Public Release Summary
on

Evaluation of the new active

Fludioxinil

in the product

Maxim 100 FS Fungicide Seed Treatment

National Registration Authority
for Agricultural and Veterinary Chemicals

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FOREWORD

The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) is an independent statutory authority with responsibility for assessing and approving agricultural and veterinary chemical products prior to their sale and use in Australia.

In undertaking this task, the NRA works in close co-operation with advisory agencies, including the Department of Health and Aged Care (Chemicals and Non-prescription Medicines Branch), Environment Australia (Risk Assessment and Policy Section), the National Occupational Health and Safety Commission (NOSHC) and State departments of agriculture and environment.

The NRA has a policy of encouraging openness and transparency in its activities and of seeking community involvement in decision making. Part of that process is the publication of public release summaries for all products containing new active ingredients and for all proposed extensions of use for existing products.

The information and technical data required by the NRA to assess the safety of new chemical products and the methods of assessment must be undertaken according to accepted scientific principles. Details are outlined in the NRA's publications *Ag Manual: The Requirements Manual for Agricultural Chemicals* and *Ag Requirements Series.*

This Public Release Summary is intended as a brief overview of the assessment that has been completed by the NRA and its advisory agencies. It has been deliberately presented in a manner that is likely to be informative to the widest possible audience thereby encouraging public comment.

More detailed technical assessment reports on all aspects of the evaluation of this chemical can be obtained by completing the order form in the back of this publication and submitting with payment to the NRA. Alternatively, the reports can be viewed at the NRA Library, Ground floor, 22 Brisbane Avenue, Barton, ACT.

The NRA welcomes comment on the usefulness of this publication and suggestions for further improvement. Comments should be submitted to the Executive Manager—Registration, National Registration Authority for Agricultural and Veterinary Chemicals, PO Box E240, Kingston ACT 2604.

CONTENTS

LIST OF ABBREVIATIONS AND ACRONYMS

[This list should be modified to include all the acronyms and abbreviations that actually appear in the publication.]

ac	active constituent
ADI	acceptable daily intake (for humans)
AHMAC	Australian Health Ministers Advisory Council
ai	active ingredient
d	Day
DT90	Time taken for 90% of the compound to dissipate
EbC_{50}	Median Effective Concentration resulting in a 50% change in algal biomass relative to the control.
EC_{50}	Concentration at which 50% of the test population are immobilised
EUP	End use product
Fo	Original parent generation
h	Hour
HPLC	high pressure liquid chromatography *or* high performance liquid chromatography
id	Intradermal
ip	Intraperitoneal
im	Intramuscular
iv	Intravenous
in vitro	outside the living body and in an artificial environment
in vivo	inside the living body of a plant or animal
kg	Kilogram
L	Litre
LC_{50}	Concentration that kills 50% of the test population of organisms
LD_{50}	Dosage of chemical that kills 50% of the test population of organisms
LOEC	Lowest observed effect concentration
LOQ	Analytical Limit of Quantitation
Koc	Adsorption coefficients based on organic carbon content
mg	Milligram
mL	Millilitre
MRL	maximum residue limit
MSDS	Material Safety Data Sheet
NDPSC	National Drugs and Poisons Schedule Committee
ng	Nanogram
NHMRC	National Health and Medical Research Council
NOEC/NOEL	no observable effect concentration/level
po	Oral
ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
s	Second
sc	Subcutaneous
SC	suspension concentrate
SUSDP	Standard for the Uniform Scheduling of Drugs and Poisons
T-Value	a value used to determine the First Aid Instructions for chemical products that contain two or more poisons
TGAC	technical grade active constituent
WDG	water dispersible granule
WHP	withholding period

SUMMARY

Fludioxinil is a new phenylpyrrole fungicide that provides broad-spectrum activity against a wide range of air-, seed- and soil-borne diseases caused by *Ascomycetes*, *Deuteromycetes* and *Basidiomycetes*. It is believed to inhibit transport-associated phosphorylation of glucose, which subsequently results in the inhibition of mycelial growth.

Novartis Crop Protection Australasia Ltd have applied for registration of the product Maxim 100 FS Fungicide Seed Treatment (Maxim 100 FS), a suspension concentrate formulation containing 100g/L fludioxonil. The product is to be marketed, in all States, for the control of Silver and Black (Rhizoctonia) Scurf in seed potatoes. It will be applied as seed dressing prior to sowing or applied to the seed during the planting operation. The proposed application rate is 25 ml product/100 kg seed.

This publication provides a summary of the data reviewed and an outline of the regulatory considerations for the proposed registration of Maxim 100 FS. At this stage the product is not registered. Responses to this public release summary will be taken into consideration by the NRA in deciding whether the product should be registered and in determining appropriate conditions of registration and product labelling.

Written comments are invited and should be submitted to the NRA at the address shown in the Introduction. Comments should be submitted by **10 May 2000.**

Public health aspects

Concentrated fludioxonil has low acute oral, dermal and inhalation toxicity. It is a slight skin irritant and a slight to moderate eye irritant but does not cause skin sensitisation. The product Maxim 100 FS Fungicide Seed Treatment, which contains fludioxonil at 100 g/L, has a similar toxicity profile to the concentrated active except that it is anticipated to be only a slight eye irritant and not cause any skin irritation.

Repeat dose studies in a range of animal species indicate that the primary targets for fludioxonil toxicity are the liver and kidneys. High concentrations in the diet also caused reduced body weight gain, increased serum cholesterol levels and blue discolouration of the urine, faeces and body surfaces (due to a metabolite of fludioxonil).

Special studies indicate that fludioxonil does not damage genetic material. Long-term exposure to fludioxonil in the diet was not associated with an increase in cancer among mice and rats. There were no effects on reproductive behaviour or performance in rats. At doses that were not toxic to the mother, there were no developmental effects on the rat or rabbit foetus. Studies in rats have shown that although fludioxonil is efficiently absorbed and metabolised following oral administration, the majority is excreted via bile in the faeces.

Based on an assessment of the toxicology and the potential dietary intake of residues, it was considered that there should be no adverse effects on human health from the proposed use of Maxim 100 FS when used in accordance with the label directions.

Residues in food and trade aspects

Residue data were presented for trials conducted in Australia on potatoes. Overseas trial data were provided for potatoes and processed potato products such as potato chips and peeled potatoes. Residues in potato peelings, a potential animal feed commodity were also addressed in overseas trials. This data allowed an MRL of 0.02mg/kg potatoes to be established.

Trade aspects of exports of fresh potatoes and the implication of feeding treated potato peelings to livestock have been considered. Grazing practices exclude potato foliage as an animal feed. There are no CODEX MRLs set for fludioxonil on potatoes however the trial data provided demonstrates that fludioxonil residues in potatoes will not exceed 0.01mg/kg, the analytical Limit of Quantitation (LOQ). Animal transfer studies and metabolism studies show that feeding fludioxonil at a level of 0.07mg/kg (potato peels contain finite residues up to this level) will not result in residues higher than the animal commodity Limit of Quantitation.

