of the dose was rapidly eliminated in the excreta. Radioactive residues in the excreta and cage wash accounted for 88.9% of the total administered dose.

Total ^{14}C residues in the eggs accounted for 0.07% (0.02% in the yolk and 0.05% in the white) of the administered dose. Tissues contained approximately 0.23% of the administered dose. The gastrointestinal tract and its contents accounted for 1.31% of the administered radioactivity residues. The residue levels detected in egg white, egg yolk, liver, fat, muscle and blood were 0.007–0.13 mg eq./kg and accounted for 0.01–0.12% of the administered dose.

Dinotefuran was the major residue component at 57.0% TRR (0.013 mg/kg) in egg white and 44.2% TRR (0.0071 mg/kg) in egg yolk. FNG was only metabolite in egg white (0.0030 mg eq./kg, 13.1% TRR) and egg yolk (0.0013 mg eq./kg, 8.0% TRR). All other components were detected at < 0.003 mg eq./kg in egg white and egg yolk. Bound residues were accounted for only 0.0012–0.0028 mg eq./kg in the post-extraction solids (PES).

Dinotefuran was detected at 9.1% TRR (0.0049 mg/kg) in muscle, 10.8% TRR (0.0012 mg/kg) in fat and 9.3% TRR (0.011 mg/kg) in liver. Minor metabolites FNG, UF and DN were identified at 2.2–7.4% TRR (0.0006–0.0080 mg eq./kg) in muscle, fat and liver (DN was not detected in fat). All other components were also detected at < 0.01 mg eq./kg in those tissues.

In animal metabolism studies, dinotefuran was metabolized to several compounds. Dinotefuran was the most important component in milk and muscle for lactating goat, and in eggs for laying hens.

Plant metabolism

The Meeting received plant metabolism studies performed on apples, lettuce, rice and oilseed rape with dinotefuran ^{14}C-labeled in two positions (^{14}C-furanyl and ^{14}C-guanidine).

In an apple metabolism study under field conditions, apple trees were treated with a foliar spray using a 20% SG formulation at a nominal rate of 200 g ai/ha (1× rate) on one tree and at an exaggerated rate treatment at 2000 g ai/ha (10× rate) on the second tree to generate metabolites for identification. The trees were treated 21 days before mature fruit harvest.

The overall residue levels (TRR) in the harvested apples were 0.15 mg/kg for fruits from the apple tree treated at the nominal application rate (1×) and 1.9 mg/kg in apples from exaggerated rate (10×) treatment. Dinotefuran was one of the major ^{14}C residues present and accounted for approximately 29–33% (0.044–0.63 mg/kg) of the total radioactivity in the harvested apples. UF was identified as the major metabolite, accounted for 0.031 mg/kg, 20.0% TRR at 1× rate and 0.40 mg/kg, 20.9% TRR at 10× rate. DN was also identified at a concentration ranging from 0.016 mg/kg, 10.4% TRR at 1× rate and 0.13 mg/kg, 6.9% TRR at 10× rate. PHP was also present at > 10% TRR (0.021 mg/kg, 13.5% TRR from 1×; 0.25 mg/kg, 13.2% TRR from 10×). NG, MNG, 446-DO, BCDN, UF-DO and FNG were identified in the apple fruit as minor metabolites (< 5% TRR).

In a lettuce metabolism study, under greenhouse conditions was carried out to generate metabolites for identification. The test substance was applied as a foliar spray using a 20% SG formulation at a nominal rate equivalent to 150 g ai/ha and at an exaggerated rate equivalent to 1500 g ai/ha. Lettuce plants were treated 14 days before mature harvest (approximately 8 weeks from seeding).

Residue levels in the mature lettuce were 1.8 and 11 mg/kg for the 150 and 1500 g ai/ha applications, respectively. The extracted radioactivity from the mature lettuce accounted for 97.6 and 98.0% TRR for the 150 and 1500 g ai/ha applications, respectively. Dinotefuran was the major residue in the mature lettuce, accounted for 1.1 mg/kg (61.6% TRR) and 6.9 mg/kg (64.7% TRR) for the 150 and 1500 g ai/ha applications, respectively. PHP, 446-DO, UF, DN-OH, BCDN, DN, NG and MNG were detected as metabolites in the mature lettuce, but none of these metabolites were present at greater than 5% TRR level. Among these metabolites, relatively higher amounts of PHP, UF and DN were detected as compared to the other minor metabolites, approaching 4–5% of the TRR level.

In a potato metabolism study under field conditions, the application of test item was performed by foliar spray at rates equivalent to 100 g ai/ha, 200 g ai/ha (six plants each), or 1000 g ai/ha (exaggerated dose; one plant) at the BBCH stage 50–59 (just before flowering). One

potato plant at each of the two lower application rates was harvested 54 days after treatment. The remaining five plants per dosage as well as the plant of exaggerated dose were harvested at maturity (75 days after treatment).

The TRR in peel and pulp (peeled potato tubers) was determined. The TRR in the whole potato was very low for the 100 and 200 g ai/ha treatment rates, even at the first harvest interval. The majority of the radioactive residue was extracted with acetonitrile/water followed by water (94.5% to 97.7% of TRR for all samples). In the first harvest, dinotefuran accounted for 13.1% TRR (0.004 mg/kg) at 100 g ai/ha and 8.5% (0.003 mg/kg) at 200 g ai/ha application rate. One very polar fraction (M3) was determined with 61.7% TRR (0.019 mg/kg) and 57.1% TRR (0.021 mg/kg) at application rates of 100 and 200 g ai/ha, respectively. This fraction could be characterised to consist of traces of NG and at least six further unknown fractions each being less than 10% of the TRR. MNG was found at 7.6% TRR (0.002 mg/kg) and 9.6% TRR (0.003 mg/kg) at both application rates. Four other metabolites characterized as UF, PHP, 446-DO and FNG were all less than 7% TRR. The metabolic pattern of the mature potatoes was qualitatively similar to that of the first harvest, but the concentrations of dinotefuran and metabolites were even lower.

In a rice metabolism study under greenhouse conditions, simulating rice-paddy application of dinotefuran were performed to quantify total ^{14}C levels in rice plant tissue and grain and identify major components of the residue and their distribution in the plant.

There were two application times (5 and 20 days after bolting, DAB) and two application methods (soil and foliar spray application). Extracts of whole rice grain, brown rice, polished rice, chaff, bran, straw, root and soil were analysed to determine the nature of metabolites and their relative distribution in the samples. The results were similar for both application times (5 and 20 DAB).