Occupational Health and Safety aspects

Fludioxonil is not on the NOHSC *List of Designated Hazardous Substances*. Based on the NOHSC *Approved Criteria for Classifying Hazardous Substances,* fludioxonil and Maxim 100 FS Fungicide Seed Treatment are classified as non-hazardous.

Maxim 100 FS will be imported fully formulated and packaged. It will be packed in 1, 5, and 10 L polyethylene and HDPE containers.

Maxim 100 FS possesses low acute oral and dermal toxicity. The product was neither an eye and skin irritant, nor a skin sensitiser, and was of low inhalation toxicity.

Worker exposure data was not available for fludioxonil or Maxim 100 FS.

Instructions and Safety Directions are provided on the product labels to minimise exposure to the product. Based on the risk assessment, elbow length PVC gloves and face shield or goggles are recommended for users of Maxim 100 FS. A re-entry statement is not recommended for this product.

Environmental Aspects

Fludioxinil is stable to hydrolysis and the principal degradation pathway is by photolysis in solution and on the surface of soils. Microbial breakdown in aerobic soils in the dark is slow. There was little degradation via aquatic metabolism or under anaerobic conditions. Laboratory studies and extensive field studies showed that fludioxonil was immobile, with residues not detected below 20cm, at rates well above those proposed. Fludioxinil does not bioaccumulate.

Fludioxinil is non-toxic to birds, bees and earthworms and highly toxic to fish, and aquatic invertebrates and highly toxic to algae. It does not appear to affect soil/terrestrial invertebrates. However, it could do so for soil micro-organisms but only at high rates.

The hazards to birds, fish, aquatic invertebrates, bees, earthworms and soil microbes, even using worst case scenarios, ie 10% overspray, was determined to be insignificant. While there is a slight hazard to algae using worst case scenarios for runoff, with more realistic assumptions and taking into account the strong binding to soil, the hazard is lower. With the limited use pattern, low mobility and low environmental exposure, the lack of aquatic plant studies is not considered critical to the proposed use.

Efficacy and crop safety

In regards to the efficacy of Maxim 100 FS, the claims made in the submission are for control of seed borne Silver Scurf (*Helminthosporium solani)* and Black Scurf (*Rhizoctonia solani*), when applied to seed potatoes at a rate of 25ml per 100kg of seed.

Results of trials show that the incidence of these diseases is adequately reduced in mother tubers, and also in daughter tubers produced from treated seed potatoes. It is acknowledged that this product is likely to become a useful addition to the range of fungicides available for seed treatment in Australia's potato industry.

In regards to crop safety, no phytotoxic affects were observed in any plants or harvested tubers, in the trials conducted. Application rates of up to twice the proposed rate were applied to seed potatoes with no visible crop effects or deleterious effects to crop development.

INTRODUCTION

This publication provides a summary of the data reviewed and an outline of the regulatory considerations for the proposed registration of Maxim 100 FS Fungicide Seed Treatment (Maxim 100 FS), containing the new active constituent fludioxonil.

Responses to this public release summary will be considered prior to registration of the product. They will be taken into account by the NRA in deciding whether the product should be registered. They will also be taken into account in determining appropriate conditions of registration and product labelling.

Written comments are invited and should be submitted by 10 May 2000, addressed to:

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Applicant:

Novartis Crop Protection Australasia Ltd

Product Details:

Maxim 100 FS is a suspension concentrate containing 100 g/L fludioxonil. Fludioxinil is a new phenylpyrrole fungicide that provides broad-spectrum activity against a wide range of air-, seed- and soil-borne diseases caused by *Ascomycetes, Deuteromycetes* and *Basidiomycetes*. It is believed to inhibit transport-associated phosphorylation of glucose, which subsequently results in the inhibition of mycelial growth.

The active constituent is manufactured in Switzerland by Novartis Crop Protection AG at Pratteln and the end use product will be formulated by that company and a number of Australian formulators.

Registration of Maxim 100 FS for the purpose of controlling seed borne Silver and Black Scurf is proposed.

Fludioxinil is registered for use as a foliar treatment and seed treatment in a number of countries including USA, France, Switzerland, Italy and Spain. These registrations are for number of formulation types including wettable powders and water dispersable granules. The predominant crops on which fludioxonil is registered are sorghum, maize, potatoes, rice, wheat, barley oats.

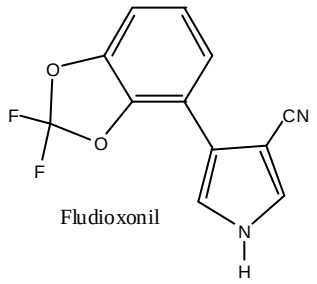
CHEMISTRY AND MANUFACTURE

Active constituent

The chemical active constituent fludioxonil is manufactured in Switzerland by Novartis crop Protection AG at Pratteln and has been approved by the NRA (TGAC Approval number 51425). Fludioxinil has the following properties:

Common name (SA or ISO common name):	Fludioxonil
Synonyms and code number:	CGA 173506
Chemical name	
(IUPAC):	4-(2,2-difluoro-1,3-benzodioxol-4-yl)pyrrole-3-carbonitrile
(CA):	4-(2,2-difluoro-1,3-benzodioxol-4-yl)-1*H*-pyrrole-3-carbonitrile
Chemical Abstracts Service (CAS) Registry Number:	131341-86-1
Molecular formula:	$C_{12}H_8F_2N_2O_2$
Molecular weight:	248.2 g/mole

Chemical structure:



Fludioxonil

Physical state:	Fine powder	
Colour:	Light olive green	
Odour:	Odourless	
Melting point or range (for solids):	199.8 °C	
Density:	1.54 g/cm^3	
Solubility in water:	1.8 mg/L at 25 °C	
Solubility in various organic solvents at 25 °C:	acetone	190 g/L
	ethanol	44 g/L
	n-octanol	20 g/L
	toluene	2.7 g/L
	n-hexane	0.0078 g/L
Vapour pressure:	3.9 x 10^{-7} Pa at 25 °C (extrapolated)	
Dissociation constants:	pKa_1 < 0 (basic)	pKa_2 ~ 14.1 (acidic)
Octanol/water Partition Coefficient:	log Pow = 4.12 ± 0.016 at 25 °C	
pH (1 % aqueous dispersion):	8.6 at 25 °C	
Storage stability:	No storage stability data provided for the TGAC. Requested from the Applicant.	
Corrosion characteristics:	Not corrosive to tin plate, iron steel (ST 37) or stainless steel (DIN 1.4541)	
Chemical type:	Fungicide	
Chemical family:	Phenylpyrrole	

Formulated Product

Distinguishing name:	Maxim® 100 FS Fungicide Seed Treatment
Formulation type:	Suspension concentrate for seed treatment
Active constituent concentration:	100 g/L fludioxonil
Mode of Action:	The fungicidal action of fludioxonil is believed to be via inhibition of transport-associated phosphorylation of glucose, which results in the inhibition of mycelial growth.

Physical and Chemical Properties of the Product

Physical state:	Liquid
Colour:	Light to dark red
Odour:	Slight varnish-like odour
Specific gravity (liquids):	1.02 to 1.08 g/cm^3 at 20 ^{o}C
pH value (1% in deionised water):	6.0 to 9.0
Surface tension:	
Filtrates of 0.1 g/L suspensions	42.7 to 43.4 mN/m
Filtrates of 0.1 g/L dilutions	65.4 to 66.9 mN/m after 60 minutes
Flash point:	>100 ^{o}C
Flammability:	Not flammable (auto-ignition at 460 ^{o}C)
Explodability:	Not explosive
Corrosion Characteristics:	Not corrosive to tin plate, stainless steel or polyethylene. Slightly corrosive to iron steel.
Storage Stability:	Stability data provided by applicant supports a shelf life of 2 years when the product is stored below 30 ^{0}C (room temperature) in HDPE drums (1, 5 and 10 L capacity).

TOXICOLOGICAL ASSESSMENT

The toxicological database for fludioxonil consisting primarily of toxicity tests conducted using animals, is quite extensive. In interpreting the data, it should be noted that toxicity tests generally use doses that are high compared to likely human exposures. The use of high doses increases the likelihood that potentially significant toxic effects will be identified. Toxicity tests should also indicate dose levels at which the specific toxic effects are unlikely to occur. Such dose levels as the No-Observable-Effect Level (NOEL) are used to develop acceptable limits for dietary or other intakes at which no adverse health effects in humans would be expected.

Toxicokinetics and Metabolism

In rats, fludioxonil was rapidly absorbed following oral administration with the maximum blood levels reached within half an hour. Approximately 77% of an orally administered dose was absorbed and the majority was excreted via bile in the faeces within 24 hours. Fludioxonil is extensively metabolised in the body.

Acute Studies

Fludioxonil has low acute oral (LD_{50} >5000 mg/kg bw in mice and rats), dermal (LD_{50} >2000 mg/kg bw in rats) and inhalation toxicity (LC_{50} >2600 mg/m^3 in rats). It is a slight skin irritant and a slight to moderate ocular irritant to rabbits. Washing the eye immediately after exposure reduced the severity of the irritation. Fludioxonil did not cause skin sensitisation in guinea pigs.

Studies using a formulation containing 25 g/L fludioxonil indicate that the product Maxim 100 FS (100 g/L fludioxonil) has very low acute oral toxicity, low dermal toxicity, and low inhalation toxicity. The product is unlikely to cause dermal irritation or skin sensitisation but may be a slight eye irritant.

Short-Term Studies

Mice fed a diet containing up to 7000 ppm fludioxonil for 90 days showed reduced body weight gain, liver enlargement, reduced thymus weights and chronic nephropathy at 7000 ppm. Males at 1000 ppm and above had increased bilirubin in the urine. No adverse effects were found at 100 ppm (approximately 14 mg/kg bw/day).

Fludioxonil given to rats at oral doses of up to 1000 mg/kg/day for 28 days or in the diet at concentrations up to 20000 ppm for 90 days showed reduced body weight gain and food consumption, blue discolouration of the tail, faeces and urine, reduced serum glucose levels, and elevated serum cholesterol, bilirubin and calcium, increased urinary bilirubin and increased incidence of ketonuria, enlarged liver, decreased thymus weights, kidney toxicity (inflammation and/or nephropathy) at 100 mg/kg/day and above. Fludioxonil applied to the skin of rats for 28 days showed only increased numbers of phagocytic cells in the thymus at 1000 mg/kg/day. No effects were seen at 14 mg/kg/day.

Dogs fed fludioxonil in the diet at up to 10000 ppm for 90 days had blue faeces and diarrhoea at concentrations of 2000 ppm and above. Cessation of treatment reversed these effects. At 10000 ppm, body weight gain, red blood cell numbers, haemoglobin and mean corpuscular haemoglobin concentrations and fibrinogen levels were reduced, while serum cholesterol levels, thrombocyte counts and mean corpuscular volume were increased. These effects were partially or totally reversible. A reversible increase in liver weights with increased bile duct proliferation was noted in 10000 ppm dogs. No effects were seen at 6.2 mg/kg/day.

Long-Term Studies

Mice fed a diet containing up to 7000 ppm fludioxonil for 18 months showed decreased survival, reduced red blood cell counts, reduced haemoglobin and haematocrit levels, slight increases in reticulocyte counts, and renal and liver toxicity (increased incidences of renal and hepatic cysts, nephropathy, liver necrosis and bile duct hyperplasia) at 7000 ppm. At 3000 ppm, males had reduced body weight gain, females had an increased incidence of lymphoma and, in both sexes, enlarged spleen, liver, thymus and lymph nodes were noted. At 1000 ppm and above, blue discolouration of the skin, stomach and urine, red ears, convulsions and reduced mean corpuscular haemoglobin concentration were found. The NOEL was 30 ppm (approximately 3.3 mg/kg bw/day).

Rats fed a diet containing up to 3000 ppm fludioxonil for 24 months showed blue discolouration of faeces, urine and body surfaces, reduced body weight gain and increased urinary urobilinogen levels at 1000 ppm and above. At 3000 ppm, kidney and liver toxicity (enlarged/necrotic livers, hepatocellular hypertrophy, nephropathy and renal cysts) were noted. The blue discolouration noted in urine, faeces and on the body surfaces of rats after repeat exposure was due to a non-polar metabolite of fludioxonil. The NOEL was 100 ppm (approximately 3.7 mg/kg bw/day).

Dogs fed a diet containing up to 8000 ppm fludioxonil for 52 weeks had blue faeces and reduced body weight at 1000 ppm and above. At 8000 ppm, dogs had increased serum fibrinogen levels (males only), elevated serum cholesterol and bilirubin levels, enlarged livers, decreased spleen, thymus and heart weights, and discolouration of the digestive tract. The NOEL was 100 ppm (approximately 3.1 mg/kg bw/day).

Reproduction and Developmental Studies

Rats fed fludioxonil at up to 3000 ppm in the diet for two generations showed decreases in food intake and lower body weights at 3000 ppm, but no effect on fertility or length of gestation. At 3000 ppm, F_1 and F_2 pups weighed less than controls and the number of F_2 pups surviving to day 4 was reduced. The NOEL for maternal toxicity and pup development was 300 ppm (15 mg/kg bw/day).

Fludioxonil orally administered to rats and rabbits during the period of foetal organogenesis caused no foetal abnormalities at doses which resulted in bodyweight loss and reduced food intake in the dams and does, respectively. The NOEL for maternal toxicity was 100 mg/kg and 10 mg/kg for rats and rabbits, respectively.

Genotoxicity

Fludioxonil was not mutagenic to bacteria (Ames test), or to Chinese hamster cells *in vitro*. *In vitro* tests for chromosomal aberrations in Chinese hamster ovary cells (with and without metabolic activation) and DNA repair in rat hepatocytes produced positive results. Fludioxonil was not genotoxic in the following *in vivo* tests: micronucleus (in mice and rats), chromosomal aberrations, dominant lethal effects and DNA repair synthesis.