Residue levels in whole grain from the soil applications were 0.35–0.40 mg/kg. Residues were greatly reduced when the chaff was removed from the whole grain and further reduced upon polishing of the brown rice to produce polished rice. The residue levels were 0.052–0.055 mg/kg in brown rice, and 0.033–0.039 mg/kg in polished rice. Dinotefuran was the major residue in whole rice grain and brown rice from the soil applications. The level of dinotefuran residues ranged from 0.23 mg/kg (66.0% TRR) to 0.24 mg/kg (60.5% TRR) in the whole grain, and 0.014 mg/kg (26.2% TRR) to 0.015 mg/kg (26.3% TRR) in the brown rice. After polishing of the brown rice, to produce polished rice, the residues of dinotefuran decreased to 0.008–0.010 mg/kg (21.2–29.9% TRR). PHP, 446-DO, UF, DN-OH, BCDN and DN were detected as the minor metabolites in whole grain and brown rice (< 10% TRR). PHP, 446-DO, UF and DN were also detected in polished rice at the level of less than 8% TRR.

The TRR in rice straw were 1.3–1.8 mg/kg for the soil applications. Dinotefuran was the major residue in straw, accounting for 0.70– 0.97 mg/kg (51.6–53.0% TRR). UF and DN were observed as the major metabolites in straw. UF accounted for 0.18–0.22 mg/kg (13.4–11.8% TRR), while DN accounted for 0.089–0.091 mg/kg (6.6–5.0% TRR). PHP, 446-DO, DN-OH and BCDN were detected as the minor metabolites (< 5% TRR).

The TRR in the whole rice grain for the foliar spray applications accounted for 5.1–5.8 mg/kg. Residues were greatly reduced during processing to produce the brown rice and polished rice fractions, similar to what was observed for the soil application. The residue levels in brown rice were 0.34–0.61 mg/kg, while the residue levels in polished rice were 0.15–0.34 mg/kg. Dinotefuran was the major residue in whole rice grain and brown rice. The level of dinotefuran ranged from 2.1 mg/kg (35.9% TRR) to 2.7 mg/kg (52.7% TRR) in the whole grain, and 0.18 mg/kg (53.6% TRR) to 0.20 mg/kg (33.4% TRR) in the brown rice. The residues of dinotefuran were further reduced to 0.073 mg/kg (48.4% TRR) to 0.14 mg/kg (41.7% TRR) in the polished rice. UF were observed as the major metabolite, accounting for 0.70–1.0 mg/kg (13.7–17.2% TRR) in whole grain, 0.048–0.1 mg/kg (14.1–17.2% TRR) in brown rice, and 0.021–0.076 mg/kg (14.2–22.8% TRR) in polished rice. PHP, 446-DO, DN-OH, BCDN and DN were detected as the minor metabolites in whole grain, brown rice and polished rice (< 8% TRR).

The TRR in rice straw were 7.6–8.1 mg/kg for the foliar spray applications. Dinotefuran was the major residue in straw, accounting for 4.0–5.6 mg/kg (53.3–69.0% TRR). UF and DN were observed as the major metabolites in straw. UF accounted for 0.72–1.2 mg/kg (8.8–15.9% TRR), while DN accounted for 0.47–0.65 mg/kg (5.7–8.5% TRR). PHP, 446-DO, DN-OH and BCDN were detected as the metabolites in straw (< 5% TRR).

In an oilseed rape metabolism study under natural conditions, oilseed rape plants were treated at pre-flowering (growth stage 50–59) by foliar application with formulated ^{14}C-dinotefuran at doses of 100 g ai/ha (low dose), 200 g ai/ha (high dose) and 1000 g ai/ha (exaggerated dose, plant pot). Planting, cultivation and harvesting of the mature winter rape plants was carried out according to common agricultural practice.

The TRR in the whole rape plant was 0.21, 0.49 and 2.1 mg/kg for the 100, 200 and 1000 g ai/ha treatment rates, respectively. For seeds, the residue levels for the 100, 200 and 1000 g ai/ha doses were determined to be 0.055, 0.13 and 0.70 mg/kg, respectively. Accordingly, residue levels for foliage were determined to be 0.26, 0.65 and 2.4 mg/kg, respectively.

In seeds dinotefuran was found at levels of 0.006 mg/kg (14.8% TRR), 0.016 mg/kg (18.7% TRR) and 0.095 mg/kg (18.0% TRR) for doses 100, 200 and 1000 g ai/ha, respectively. MNG was found as the most significant fraction, amounting to 0.005 mg/kg (12.4% TRR), 0.004 mg/kg (4.8% TRR) and 0.071 mg/kg (13.4% TRR) in seeds for the three application rates respectively. None of the other radioactive fractions exceeded 8.2% of TRR. UF, PHP, FNG, MG, DN and BCDN were found at low concentrations not exceeding 0.003 mg/kg for the low or high dosed plants with the exception of PHP amounting to 0.006 mg/kg.

In foliage dinotefuran was found at levels of 0.025 mg/kg (11.3% TRR), 0.094 mg/kg (16.9% TRR) and 0.22 mg/kg (10.6% TRR) for doses 100, 200 and 1000 g ai/ha, respectively. Radioactive fractions M3 (at least 8 compounds), MG and DN were found as significant metabolite fractions. M3 amounted to 0.12 mg/kg (53.4% TRR), 0.27 mg/kg (48.8% TRR) and 0.62 mg/kg (29.5% TRR) for the three application rates respectively. MG was found at 0.007 mg/kg (8.7% TRR), 0.010 mg/kg (4.9% TRR) and 0.088 mg/kg (11.5% TRR) for the three application rates respectively. DN was 0.037 mg/kg (13.2% TRR), 0.11 mg/kg (15.0% TRR) and 0.46 mg/kg (17.4% TRR) for the three application rates respectively. Furthermore detected in foliage at a dose of 1000 g ai/ha were UF, MNG (one of the compounds in M3) and BCDN amounting to 0.14 mg/kg (8.7% TRR), 0.14 mg/kg (6.5% TRR) and 0.043 mg/kg (2.7% TRR), respectively.

In the plant metabolism studies on apples, lettuce, potato, rice and oilseed rape, dinotefuran was the major component of the residues found in apples, lettuce, potato, rice (grain and straw) and oilseed rape (seed). UF and DN were significant components (> 10% TRR) in apples, rice (grain and straw) and foliage of oilseed rape. MNG was present at more than 10% TRR in seeds of oilseed rape but its concentration was less than 0.01 mg/kg at a normal rate. UF-DO and NG were only found in plants but the contributions were insignificant (< 5% TRR).

Environmental fate in soil

The Meeting received information on aerobic soil metabolism, soil photolysis and rotational crop study.

Dinotefuran degraded in soil under the aerobic conditions employed, principally via cleavage of tetrahydromethyl portion of the molecule to MNG and demethylation of MNG to NG. The DT_{50} was 10–52 days at 20 to 25 °C.

The photolysis study indicated that photolysis was not a significant degradation pathway for dinotefuran in soil incubated at 20 °C.