PUBLIC HEALTH STANDARDS

Acceptable Daily Intake

The ADI for fludioxonil is 0.03 mg/kg bw/day, based on a NOEL of 3.1 mg/kg/day in a 1 year dog study and using a 100-fold safety factor. The safety factor was selected based on the presence of an adequate toxicology database.

Poisons Schedule

The National Drugs and Poisons Schedule Committee (NDPSC) considered the toxicity of the product and its active ingredients and assessed the necessary controls to be implemented under States' poisons regulations to prevent the occurrence of poisoning. The NDPSC recommended that fludioxonil be listed in Schedule 5 of the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP), **except** in preparations containing 10 per cent or less of fludioxonil. There are provisions for appropriate warning statements and first-aid directions on the product label.

METABOLISM AND TOXICOKINETICS ASSESSMENT

Plant Metabolism

The metabolism of fludioxonil in potatoes, wheat, rice, grapes and tomatoes was investigated. In all plant species, after treatment the major residue component was shown to be the parent compound fludioxonil. A large proportion of the residues were present on the surfaces of treated crops at harvest (48% in potato peels, 57% in grape washes and 41% in tomato washes). Identified metabolites suggest that fludioxonil underwent successive oxidation at the pyrrole ring which resulted in formation of metabolites with an intact benzol ring and modified at the pyrrole ring.

Animal Metabolism

Animal metabolism in general indicated that the majority of dosed fludioxonil was eliminated in the excreta. A significant proportion of the residues in tissues was not extractable. The target tissues for the residual radioactivity were the liver and kidney in goats, rats and hens. The goat study showed that metabolites of fludioxonil were mainly conjugates of the parent compound with glucose or sulfate at the pyrrole ring following hydroxylation. In different tissues, the metabolites were present at varying percentages, from 14 to 83%. In milk, the residues comprised 2 metabolites; parent fludioxonil was not present. In hens, more metabolic fractions were detected, but none of them exceeded 10% of the total radioactivity in any tissue. Egg yolk contained 20 to 40x higher radioactive residues than egg whites. The parent compound together with 2 metabolites was the principal residue component of the radioactivity in hens.

The animal metabolism studies suggest that fludioxonil is metabolized extensively in animal tissues and is unlikely to be a bioaccumulator.

RESIDUES ASSESSMENT

Residues in food commodities

Residue data were presented for trials conducted in Australia on potatoes. Overseas trial data were provided for potatoes and processed potato products such as potato chips and peeled potatoes. Residues in potato peelings, a potential animal feed commodity were addressed in overseas trials.

Potatoes

Data from 3 Australian trials were presented. Application of the product was made at 1x and 2x the recommended rate (2.5 g a.i./100 kg seed) to seed potatoes at planting. Residues in harvested potato tubers ranged from <0.01 – 0.01 mg/kg after treatments at both 1x and 2 x the recommended rate under commercial harvest conditions (ie 106 – 208 days after treatment). A withholding period is not required when used as directed. The following protection statements are to be observed: DO NOT use treated seed potatoes for animal or human consumption; DO NOT allow treated seed potatoes to contaminate potatoes intended for animal or human consumption. An MRL of 0.02 mg/kg is recommended for potato seed treatment in accordance with the proposed use-pattern in Australia. The Supervised Trial Median Residue (STMR) is <0.01 mg/kg.

Processed potato products

Processing data from overseas trials was made available. Finite residues above the LOQ of 0.01 mg/kg were not detected in potato chips, potato granules or peeled potatoes when the Australian use pattern was observed.

Animal feeds

Potato foliage is not likely to be an animal feed as it contains compounds toxic to animals. Potatoes and potato peelings are not considered to be major animal feed commodities, however, they may make up a small percentage of the diet. Overseas data show that potato peelings (dry) contained residues of up to 0.07 mg/kg from potato tubers with residues of <0.01 mg/kg after treatment at the proposed rate.

Animal commodities

Lactating cow transfer studies revealed that no detectable residues can be expected in meat, edible offal or milk (LOQ of 0.01 mg/kg for meat and milk, 0.05 mg/kg for edible offal) using feeding levels up to 1.6 ppm. Feeding of potatoes or potato peels should therefore result in non-detectable residues in animal commodities. The protection statements of "DO NOT use treated seed potatoes for animal or human consumption" and "DO NOT allow treated seed potatoes to contaminate potatoes intended for animal or human consumption" provide additional measures in ensuring non-transfer of residues to animals.

Dietary intake assessment

The Australian Acceptable Daily Intake (ADI) for fludioxonil is set at 0.03 mg/kg bodyweight/day. With the STMR value of <0.01 mg/kg, the dietary intake is estimated at approximately 0.04% of the ADI, indicating that the chronic dietary exposure is very small and the risk is acceptable.

Animal Transfer Studies

Animal transfer studies were conducted in dairy cattle. Lactating cows were treated with fludioxonil in gelatine capsules equivalent to 0.55, 1.62 and 5.5 ppm in feed for 28, 29 and 30 consecutive days. The animals were milked twice daily with samples collected during the dosing period. At the end of the treatment period, tissue samples were collected for residue analysis. No detectable residues were observed above the analytical LOQof 0.01 mg/kg (meat) and 0.05 mg/kg (liver and kidney). Milk residues up to 0.016 mg/kg (3-21 days) were only found at the highest treatment rate of 5.5 ppm and in other treatments, milk residues were below the LOQ of 0.01 mg/kg.

Animal transfer studies for pigs or poultry were not provided.

While potato peelings and potatoes can be fed to animals, they are not considered to be significant animal feeds. Residues of fludioxonil are low in these commodities and the chemical does not accumulate in animal tissues. Therefore, animal commodity MRLs are not recommended.

MRL Standard

The following additions to the *MRL Standard* have been recommended:

Table 1

Compound	**Food**	**MRL (mg/kg)**
Fludioxonil	VR 0589 Potato	0.02

Table 3

Compound	***Residue***
Fludioxonil:	Fludioxonil

ASSESSMENT OF OVERSEAS TRADE ASPECTS OF RESIDUES IN FOOD

Commodities Exported

Exports of fresh potatoes account for a small proportion of potato production (1%) in Australia. Approximately 13 kt of potatoes were exported at a value of $4 million in 1993-94. The export value was increased to $6.3 million in 1994-95 (AHC, *The Australian Horticultural Statistics Handbook, 1995/96 edition*). Seventy three percent of exported potatoes were produced in Western Australia. Most were exported to Mauritius and Singapore with small amounts to Malaysia, Papua New Guinea and Hong Kong and a number of Pacific nations.

International Use

The applicant advised that products containing fludioxonil are currently registered for use on potatoes in Mexico, Russia, and South Africa. Registration on potatoes is pending in the USA.

Fludioxonil is registered for use on grapes as a foliar treatment and seed treatment for cereal grains in countries such as USA, France, Italy, Switzerland and Spain.

Codex Alimentarius Commission MRLs

Codex MRLs have not been set for fludioxonil.

Australian MRLs

The MRL recommended for inclusion in the Australian *MRL Standard* is as follows:

Potato	0.02 (mg/kg)

Potential Risk to Trade

Australian residue trials show that fludioxonil in potatoes should not exceed the LOQ of 0.01 mg/kg when used as proposed and therefore a trade risk is minimal.

Animal commodities are not expected to have a trade risk associated with application of fludioxonil when it is used in accordance with the product label. Feeding of potato tubers or potato peels would not result in detectable residues in animal commodities including meat and milk. The protection statements of “DO NOT use treated seed potatoes for animal or human consumption” and “DO NOT allow treated seed potatoes to contaminate potatoes intended for animal or human consumption” should provide protection of livestock from contamination with residues.

OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT

Fludioxonil is not on the NOHSC *List of Designated Hazardous Substances*. Based on the NOHSC *Approved Criteria for Classifying Hazardous Substances,* fludioxonil is classified as non-hazardous.

Fludioxonil is in the form of a light olive green, odourless powder. It has low acute oral, dermal and inhalation toxicity in rats and rabbits. It is a slight eye irritant but not a skin irritant in rabbits nor a skin sensitiser in guinea pigs.

Maxim 100 FS cannot be classified as hazardous according to NOSHC criteria based on the information supplied to NOHSC.

Maxim 100 FS is a suspension concentrate formulation containing red coloured dye. It is expected to possess low acute oral and inhalation toxicity and low acute dermal toxicity. The product is not likely to be a skin irritant but may be irritating to eyes. The product will be supplied in 1, 5 or 10 litre polyethylene and HDPE containers.

Formulation, transport, storage and retailing

Maxim 100 FS will be formulated overseas and imported into Australia in sale packs. Transport workers, storepersons and retailers will handle the packaged product and could only become contaminated if the packaging were breached.

End use and exposure

Maxim 100 FS is proposed for the control of seed borne *Rhizoctonia* (Black scurf) and *Helminthosporium solani* (Silver scurf) in potatoes. It will be applied at a rate of 25 mL per 100 kg of seed potato at or prior to planting.

The main routes of exposure to the product are inhalational and dermal. The product is a suspension concentrate formulation, however workers are still likely to be exposed to some concentrate while loading spray equipment. Workers may also be exposed to spray mist from the product spray. Functions that can lead to exposure to the product include opening containers, mixing/loading, application, cleaning up spills, cleaning/maintaining equipment and handling treated seed potatoes.

Handling treated crops

Based on the toxicity of the product and its use pattern, a re-handling statement is not recommended at this stage.

Recommendations for safe use

Workers involved in transport, storage and retailing should be protected by safe work practices and training. End users should follow the instructions on the product label. Based on the toxicity of the active ingredient and the product, elbow-length PVC gloves and face shield or goggles are recommended for users of Maxim 100 FS.

The personal protective equipment recommended should meet the relevant Standard Australian standards specified below:

AS 1337-1992	***Eye Protection for Industrial Applications***
AS 2161-1978	***Industrial Safety Gloves and Mittens (Excluding Electrical and Medical Gloves)***

ENVIRONMENTAL ASSESSMENT

Environmental Exposure

Fludioxinil is likely to have limited environmental exposure as the proposed use is for the treatment of seed potatoes at planting to control Black Scurf and Silver Scurf.

Environmental Fate

Hydrolysis

In a study conducted according to US EPA Guidelines, there was no hydrolysis at pH 4, 7, and 9 after 30 days at 25 °C. Hydrolysis is not expected under normal environmental conditions.

Photolysis

In two studies conducted to meet US EPA Guidelines using either phenyl or pyrrole ring labelled material, the photolytic half-life at pH 7 was determined as 9 and 10 days respectively of natural sunlight equivalent. There were a number of degradates noted, three of which were identified, CGA 344623, CGA 339833 and CGA 308565, all of which are pyrrole ring oxidised derivatives. Both studies using the differently radiolabelled material showed the same principal metabolites.

In soil photolysis studies using either the pyrrole or phenyl ring labelled fludioxonil, conducted to meet US EPA requirements, the photo-degradation was faster. The half-lives were determined using a two-compartment model, where one compartment is directly exposed and the other partially or completely shaded from the light. The half-life for the directly exposed compartment was calculated as 0.8 and 1.6 days respectively of natural sunlight equivalence but second compartment was longer, 56 and 98 days of natural sunlight. Again there were several photo-degradates, with 3 identified, CGA 265378, CGA 339833 and CGA 192155, only one of which was identified in the aquatic photolysis study. Both studies using the differently radiolabelled material showed the same principal metabolites, again all oxidised pyrrole ring derivatives. The lamp used for both studies used was similar to natural sunlight in England during June.

Photolysis in soil and water under Australian conditions could be a significant route of degradation, especial for material directly exposed to light. Degradation is expected to be significantly slower for material not directly exposed.

Metabolism

Eight aerobic soil degradation studies, generally conducted to meet US EPA and European Guidelines used 9 different soils, with incubation periods of between 84 days and 1 year. The overall first half-lives under typical environmental conditions (20 °C) were between 143 and 520 days but the DT90s, when calculated, were very long and > 3 years. There were no metabolites identified, with bound residues and CO_2 as the principal degradates in all these studies. The rate of degradation was dependent on the microbial activity of the soil, with the faster degradation associated with the more microbially active soils. There was no effect due concentration of active in the soils. Fludioxonil is rated as very slightly to slightly degradable in laboratory studies in the dark.

An aquatic aerobic metabolism was performed to meet Dutch and US EPA Guidelines using two sediments and the corresponding natural waters from a pond and the Rhine River. There was approximately 20% degradation during the half-year study and a half-life at 25 °C was calculated as 450 and 700 days for the Rhine and pond systems respectively. Fludioxonil is rated as very slightly degradable in aquatic systems in the dark.

Two anaerobic soil studies conducted to satisfy to US EPA requirements showed there was no detectable degradation of fludioxonil after 60 days of anaerobic incubation. Fludioxonil does not readily degrade in anaerobic soils.

An anaerobic aquatic degradation study was not presented but given that there was no degradation in an anaerobic soil study, aquatic degradation is considered unlikely. However, fludioxonil is likely to partition to sediment due to the high Koc, where it is likely to be stable.

Mobility

In batch adsorption/desorption studies performed to meet US EPA requirements using 5 different soils from the UK, the Koc ranged from 12,000 for a sandy loam to 392,000 for a silt clay loam. Fludioxonil was rated as immobile the soils tested. There was no evidence of leaching in the column leaching studies, conducted to US EPA and European Guidelines, using 5 different soils (a sand, a sandy loam, 2 sandy silt loams and a silt clay loam). Even in the sandy soil with high leaching potential, movement was limited, only 4-6 cm from the top of the column. Similarly, there was no leaching of metabolites from two soils where fludioxonil was aerobically aged for 32 or 321 days and then leached.

In studies conducted on the volatility of fludioxonil from soil and leaf surfaces according to German Guidelines, it was concluded that it is non-volatile from soils and only slightly volatile from leaf surfaces.