In confined rotational crop study, rotational crops (radish, lettuce, sorghum and wheat) were planted at 30 and 120 days after treatment. The test substance was applied as one broadcast spray application at a rate of 0.60 kg ai/ha in a volume of 1062 L/ha.

The TRR found in each of the plant fractions amounted to as much as 1.3 mg/kg in 30 day immature radish leaves to as little as 0.003 mg/kg in 120 day lettuce (mature and immature). The TRR was less than 0.01 mg/kg in all of the 120 day plant sample fractions except for the radish leaf samples where it was 0.035 mg/kg in the immature samples and 0.026 mg/kg in the mature samples.

For the 30 day after the application, in the immature radish samples, dinotefuran was present as the highest concentration of any individual components in the leaf and root samples (0.33 and 0.019 mg/kg, respectively). In the immature lettuce samples, BCDN and UF metabolites were found at the highest concentration (0.027 mg/kg for both). In the immature sorghum, the highest residue level was for dinotefuran followed by BCDN, DN, PHP, 446-DO, UF and MNG (0.20, 0.19, 0.14, 0.13, 0.080, 0.069 and 0.017 mg/kg, respectively).

In the mature radish samples (leaf and root), DN was present at the highest concentration (0.074 and 0.007 mg/kg, respectively). In the mature lettuce samples, PHP was found to be present at the highest concentration (0.083 mg/kg) followed by dinotefuran, BCDN and DN (0.064, 0.061 and 0.033 mg/kg, respectively). The mature sorghum samples analyses indicated extracted residues of 0.15, 0.12 and 0.034 mg/kg in forage, chaff and grain. The extracted residues consisted of BCDN and DN in forage and chaff as well as an unidentified component known as M16.

There were no individual components seen at concentrations above 0.006 mg/kg in any matrix in the 120 day samples.

Methods of residue analysis

The Meeting received description and validation data for analytical methods for residues of parent dinotefuran and its metabolites (DN and UF) in raw agricultural commodities, processed commodities, feed commodities and animal commodities. In most of the methods for determination of dinotefuran, UF and DN, homogenized samples were extracted with acetonitrile/water, and the extract was cleaned up with liquid –liquid partition followed by column chromatography using SPE cartridges. Residues were determined by HPLC with UV or MS/MS detection. The methods of analysis for a range of substrates were validated with LOQs of the 0.01 mg/kg for dinotefuran, UF and DN.

The multiresidue method with GC employing NPD or ECD detection was validated for dinotefuran in plant materials (non-fatty and fatty). LOQs were 0.01 mg/kg for dinotefuran.

Stability of residues in stored analytical samples

The Meeting received information on the freezer storage stability of dinotefuran and its metabolites (DN and UF) in plant (apple, peach, grape, cranberry, bulb onion, green onion, broccoli, melon, tomato, lettuce, watercress, potato, rice grain and cotton seed), their processed (rice bran, cotton meal and refined oil) commodities and animal products.

Storage stability results indicate that dinotefuran and its metabolites (DN and UF) residues were stable for at least 4 days in milk and eggs, for at least 2 months in bovine tissues, for at least 3 months in rice bran, for at least 4 months in grape and broccoli, for at least 5 months in melon, for at least 9 months in cranberry, for at least 12 months in apple, tomato, lettuce, potato and cotton (seeds, meal and oil), for at least 14 months in rice grain, for at least 20 months in watercress, for at least 22 months in green onion, for at least 24 months in bulb onion, and for at least 26 months in peach.

The periods of storage stability studies cover the sample storage intervals of residue trials.

Definition of the residue

In the lactating goat metabolism study, TRRs in kidney (0.27 mg/kg) and liver (0.14 mg/kg) were higher than those in milk (0.04–0.05 mg/kg), heart (0.05 mg/kg), muscle (0.04 mg/kg) and fat (0.01 mg/kg). Dinotefuran is the major component of the residue in muscle (41% TRR), milk (40% TRR), fat (20% TRR), kidney (13% TRR) and liver (12% TRR). FNG is the major component of the residue in kidney (20% TRR) but less than 7% TRR in all other tissues and milk.

In the lactating cow feeding study, the mixture of dinotefuran, UF and DN (3:1:1) was administered. Livestock are expected to be exposed to a mixture of dinotefuran, UF and DN at approximately 3:1:1 ratio from animal feedstuffs such as rice straw or cotton gin trash. UF was the predominant residue in tissues and milk. No detectable residues of dinotefuran occurred in any tissue samples and low concentrations of dinotefuran occurred in milk at the highest dose group (10×) only. Low concentrations of DN (0.02–0.04 mg/kg) were detected in liver, kidney and muscle from animals in the highest dose group only (10×). DN was occasionally found at very low concentrations (0.01 mg/kg) in whole milk. The concentrations of UF in tissues and milk are at least 10 times higher than those of dinotefuran at a highest dose. The concentrations of UF in tissues are approximately 10 times higher than those of DN at a highest dose.

In the laying hen metabolism study, TRRs were the highest for liver (0.13 mg/kg), followed by muscle (0.05 mg/kg), eggs (0.01–0.02 mg/kg for egg white, < 0.002–0.02 mg/kg for egg yolk) and fat (0.01 mg/kg). Dinotefuran is the major residue component in eggs (57% TRR for egg white, 44% TRR for egg yolk). FNG is present in egg white (13% TRR) but its concentration is very low (0.003 mg/kg). In other tissues (muscle, liver and fat), dinotefuran is detected at 9.1–11% TRR. However, all components were detected at ≤0.01 mg/kg (< 10% TRR) in all tissues and eggs.

The analytical methods for animal products submitted to the Meeting can quantify dinotefuran, UF and DN individually using the same analytical method.

The Meeting decided that parent dinotefuran and metabolite UF are suitable analytes for enforcement purposes and dietary risk assessment in animal commodities.

The octanol/water coefficient (log P_{ow}) of dinotefuran is -0.6 at 25 °C (pH 7). In the lactating goat and laying hen metabolism study, dinotefuran residues in muscle were at least 4 times higher than those in fat. In the lactating cow feeding study, dinotefuran residues in skimmed milk were at least twice higher than those in cream. The Meeting considered the residue of dinotefuran is not fat-soluble.

Parent dinotefuran was a major component (11–66% TRR) in apple, lettuce, potato, rice grains, rape seeds and foliage. UF, DN and MNG were detected as major metabolites in some matrices. UF was present in apple (21% TRR), rice grains (17% TRR for the spray application) and rice straw (16% TRR for the spray application, 13% TRR for the soil application,). DN was present in apple (10% TRR) and rape foliage (17% TRR). MNG was found in rape seeds (12%) but at very low concentration at a normal rate (< 0.01 mg/kg). No other radioactive components in the extracts from plant matrices were individually present at more than 10% TRR.