Field Dissipation

In 11 field studies performed in Europe and South Africa, the first half lives were calculated as between 6 and 25 days, except for one outlier with a half life of 59 days, for soils exposed to sunlight. However, for one experiment where the active was covered with soil after application, the first half-life was 167 days. The degradation was strongly second-order, with DT90s ranging from 29 to 280 days, except for the outlier with DT90 of 650 days. Fludioxonil was not detected in any soil below 20 cm. The outlier was the only field study with a crop (grapes) in the plot used and it was considered that the longer degradation rate was a result of shading caused by the vines. Similarly, a 5 year soil residue study in grapes showed that residues were persistent under the vines and carried over from one year to the next. There was little carryover in the soil between the rows. Modelling of the data indicated that the half-lives were approximately 125 days between rows and 340 days below the vines. Fludioxonil is rated as readily degradable to slightly degradable in soils exposed to sunlight but only very slightly degradable when not exposed to sunlight.

A field study was undertaken that examined the residues in turf and soil over a year following application at 3 different concentrations. The degradation was similar to the other field studies, with first half-lives of between 2.5 and 26 days and DT 90s between 27 and 172 days.

Migration following seed treatment

Studies on the migration of radiolabelled fludioxonil into soil following treatment and germination of wheat seeds showed that the applied radioactivity remained within 1 cm of the seed. The dissipation half-life of the extractable radioactivity from the seed (assumed to be unchanged fludioxonil) was 21 days using one compartment model. The more rapid degradation compared to the field study using covered soils was considered to be due to the more biologically active rhizosphere.

Bioaccumulation

The bioaccumulation of fludioxonil was studied in bluegill sunfish according to US EPA and OECD Guidelines. The steady state bioaccumulation factors were determined as 366, 58 and 741 for whole fish, edible and viscera tissue respectively, indicating that there is limited bioaccumulation of fludioxonil. As the residues were rapidly eliminated in clean water, 90% depuration occurred in <2 days for all tissues, bioaccumulation under natural conditions is not expected.

Environmental Toxicity

Avian

In acute oral and dietary toxicity tests on mallards and Bobwhite quail, conducted to meet US EPA requirements, there were no treatment related effects at the maximum doses used, approximately 2000 mg/kg bw and 5000 mg/kg (in feed) respectively. In the long-term reproductive studies, there were no effects on for mallard ducks at 700 mg/kg in the feed. For Bobwhite quail there were effects on body weight for males and a slight reduction in viable embryos, which while not statistically significant was considered of biological significance, and therefore the NOEL was set at 125 mg/kg of fludioxonil in the feed. A special study on the repellency of Celest 25 (essentially the same formulation as Maxim 100 FS) formulated with fludioxonil at 25.3 g /L active, showed there was no repellent effect to quail and laughing doves. Fludioxonil is practically non-toxic to birds in acute situations.

Aquatic

A range of studies was conducted to meet US EPA and OECD requirements using the TGAC. The LC50 for fish ranged from 0.23 to 1.5 mg ai/L, based on 8 studies using the TGAC, and for *D. magna* the EC50 ranged 0.4 to 1.13 mg ai/L (3 studies). In chronic studies, using early life stages of fish, a NOEC of 0.039 mg ai/L was determined and a LOEC of 0.077 mg ai/L, based on survival of fish fry. A 21 day test was also provided but it was not considered acceptable due to the wide fluctuations in the measured concentrations. In two chronic 21 days daphnia studies, the NOECs were 5.2 and 19 µg ai/L for a semi static and flow-through study respectively. Fludioxonil is rated as highly toxic to fish and daphnia, based on these studies. In tests conducted to US EPA requirements, it is also rated as highly toxic to mysid shrimp and oysters, with LC50s of 0.27 and 0.37 mg/L respectively.

In acute fish and daphnia tests, conducted to OECD requirements using the formulation Celest 25 FS, the LD50s were 20.0 and 24.9 mg/L for fish and 54 mg/L for daphnia. In a chronic 21 day daphnia test using Celest, conducted to OECD Guidelines under semi-static conditions, the NOEC was 1.0 mg/L and LOEC 4.0 mg/L. These results, when converted to active ingredient based on the concentration of active, show that Celest is significantly less toxic than the active itself. As the formulations of Celest and Maxim 100 FS are essentially the same, these results are of relevance to Australia.

In tests conducted to US EPA or OECD requirements, the TGAC was rated as highly toxic to very toxic to green algae with EbC50s of 0.092 and 0.93 mg/L respectively and Celest was rated as moderately toxic, with an EbC50 of 6.5 mg/L.

Microcosm study

In a microcosm study conducted to an in-house protocol, the half-life of fludioxonil in water was approximately 10 days in all treatments and the major dissipation pathway was considered to be through photolysis. There were 4 treatment levels used and 5 treatments, 2 weeks apart. Maximum average concentrations of fludioxonil in water slowly increased following each new dose during the study and reached a maximum immediately after the last application of 4.23, 11.1, 23.45 and 48.13 µg/L for treatment levels 1 to 4 respectively. It should be noted that in treatment levels 4 and 5, one tank (replicate) showed consistently lower concentrations and more rapid degradation than the other two ponds. There was a slow increase in residues of fludioxonil in sediment and at peak levels (477-558 µg/L for treatment 4) represented approximately 3% of the applied fludioxonil.

While fludioxonil effected phytoplankton (Chrysophytes and diatoms) and periphyton populations, these were not statistically significant. Among the zooplankton only the rotifer *Keratella sp* was statistically significantly affected. Some benthic macro-invertebrates may have been affected, based on a weight of evidence approach, but this was not statistically significant. Fish were unaffected.

It was concluded that the overall effects of fludioxonil were minor and occurred at the lowest trophic level (phytoplankton and periphyton), with possible secondary effects on the rotifer *Keratella*. Densities of benthic macro-invertebrates might have been effected near the end of the study.

Environment Australia agrees that the study shows relatively minor effect but notes that the effects are prolonged and in natural ecosystems these effects on low trophic organisms can lead to significant changes in aquatic ecosystems. In addition, it is noted from the laboratory studies, that the concentrations in the microcosms were those at which chronic effects on sensitive organisms, ie aquatic invertebrates, could be expected. This appears to have been the case.

Non-target invertebrates

In a study on the acute contact and oral toxicity to bees, conducted to an in-house protocol, fludioxonil was relatively non-toxic to bees in the contact test, with this part of the test considered as acceptable. The acute oral section of the study was not considered acceptable and the company has been requested to comment. In a second acute contact study, conducted to US EPA Guidelines and considered as reliable, fludioxonil was also found to be relatively non-toxic to bees.

Based on a test conducted to OECD Guidelines, fludioxonil was rated as practically non-toxic to earthworms. In studies on the effect on beneficial organisms, conducted to proposed German Guidelines, there was no adverse effect on 3 species of beneficial predatory beetles or on one species of spider. In two studies on the effect of fludioxonil on soil micro-organisms, there were no effects on respiration. There were some minor effects on soil nitrification 14 days after application but these were not significant at rates equivalent to 250 g ai/ha or less.

At the highest rates tested, equivalent to 1000 g ai/ha, there were effects on nitrification that lasted for the duration of the test, 96 days after treatment.