The results of the trials indicated that UF and DN residues were generally less than 10% of parent dinotefuran residue in food commodity matrices. These findings agree with the information obtained from the metabolism studies. The Meeting assumed the toxicity of UF and DN was comparable to that of dinotefuran.

The Meeting decided that parent dinotefuran is a suitable analyte for enforcement purposes and dinotefuran, UF and DN are suitable analytes for dietary risk assessment in plant commodities.

The Meeting recommended the following residue definition:

For plants: Definition of the residue (for compliance with the MRL): *Dinotefuran*

Definition of the residue (for estimation of dietary intake): *Sum of dinotefuran, 1-methyl-3-(tetrahydro-3-furylmethyl) urea (UF) and 1-methyl-3-(tetrahydro-3-furylmethyl) guanidium dihydrogen (DN) expressed as dinotefuran.*

For animalS: Definition of the residue (for compliance with the MRL and for estimation of dietary intake): *Sum of Dinotefuran and 1-methyl-3-(tetrahydro-3-furylmethyl) urea (UF) expressed as dinotefuran*

The residue is not fat-soluble

Results of supervised residue trials on crops

The Meeting received supervised trial data for the foliar application and soil application (irrigation) of dinotefuran on peaches, grapes, cranberries, bulb onions, green onions, broccoli, cauliflowers, cabbages, cucumbers, melons, summer squashes, zucchinis, peppers, tomatoes, lettuces, spinach, watercress, potatoes, celery, rice and cotton. Residue trial data was made available from Japan and the USA.

Labels were available from Japan, Korea and the USA describing the registered uses of dinotefuran.

The OECD calculator was used as a tool to assist in the estimation of maximum residue levels from the selected residue data set obtained from the supervised residue trials. As a first step, the Meeting reviewed the trial conditions and other relevant factors related to each data set to arrive at a best estimate of the maximum residue level using expert judgement. Then the OECD calculator was employed. If the statistical calculation spreadsheet suggested a different value, a brief explanation of the deviation was supplied.

The residue concentrations are reported for dinotefuran, UF and DN. Total residues for estimation of STMRs are calculated by summing up the concentrations of dinotefuran, UF and DN.

In case that the residues of dinotefuran were found at high levels, UF and DN were also detected and the residue levels of both metabolites depend on the commodity.

Since the residue values were expressed as mg of the analyte/kg sample, UF and DN need to be converted into dinotefuran equivalent. The conversion factors are 1.3 (202.21/158.20=1.28) for UF and 1.3 (202.21/157.22=1.29) for DN. Residues of < LOQ for both analytes are not converted.

The method for calculation of the total residues for plant commodities is illustrated below.

Dinotefuran	UF	DN	Total
< 0.01	< 0.01	< 0.01	< 0.03 (0.01 + 0.01 + 0.01)
0.051	< 0.01	< 0.01	0.071 (0.051 + 0.01 + 0.01)
0.056	0.011	< 0.01	0.080 (0.056 + 0.011 × 1.3 + 0.01)
0.14	0.016	0.010	0.17 (0.14 + 0.016 × 1.3 + 0.010 × 1.3)

Stone fruits

Peach

Data were available from supervised trials on peaches in the USA.

The US GAP on peach and nectarine is for a soil application at a maximum rate of 0.30 kg ai/ha with a PHI of 21 days and a foliar application at a maximum rate of 0.20 kg ai/ha with a PHI of 3 days. The maximum seasonal rate is 0.30 kg ai/ha for soil application and 0.30 kg ai/ha for foliar application. The seasonal rate for foliar application of the trials was slightly higher (33%) than the US GAP. The Meeting agreed to use the residue data for foliar application because the contribution of the first foliar spray to the final residue was less than 20% based on the decline study.

Dinotefuran residues in peaches from trials in the USA approximating GAP were (n=7): 0.09, 0.21 (2), 0.24, 0.31, 0.35 and 0.47 mg/kg.

Total residues in peaches were (n=7): 0.11, 0.23, 0.25, 0.28, 0.35, 0.37 and 0.57 mg/kg.

Based on the trials for peaches in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in peach of 0.8, 0.28 and 0.57 mg/kg respectively.

The Meeting agreed to extrapolate these recommendations to nectarine.

Berries and other small fruits

Grape

Data were available from supervised trials on grapes in the USA.

The US GAP on Berry and Small fruit (Small fruit vine climbing, except fuzzy kiwifruit) is for a soil application at a maximum rate of 0.38 kg ai/ha with a PHI of 28 days and two foliar applications at a maximum rate of 0.15 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day.

Dinotefuran residues in grapes from trials in the USA matching GAP were (n=13): 0.087, 0.10, 0.11, 0.12, 0.16, 0.17, 0.20, 0.22, 0.27 (2), 0.40, 0.52 and 0.55 mg/kg.

Total residues in grapes were (n=13): 0.11, 0.12, 0.13, 0.14, 0.18, 0.19, 0.22, 0.24, 0.29 (2), 0.47, 0.57 and 0.67 mg/kg.

Based on the trials for grapes in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in grape of 0.9, 0.22 and 0.67 mg/kg respectively.

Cranberry

Data were available from supervised trials on cranberries in the USA.

The GAP on Berry and Small fruit (Low growing berry subgroup, except strawberry) of the USA is a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.40 kg ai/ha) with a PHI of 7 days.

Dinotefuran residues in cranberries from trials in the USA matching GAP were (n=4): 0.01, 0.04, 0.05 and 0.06 mg/kg.

Total residues in cranberries were (n=4): 0.03, 0.06, 0.07 and 0.10 mg/kg.

Based on the trials for cranberries in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in cranberry of 0.15, 0.065 and 0.10 mg/kg respectively.

Bulb vegetables

Onion, bulb

Data were available from supervised trials on bulb onions in the USA.

The GAP on Onion, bulb and green of the USA is a soil application at a maximum rate of 0.30 kg ai/ha at planting and a foliar application at a maximum rate of 0.20 kg ai/ha with a PHI of 1 day. The maximum seasonal rate is 0.30 kg ai/ha for each application. The maximum seasonal rate is 0.43 kg ai/ha regardless of application method. The seasonal rate for foliar application of the trials was slightly higher (33%) than the US GAP. The Meeting accepted the residue data because it would accommodate the residue from potential combination from soil and foliar applications.

Dinotefuran residues in bulb onions from trials in the USA approximating GAP were (n=8): < 0.01 (2), 0.01, 0.02 (3), 0.04 and 0.06 mg/kg.

Total residues in bulb onions were (n=8): < 0.03 (2), 0.03, 0.04 (3), 0.06 and 0.09 mg/kg.

Based on the trials for bulb onions in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in onion, bulb of 0.1, 0.04 and 0.09 mg/kg respectively.

Onion, green

Data were available from supervised trials on green onions in the USA.

The GAP on Onion, bulb and green of the USA is a soil application at a maximum rate of 0.30 kg ai/ha at planting and a foliar application at a maximum rate of 0.20 kg ai/ha with a PHI of 1 day. The maximum seasonal rates are 0.30 kg ai/ha for each application. The residues from the trial for the soil application are insignificant, compared those for the foliar application. The Meeting decided to estimate a maximum residue level, an STMR and an HR based on the residue data for the foliar application.

Dinotefuran residues in green onions from trials in the USA matching GAP were (n=5): 0.086, 0.22, 0.52, 1.3 and 1.9 mg/kg.

Total residues in green onions were (n=5): 0.12, 0.59, 0.91, 1.5 and 2.3 mg/kg.

Based on the trials for green onions in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in spring onion of 4, 0.91 and 2.3 mg/kg respectively.

Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead cabbages

Broccoli and Cauliflower

Data were available from supervised trials on broccoli and cauliflowers in the USA.

The GAP of the USA for Head and stem brassica is for a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day. Only one application method can be used.

Dinotefuran residues in broccoli and cauliflowers from trials for the foliar application in the USA, matching GAP were (n=6): 0.49 and 1.0 (2) mg/kg for broccoli, and 0.086, 0.20 and 0.36 mg/kg for cauliflowers. Dinotefuran residues in broccoli from trials for the soil application in the USA matching GAP were (n=2): < 0.01 and 0.059 mg/kg.

Total residues in broccoli and cauliflowers for the foliar application were (n=6): 0.56, 1.0 and 1.1 mg/kg for broccoli, and 0.11, 0.22 and 0.41 mg/kg for cauliflowers. Total residues in broccoli for the soil application were (n=2): < 0.03 and 0.079 mg/kg.

Cabbage, head

Data were available from supervised trials on head cabbages in the USA.

The GAP on Head and stem brassica of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day. Only one application method can be used.

Dinotefuran residues in head cabbages from trials for the foliar application in the USA matching GAP were (n=6): 0.013, 0.036, 0.22, 0.25, 0.78 and 0.85 mg/kg. Dinotefuran residue in cabbages from trials for the soil application in the USA matching GAP was 0.17 mg/kg.

Total residues in head cabbages for the foliar application were (n=6): 0.033, 0.056, 0.28, 0.38, 0.90 and 1.1 mg/kg. Total residue in head cabbages for the soil application was 0.34 mg/kg.

The GAP is the same for broccoli, cauliflower and head cabbage. The Meeting considered that the residues from trials with the foliar application on broccoli/cauliflowers and head cabbages were similar. The Meeting agreed to explore a group maximum residue level for brassica (cole or cabbage) vegetables, head cabbages, flowerhead cabbages.

Since the residue populations from trials on broccoli/cauliflowers and head cabbages were not significantly different (Mann-Whitney U-test), the Meeting agreed that they could be combined. The residues of dinotefuran in those brassica vegetables for the foliar application were (n=12): 0.013, 0.036, 0.086, 0.20, 0.22, 0.25, 0.36, 0.49, 0.78, 0.85 and 1.0 (2) mg/kg. Total residues for the foliar application were (n=12): 0.033, 0.056, 0.11, 0.22, 0.28, 0.38, 0.41, 0.56, 0.90, 1.0 and 1.1 (2) mg/kg

Based on the trials for broccoli/cauliflowers and head cabbages in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in brassica (cole or cabbage) vegetables, head cabbages, flowerhead cabbages of 2, 0.40 and 1.1 mg/kg respectively.

Fruiting vegetables, Cucurbits

Cucumber

Data were available from supervised trials on cucumbers in the USA.

The GAP on Cucurbits of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day. Only one application method can be used.

Dinotefuran residues in cucumbers from trials for the foliar application in the USA matching GAP were (n=7): 0.13, 0.14, 0.17, 0.18 (2), 0.20 and 0.21 mg/kg. Dinotefuran residue in cucumbers from trials for the soil application in the USA matching GAP was 0.053 mg/kg.

Total residues in cucumbers for the foliar application were (n=7): 0.18, 0.26 (3), 0.28 (2) and 0.33 mg/kg. Total residue in cucumbers for the soil application was 0.073 mg/kg.

Melon

Data were available from supervised trials on melons in the USA.

The GAP on Cucurbits of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day. Only one application method can be used.

Dinotefuran residues in melons from trials for the foliar application in the USA matching GAP were (n=6): 0.042, 0.054, 0.082, 0.15, 0.18 and 0.20 mg/kg. Dinotefuran residue in melons from trials for the soil application in the USA matching GAP was 0.040 mg/kg.

Total residues in melons for the foliar application were (n=6): 0.073, 0.11, 0.16, 0.23, 0.24 and 0.32 mg/kg. Total residue in melons for the soil application was 0.060 mg/kg.

Summer squash and Zucchini

Data were available from supervised trials on summer squashes and zucchinis in the USA.

The GAP on Cucurbits of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day. Only one application method can be used.

Dinotefuran residues in summer squashes and zucchini from trials for the foliar application in the USA matching GAP were (n=5): 0.092, 0.15 and 0.18 mg/kg for summer squashes, and 0.10 and 0.15 mg/kg for zucchini. Dinotefuran residues in summer squashes from trials for the soil application in the USA matching GAP were (n=2): 0.041 and 0.087 mg/kg.

Total residues in summer squashes and zucchini for the foliar application were (n=5): 0.19, 0.30 and 0.32 mg/kg for summer squashes, and 0.14 and 0.22 mg/kg for zucchini. Total residues in summer squashes for the soil application were (n=2): 0.065 and 0.11 mg/kg.

The GAP is the same for cucumber, melon, summer squash and zucchini. The Meeting considered that the residues from trials with the foliar application on cucumber, melon, summer squash and zucchini were similar. The Meeting agreed to propose a group maximum residue level for fruiting vegetables, cucurbits.

Since the residue populations from trials on cucumbers, melons, summer squashes and zucchinis for foliar application were not significantly different (Kruskal-Wallis H-test), the Meeting agreed that they could be combined. The residues of dinotefuran in those cucurbits for the foliar application were (n=18): 0.042, 0.054, 0.082, 0.092, 0.10, 0.13, 0.14, 0.15 (3), 0.17, 0.18 (4), 0.20 (2) and 0.21 mg/kg. Total residues for the foliar application were (n=18): 0.073, 0.11, 0.14, 0.16, 0.18, 0.19, 0.22, 0.23, 0.24, 0.26 (3), 0.28 (2), 0.30, 0.32 (2) and 0.33 mg/kg.

Based on the trials for cucumbers, melons, summer squashes and zucchinis in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in fruiting vegetables, cucurbits of 0.5, 0.25 and 0.33 mg/kg respectively.

Fruiting vegetables, other than Cucurbits

Peppers

Data were available from supervised trials on sweet peppers and chili peppers in Japan and the USA.