Prediction Of Environmental Hazard

Hazard arising from use

Fludioxonil is for the treatment of seed potatoes to control the fungal diseases Black Scurf and Silver Scurf throughout Australia. It is formulated at 100 g/L in the EUP (Maxim 100 FS) and will be applied using two methods, one where the potatoes are treated before planting, often in a shed, and the other where the potatoes are directly sprayed during planting operations.

Terrestrial organisms

The risk to terrestrial organisms is expected to be negligible. Potatoes are not known as a food source for birds or mammals and therefore exposure to these organisms is considered low. It is concluded that with the low exposure and low toxicity to birds and mammals, the risk is negligible.

Earthworms could be exposed to Maxim 100 FS but given the low toxicity and the low rates used (125 g ai/ha), the hazard is expected to be negligible. Terrestrial insects are unlikely to be exposed when Maxim 100 FSis used according to label directions. In addition, there was no effect on beneficial soil/terrestrial insects when the EUP (Celest) was used as a seed treatment for wheat at a higher rate. The hazard to non-target insects is expected to be minimal.

Aquatic organisms

Exposure to aquatic organisms is expected to be limited to spray drift that occurs during planting and run-off from the treated area. When the potatoes are treated before planting, the exposure to aquatic organisms should be negligible provided the excess solution and washings are disposed of properly.

The level of spray drift during planting is expected to be minimal as the spray nozzles are very close to the potatoes and within the machinery. As a worst case and due to the lack of information on possible spray drift from the planting equipment, the spray drift from boomspray equipment was used instead, acknowledging this is a gross overestimate. Using available figures for spray drift from a boomsprayer at 5 metres away, it was calculated by Environment Australia that the hazard to aquatic organisms from fludioxonil was low.

Runoff from treated fields could represent a significant hazard to aquatic organisms. Using as a worst case model (10% of a catchment areas is treated and that 5% of the applied material runs off), calculations showed that there is unlikely to be any effect on aquatic organisms. In addition, this analysis does not allow for adsorption to sediment, expected to be very strong, which will reduce the hazard further. The hazard from runoff is expected to be minimal.

The mobility studies showed there was very limited potential for leaching, which was confirmed in the field dissipation studies. Leaching to groundwater under Australian conditions would not be anticipated.

Desirable vegetation

When used according to label directions, the exposure, and therefore the hazard, to native and non-target vegetation should be negligible.

Conclusions

The principal degradation pathway of fludioxonil is by photolysis in solution and on the surface of soils. It is essentially non-toxic to birds, bees and earthworms but highly toxic to fish, aquatic invertebrates and algae. It could effect soil microbes but only at high rates. When used according to label directions, the hazard is minimal but every care should be taken not to contaminate natural waterways with this product. The draft label contains warning statements to this effect.

EFFICACY AND SAFETY ASSESSMENT

Efficacy

Ten trials were carried out on seven common potato varieties throughout the major potato growing regions of Australia. A range of soil types and environmental conditions were considered. The problem associated with trial work on *Rhizoctonia solani* is that most field sites are already contaminated with some level of infestation. The trial work carried out included soil treatment prior to planting therefore infections are assumed to have arisen from seed borne infections.

The data was evaluated by experts in the various State Agriculture Departments. They consider the ten trials to be a sufficient number, and the results of each trial to be relatively consistent despite the different parameters at each trial site. The data provided contained no apparent discrepancies and the number, range and method of application were adequate to interpret the data in relation to the proposed use.

Reported trials demonstrated that when Maxim 100 FS is applied at a rate of 25mL per kg of seed, adequate control of (Silver scurf) *Helminthosporium solani* and (Black Scurf) *Rhizoctonia solani* in mother tubers was achieved. The pathogen incidence was also reduced in daughter tubers, when compared to tubers produced from untreated seed.

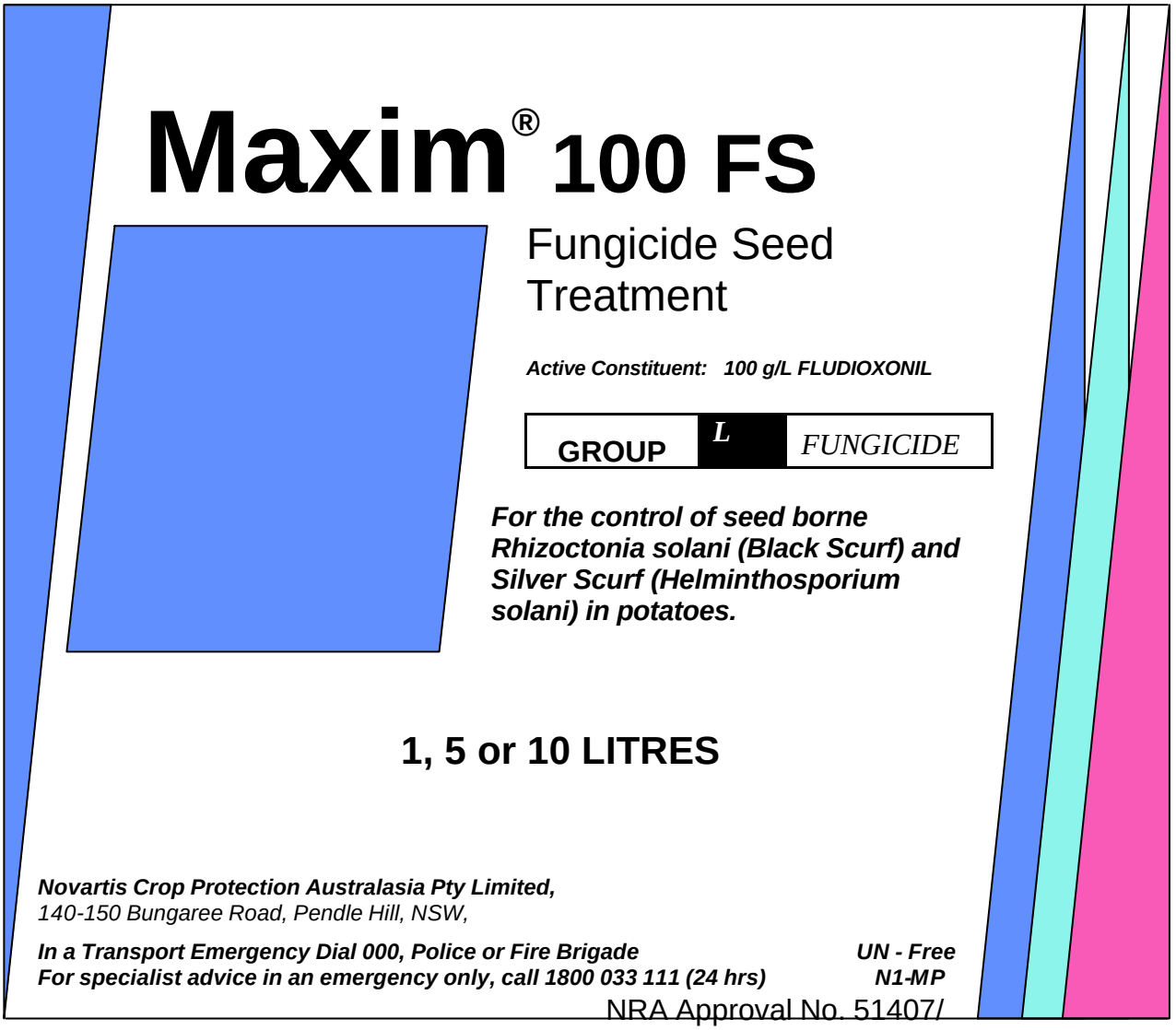
For fungicide resistance management purposes, fludioxonil has been placed in the new activity group, Group L, the phenylpyrrole group of fungicides.