In Japan, dinotefuran is registered for use on sweet pepper and chili pepper at two foliar applications of 0.0067–0.010 kg ai/hL with a PHI of 1 day. Residues in green peppers from trials matching GAP of Japan were (n=2): 0.43 and 1.2 mg/kg. However, the trials for green peppers matching GAP of Japan were insufficient to estimate a maximum residue level for the commodity.

The GAP on Fruiting vegetables of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day. Only one application method can be used.

Dinotefuran residues in sweet peppers and chili peppers from trials for the foliar application in the USA matching GAP were (n=8): 0.030, 0.042, 0.14 (2), 0.25 and 0.27 mg/kg for sweet peppers, and 0.23 and 0.41 mg/kg for chili peppers. Dinotefuran residues in sweet peppers from trials for the soil application in the USA matching GAP were (n=2): 0.024 and 0.094 mg/kg.

Total residues in sweet peppers and chili peppers for the foliar application were (n=8): 0.050, 0.062, 0.17, 0.18, 0.29 and 0.50 mg/kg for sweet peppers, and 0.26 and 0.55 mg/kg for chili peppers. Total residues in sweet peppers for the soil application were (n=2): 0.044 and 0.11 mg/kg.

Tomato

Data were available from supervised trials on tomatoes in Japan and the USA.

In Japan, dinotefuran is registered for use on tomato at an irrigation treatment to nursery box of 0.20 kg ai/hL at planting and two foliar applications of 0.0067–0.010 kg ai/hL with a PHI of 1 day. Residues in tomatoes from trials matching GAP of Japan were (n=2): 0.094 and 0.35 mg/kg. However, the trials for tomatoes matching GAP of Japan were insufficient to estimate a maximum residue level for the commodity.

The GAP on Fruiting vegetables (except varieties of tomato which are less than 2 inches in size) of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 1 day. Only one application method can be used.

Dinotefuran residues in tomatoes from trials for the foliar application in the USA matching GAP were (n=15): 0.039, 0.051, 0.056, 0.060, 0.069 (2), 0.071, 0.084, 0.097, 0.13 (2), 0.14, 0.15, 0.16 (2) mg/kg. Dinotefuran residues in tomatoes from trials for the soil application in the USA matching GAP were (n=2): 0.015 and 0.045 mg/kg.

Total residues in tomatoes for the foliar application were (n=15): 0.059, 0.071, 0.080 (2), 0.089, 0.091, 0.10 (2), 0.12, 0.15 (2), 0.18, 0.19 (2) and 0.20 mg/kg. Total residues in tomatoes for the soil application were (n=2): 0.035 and 0.065 mg/kg.

The GAP is the same for peppers and tomato and the residues of these commodities are similar. The Meeting agreed to propose a group maximum residue level for fruiting vegetables, other than cucurbits except sweet corn and mushrooms.

Since the residue populations from trials on peppers and tomatoes from foliar applications were not significantly different (Mann-Whitney U-test), the Meeting agreed that they could be combined. The residues of dinotefuran in those fruiting vegetables for the foliar application were (n=23): 0.030, 0.039, 0.042, 0.051, 0.056, 0.060, 0.069 (2), 0.071, 0.084, 0.097, 0.13 (2), 0.14 (3), 0.15, 0.16 (2), 0.23, 0.25, 0.27 and 0.41 mg/kg. Total residues for the foliar application were (n=23): 0.050, 0.059, 0.062, 0.071, 0.080 (2), 0.089, 0.091, 0.10 (2), 0.12, 0.15 (2), 0.17, 0.18 (2), 0.19 (2), 0.20, 0.26, 0.29, 0.50 and 0.55 mg/kg.

Based on the trials for peppers and tomatoes in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in fruiting vegetables, other than cucurbits except sweet corn and mushrooms of 0.5, 0.15 and 0.55 mg/kg respectively.

Leafy vegetables (including Brassica leafy vegetables)

Lettuce, leaf

Data were available from supervised trials on leaf lettuce in the USA.

The GAP on Leafy vegetables from the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.15 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 7 day. Only one application method can be used.

Dinotefuran residues in leaf lettuce from trials for the foliar application in the USA matching GAP were (n=8): 0.15, 0.20, 0.21, 0.29, 0.32, 0.91, 1.1 and 2.4 mg/kg. Dinotefuran residues in leaf lettuce from trials for the soil application in the USA matching GAP were (n=2): 0.016 and 0.11 mg/kg.

Total residues in leaf lettuce for the foliar application were (n=8): 0.33, 0.63, 0.66, 0.73, 0.81, 1.7, 2.0 and 3.3 mg/kg. Total residues in leaf lettuce for the soil application were (n=2): 0.039 and 0.20 mg/kg.

Lettuce, head

Data were available from supervised trials on head lettuce in the USA.

The GAP on Leafy vegetables of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.15 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 7 day. Only one application method can be used.

Dinotefuran residues in head lettuce from trials for the foliar application in the USA matching GAP were (n=7): 0.08, 0.12, 0.16 (2), 0.18, 0.19 and 0.53 mg/kg. Dinotefuran residue in head lettuce from trials for the soil application in the USA matching GAP was 0.016 mg/kg.

Total residues in head lettuce for the foliar application were (n=7): 0.25, 0.29 (2), 0.46, 0.49, 0.83 and 1.4 mg/kg. Total residue in head lettuce for the soil application was 0.049 mg/kg.

Spinach

Data were available from supervised trials on spinach in the USA.

The GAP on Leafy vegetables of the USA is a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.15 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 7 day. Only one application method can be used.

Dinotefuran residues in spinach from trials for the foliar application in the USA matching GAP were (n=7): 0.43, 0.48, 0.56, 0.62, 1.2, 2.0 and 3.3 mg/kg. Dinotefuran residue in spinach from trials for the soil application in the USA matching GAP was 0.65 mg/kg.

Total residues in spinach for the foliar application were (n=7): 0.63, 0.68, 0.89, 1.2, 2.3, 2.6 and 4.4 mg/kg. Total residue in spinach for the soil application was 0.73 mg/kg.

The GAP is the same for leaf lettuce, head lettuce and spinach. The median residue in leaf lettuce (0.305 mg/kg), head lettuce (0.16 mg/kg) and spinach (0.62 mg/kg) are similar. The Meeting agreed to propose a group maximum residue level for leafy vegetables except watercress.

The Meeting recognized that the residue populations from trials on leaf lettuce, head lettuce and spinach were significantly different according to statistical test. The therefore Meeting decided to use the crop with the highest residue, i.e., spinach, to estimate a maximum residue level for leafy vegetables.

Based on the trials in spinach from the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in leafy vegetables of 6, 1.2 and 4.4 mg/kg, respectively.

Watercress

Data were available from supervised trials on watercress in the USA.

The GAP on watercress of the USA is a foliar application at a maximum rate of 0.20 kg ai/ha (at a maximum seasonal rate of 0.40 kg ai/ha for foliar application) with a PHI of 1 day.

Dinotefuran residues in watercress from trials in the USA matching GAP were (n=3): 1.6, 2.1 and 3.4 mg/kg.

Total residues in watercress were (n=3): 2.0, 2.9 and 3.8 mg/kg.

Based on the trials for watercress in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in watercress of 7, 2.9 and 3.8 mg/kg respectively.

Potato

Data were available from supervised trials on potatoes in the USA.

The GAP on tuberous and corm vegetables from the USA is as a pre-plant soil application at a maximum rate of 0.38 kg ai/ha (at a maximum seasonal rate of 0.38 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.076 kg ai/ha (at a maximum seasonal rate of 0.23 kg ai/ha for foliar application) with a PHI of 7 day. Only one application method can be used.

The trials on potatoes in the USA did not match the GAP. Consequently, the Meeting could not estimate a maximum residue level for dinotefuran in potatoes.

Celery

Data were available from supervised trials on celery from the USA.

The GAP from the USA is for a soil application at a maximum rate of 0.37 kg ai/ha with a PHI of 21 days (at a maximum seasonal rate of 0.60 kg ai/ha for soil application) or a foliar application at a maximum rate of 0.15 kg ai/ha (at a maximum seasonal rate of 0.30 kg ai/ha for foliar application) with a PHI of 7 day. Only one application method can be used.

Dinotefuran residues in celery from the foliar application matching US GAP were (n=6): 0.06, 0.10, 0.18, 0.22, 0.24 and 0.28 mg/kg.

Total residues in celery following the foliar application were (n=6): 0.08, 0.20, 0.36, 0.51, 0.58 and 0.67 mg/kg.

Based on the trials for celery in the USA, the Meeting estimated a maximum residue level, an STMR value and an HR value for dinotefuran in celery of 0.6, 0.435 and 0.67 mg/kg respectively.

Rice

Data were available from supervised trials on rice in the USA.

Trials from the USA on rice were reported for the foliar application of a SG formulation (GAP: two foliar applications of a maximum rate of 0.15 kg ai/ha, PHI of 7 days).

Dinotefuran residues in rice grains from trials in the USA matching GAP were (n=9): 1.4, 1.8, 1.9 (2), 2.4, 2.5, 2.9 (2) and 4.0 mg/kg.

Total residues in rice grains were (n=9): 1.9, 2.4, 2.7, 2.9, 3.3, 3.8, 4.4, 4.6 and 8.1 mg/kg.

Based on the trials for rice in the USA, the Meeting estimated a maximum residue level, an STMR value for dinotefuran in rice of 8 and 3.3 mg/kg respectively.

Cotton seed

Data were available from supervised trials on cotton in the USA.

Trials from the USA on cotton were reported for a foliar application of a SG formulation (GAP: a foliar application of a maximum rate of 0.15 kg ai/ha with a seasonal maximum rate of 0.30 kg ai/ha, PHI of 14 days).

Dinotefuran residues in cotton seeds from trials in the USA matching GAP were (n=12): < 0.05 (5), 0.05 (3), 0.07 (2), 0.10 and 0.16mg/kg.

Total residues in cotton seeds were (n=12): < 0.15 (5), 0.15 (3), 0.17 (2), 0.20 and 0.33 mg/kg.

Based on the trials for cotton in the USA, the Meeting estimated a maximum residue level and an STMR value for dinotefuran in cotton seeds of 0.2 and 0.15 mg/kg respectively.

Animal feedstuffs

Rice straw

Data were available from supervised trials on rice in the USA.

Trials from the USA on rice were reported for the foliar application of a SG formulation (GAP: two foliar applications of a maximum rate of 0.15 kg ai/ha, PHI of 7 days).

Dinotefuran residues in rice straw from trials in the USA matching GAP were (n=9): 0.61, 0.82, 0.87, 0.90, 1.2, 1.3, 1.4, 2.6 and 3.8 mg/kg.

Total residues in rice straw were (n=9): 1.1 (2), 1.2, 1.3, 1.6, 1.7, 1.8, 3.7 and 4.3 mg/kg.

Based on the residues in rice straw from trials in the USA, the Meeting estimated a maximum residue level, a median residue value and a highest residue value for dinotefuran in rice straw and fodder, dry of 6, 1.6 and 4.3 mg/kg respectively.

Cotton gin trash

Data were available from supervised residue trials on cotton in the USA.

Trials from the USA on cotton were reported for the foliar application of a SG formulation (GAP: a foliar application of a maximum rate of 0.15 kg ai/ha at a seasonal maximum rate of 0.30 kg ai/ha, PHI of 14 days).

Total residues in cotton gin trash from trials in the USA matching GAP were (n=7): 1.5, 3.3 (2), 3.8, 4.9, 5.6 and 7.1 mg/kg.

Based on the trials for cotton in the USA, the Meeting estimated a median residue value and a highest residue value for dinotefuran in cotton gin trash of 3.8 and 7.1 mg/kg respectively.

Rotational crops

The US GAP shows that for all crops other than berry and small fruit (subgroup small fruit vine climbing except fuzzy kiwifruit and low growing berry except strawberry), cotton, head and stem brassica, leafy brassica greens (including turnip greens), cucurbits, fruiting vegetables, leafy vegetables, bulb onion, green onion, peach and nectarine, tuberous and corm vegetables, and watercress, a 120-day plant-back interval must be observed. The Meeting noted that residues were not expected on rotational crops.

Fate of residues during processing

The fate of dinotefuran residues has been examined in grapes, tomatoes, potatoes, rice grains and cotton seeds processing studies. Based on the results of processing studies conducted in the USA, processing factors were calculated for grapes, tomatoes, potatoes, rice grains and cotton seeds. Estimated processing factors and the derived STMR-Ps are summarized in the Table below.

Processing factors, STMR-P and HR-P for food and feed

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors*	PF (Mean or best estimate)	RAC STMR (mg/kg)	STMR-P (mg/kg)	RAC HR (mg/kg)	HR-P (mg/kg)
Grape	Juice	0.95, 1.4	1.2	0.22	0.264	0.67	
	Raisin	3.1, 4.2	3.7		0.814		2.479
Tomato	Puree	1.1, 1.6, 2.1	1.6	0.10	0.16		
	Paste	3.3, 4.6, 5.2	4.6		0.46		
Potato	Granules	3.0, 2.3	2.7				
	Chips	2.1, 1.5	1.9				
Rice	Polished rice	0.02, 0.05	0.04	3.3	0.132		
	Bran	0.42, 0.85	0.64		2.112		
	Hulls	3.8, 5.4	4.6		15.18		
Cotton	Meal	0.27, 0.47	0.37	0.15	0.0555		
	Hulls	0.29, 0.72	0.51		0.0765		
	Refined oil	< 0.05, < 0.09	< 0.07		0.0105		

* Each value represents a separate study. The factor is the ratio of the residue in processed commodity divided by the residue in the RAC.