Crop Safety

No phytotoxic affects were observed in plants or harvested tubers in any of the trials conducted. Crop safety was assessed by visual observation. Application rates of up to 2X the proposed rate were applied to seed potatoes with no visible crop effects noted. There were also no observed differences in crop development when Maxim 100 FS was applied at 25mL and 50mL per 100kg of seed.

LABELLING REQUIREMENTS

READ SAFETY DIRECTIONS BEFORE OPENING OR USING



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DIRECTIONS FOR USE

Crop	Disease Controlled	Rate	Critical Comments
Potatoes	Black Scurf (Rhizoctonia *solani*), Silver Scurf (*Helminthosporium solani*)	25 mL per 100 kg of seed	Apply Maxim 100 FS to the seed potato at or prior to planting. Ensure even distribution over the seed.

NOT TO BE USED FOR ANY PURPOSE, OR IN ANY MANNER, CONTRARY TO THIS LABEL UNLESS AUTHORISED UNDER APPROPRIATE LEGISLATION

WITHHOLDING PERIOD: NOT REQUIRED WHEN USED AS DIRECTED.

GENERAL INSTRUCTIONS

Maxim 100 FS can be applied prior to the planting operation as a traditional seed treatment or during planting as an at planting seed piece spray.

Application

Complete coverage of planting material is essential for best results.

Seed Treatment: Mix the required quantity of Maxim 100 FS with enough water to make up a minimum total volume of 1 - 2 L per tonne of seed. Use standard seed treating equipment.

At Planting Spray: Mix the required quantity of Maxim 100 FS with enough water to make up a total volume of 8 to 10 L per tonne of seed. Ensure constant agitation of the spray tank while spraying. Apply to the seed during the planting operation.

Fungicide Resistance Warning

GROUP	L	FUNGICIDE

MAXIM 100 FS is a member of the phenylpyrrole group of fungicides. For fungicide resistance management MAXIM 100 FS is a Group L fungicide.

Some naturally occurring individual fungi resistant to MAXIM 100 FS and other Group L fungicides may exist through normal genetic variability in any fungal population. The resistant individuals can eventually dominate the fungi population if these fungicides are used repeatedly. These resistant fungi will not be controlled by MAXIM 100 FS and other Group L fungicides, thus resulting in a reduction in efficacy and possible yield loss.

Since the occurrence of resistant fungi is difficult to detect prior to use, Novartis Crop Protection Australasia Pty Limited accepts no liability for any losses that may result from the failure of MAXIM 100 FS to control resistant fungi.

PRECAUTIONS

DO NOT use treated seed potatoes for animal or human consumption. DO NOT allow treated seed potatoes to contaminate potatoes intended for animal or human consumption.

When treated seed potatoes are stored they should be kept apart from other potatoes and the bags or other containers should be clearly marked to indicate the contents have been treated with this product. Bags and containers which have held treated seed potatoes are not to be used for any other purpose.

PROTECTION OF LIVESTOCK

Seed potatoes treated with this product must not be used for animal consumption. DO NOT allow seed potatoes treated with this product to contaminate feed intended for animal consumption.

PROTECTION OF WILDLIFE, FISH, CRUSTACEANS AND ENVIRONMENT

Dangerous to fish and other aquatic organisms.

DO NOT contaminate streams, rivers or waterways with the product or used containers.

STORAGE AND DISPOSAL

Keep out of reach of children. Store in closed original container in a cool, well ventilated area. Do not store for prolonged periods in direct sunlight.

Triple or preferably pressure rinse containers before disposal. Add rinsings to seed treatment tank. Do not dispose of undiluted chemicals on-site. If recycling, replace cap and return clean containers to recycler or designated collection point.

If not recycling, break, crush or puncture and bury empty containers in a local authority landfill. If no landfill is available, bury the containers below 500 mm in a disposal pit specifically marked and set up for this purpose clear of waterways, desirable vegetation and tree roots. Empty containers and product should not be burnt.

Rinse application equipment with water after use. Spray rinsings over land away from desirable vegetation, waterways and drainage, if appropriate.

SAFETY DIRECTIONS

Will irritate the eyes. Avoid contact with eyes. When opening the container, preparing spray and using the prepared spray wear:

- elbow-length PVC gloves and
- face shield or goggles.

Wash hands after use. After each day's use, wash gloves, and face shield or goggles.

FIRST AID

If poisoning occurs contact a doctor or Poisons Information Centre. Phone 131 126.

MATERIAL SAFETY DATA SHEET

If additional hazard information is required refer to the Material Safety Data Sheet. For a copy phone 1800 025 931 or visit our website at www.cp.au.novartis.com

MANUFACTURER'S WARRANTY AND EXCLUSION OF LIABILITY

Novartis has no control over storage, handling and manner of use of this product. Where this material is not stored, handled or used correctly and in accordance with directions, no express or implied representations or warranties concerning this product other than non-excludable statutory warranties) will apply. Novartis accepts no liability for any loss or damage arising from incorrect storage handling or use.

Batch No.	
Date of Manufacture	

Bar Code

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GLOSSARY

Active constituent	The substance that is primarily responsible for the effect produced by a chemical product.
Acute	Having rapid onset and of short duration.
Carcinogenicity	The ability to cause cancer.
Chronic	Of long duration.
Codex MRL	Internationally published standard maximum residue limit.
Desorption	Removal of an absorbed material from a surface.
Efficacy	Production of the desired effect.
Formulation	A combination of both active and inactive constituents to form the end use product.
Genotoxicity	The ability to damage genetic material
Hydrophobic	Water repelling
Leaching	Removal of a compound by use of a solvent.
Log P_{ow}	Log to base 10 of octonol water partioning co-efficient.
Metabolism	The conversion of food into energy
Photodegradation	Breakdown of chemicals due to the action of light.
Photolysis	Breakdown of chemicals due to the action of light.
Subcutaneous	Under the skin
Toxicokinetics	The study of the movement of toxins through the body.
Toxicology	The study of the nature and effects of poisons.

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NRA PUBLICATIONS ORDER FORM

To receive a copy of the full technical report for the evaluation of fludioxinil in the product Maxim 100FS Fungicide Seed Treatment please fill in this form and send it, along with payment of $30 to:

David Hutchison
Agricultural and Veterinary Chemical Evaluation Section
National Registration Authority for Agricultural and Veterinary Chemicals
PO Box E240
Kingston ACT 2604

Alternatively, fax this form, along with your credit card details, to the contact officer above on 02 6272 3218

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