The Meeting estimated a maximum residue level of 3 mg/kg (0.9 × 3.7 = 3.33 mg/kg) for dried grape and 0.3 mg/kg (8 × 0.04 = 0.32 mg/kg) for polished rice.

On the basis of the STMR and HR for sweet peppers and default dehydration factor of 10, the Meeting estimated at an STMR value and an HR value for dried chili peppers of 1.75 and 5.0 mg/kg respectively. Based on the maximum residue level of fruiting vegetables, other than cucurbits, the Meeting recommended a maximum residue level of 5 mg/kg for chili peppers (dry).

Residue in animal commodities

Farm animal dietary burden

The Meeting estimated the dietary burden of dinotefuran in farm animals on the basis of the diets listed in Appendix IX of the FAO Manual 2009. Calculation from highest residue, STMR (some bulk commodities) and STMR-P values provides levels in feed suitable for estimating MRLs, while calculation from STMR and STMR-P values for feed is suitable for estimating STMR values for animal commodities. The percentage dry matter is taken as 100% when the highest residue levels and STMRs are already expressed in a dry weight basis.

Estimated maximum and mean dietary burdens of farm animals

Dietary burden calculations for beef cattle, dairy cattle, broilers and laying poultry are provided in Appendix IX of the FAO manual. The calculations were made according to the animal diets from US-Canada, EU, Australia and Japan in the Table (Appendix IX of the FAO manual).

Livestock dietary burden, dinotefuran, ppm of dry matter diet								
	US-Canada		EU		Australia		Japan	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Beef cattle	1.5	1.3	9.3	2.6	13	4.6	3.1	1.4
Dairy cattle	5.5	2.3	6.6	2.2	**15**[a]	**6.3**[bc]	1.4	0.68
Poultry–broiler	1.0	1.0	0.24	0.24	2.4	2.4	0.12	0.12
Poultry–layer	1.0	1.0	1.6	0.52	**2.4**[d]	**2.4**[e]	0.47	0.47

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

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

[c] Highest mean dairy cattle dietary burden suitable for STMR estimates for milk

[d] Highest maximum poultry dietary burden suitable for MRL estimates for poultry meat and eggs

[e] Highest mean poultry dietary burden suitable for STMR estimates for poultry meat and eggs

Farm animal feeding studies

The Meeting received a lactating dairy cow feeding studies, which provided information on likely residues resulting in animal commodities and milk from dinotefuran residues in the animal diet.

A poultry feeding study was not submitted as the expected residues of dinotefuran in poultry feed were very low. A poultry metabolism study at a dose rate of 10 ppm dinotefuran in feed demonstrated that there was very low transfer to eggs and tissues with all residues of dinotefuran and metabolites less than 0.01 mg/kg.

Lactating dairy cows

Lactating dairy cows were dosed with the mixture of dinotefuran, UF and DN (3:1:1) for 29–30 days at the equivalent of 5, 15 and 50 ppm in the diet. Residues of dinotefuran were below the LOQ (0.01 mg/kg) in whole milk with some exceptions at all feeding levels. UF was the predominant residue found in milk from all treated animals. No detectable residues of dinotefuran occurred in any tissue samples. UF was again the predominant residue in all tissues.

Animal commodities maximum residue levels

For MRL estimation, the residue in the animal commodities is dinotefuran and UF.

Residues in tissues and milk at the expected dietary burden for dairy cattle are shown in the Table below. The total residue of dinotefuran and UF in milk reached a plateau at Day 4. The mean estimated residue in milk was calculated using the residue values of Day 4 to the final day.

	Feed level (ppm) for milk residues	Residues (mg/kg) in milk [a]	Feed level (ppm) for tissue residues	Residues (mg/kg) in[a]			
				Muscle	Liver	Kidney	Fat
Maximum residue level beef or dairy cattle							
Feeding study	15	0.082	15	0.062	0.066	0.076	0.065
Dietary burden and residue estimate	15	0.082	15	0.062	0.066	0.076	0.065
STMR beef or dairy cattle							
Feeding study	5 15	0.033 0.082	5 15	0.026 0.058	0.024 0.061	0.023 0.072	< 0.02 0.044
Dietary burden and residue estimate	6.3	0.039	6.3	0.030	0.030	0.030	0.025

[a]: Sum of dinotefuran and UF expressed as dinotefuran (using a molecular weight conversion factor of 1.3 for UF)

Based on the highest estimated residue in milk (0.082 mg/kg), the Meeting estimated a maximum residue level of 0.1 mg/kg in milk.

Based on the highest estimated residue in muscle (0.062 mg/kg), the Meeting estimated a maximum residue level of 0.1 mg/kg, an HR value of 0.062 mg/kg in mammalian meat.

Based on the highest estimated residue in kidney (0.076 mg/kg), the Meeting estimated a maximum residue level of 0.1 mg/kg, an HR value of 0.076 mg/kg in mammalian edible offal.

Based on the mean estimated residues in tissues and milk, the Meeting estimated STMR values of 0.039 mg/kg in milk, 0.030 mg/kg in meat and 0.030 mg/kg in edible offal.

The maximum dietary burden for broiler and layer poultry is 2.4 and is lower than the dose level in the laying hen metabolism study of 10 ppm. In the metabolism study, in which dinotefuran equivalent to 10 ppm in the diet was dosed to laying hens for 5 consecutive days, no residues of dinotefuran, UF and DN exceed 0.01 mg/kg were detected in tissues and egg yolk. Dinotefuran was only detected at 0.013 mg/kg in egg white.

The Meeting estimated a maximum residue level of 0.02* mg/kg, an STMR value of 0 mg/kg and an HR value of 0 mg/kg in poultry meat, poultry edible offal and eggs.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDIs) of dinotefuran were calculated for the 13 GEMS/Food cluster diets using STMRs/STMR-Ps estimated by the current Meeting (Annex 3). The ADI is 0–0.2 mg/kg bw and the calculated IEDIs were 0–3% of the maximum ADI (0.2 mg/kg bw). The Meeting concluded that the long-term intakes of residues of dinotefuran, resulting from the uses considered by current JMPR, are unlikely to present a public health concern.

Short-term intake

The International Estimated Short-Term Intakes (IESTI) of dinotefuran were calculated for food commodities and their processed commodities using HRs/HR-Ps or STMRs/STMR-Ps estimated by the current Meeting (Annex 4). The ARfD is 1 mg/kg bw and the calculated IESTIs were a maximum of 30% of the ARfD. The Meeting concluded that the short-term intake of residues of dinotefuran, when used in ways that have been considered by the JMPR, is unlikely to present a public health concern.