National Registration Authority

For Agricultural & Veterinary Chemicals

PUBLIC RELEASE SUMMARY

of the evaluation by the NRA of
the new active constituent:

Fluazinam

in the product:

SHIRLAN FUNGICIDE

1995

(Published on the APVMA website on 14 October 2011 with a compete table of contents added)

This document is published by the National Registration Authority for Agricultural and Veterinary Chemicals.

For further information, please contact –

Colin Byrnes

National Registration Authority

PO Box E240

I/Shirlan/DS

Misc. Pagemaker 23/8/95

Queen Victoria Terrace ACT 2600

Telephone: 06 272 4850

Facsimile: 06 272 3218

Table of Contents

FOREWORD

The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) is an independent Statutory Authority with responsibility for the assessment and approval of agricultural and veterinary chemical products prior to sale and use in Australia.

In undertaking this task, the NRA works in close cooperation with advisory agencies including the Department of Human Services and Health (Environmental Health and Safety Unit), the Environment Protection Agency (EPA), the National Occupational Health and Safety Commission (Worksafe Australia) and State Departments of Agriculture and Health.

The NRA has a policy of encouraging openness and transparency in its activities and seeking community involvement in decision making. The publication of Public Release Summaries for all products containing new active ingredients is a part of that process.

The information and technical data required by the NRA in order 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 document "Interim Requirements for the Registration of Agricultural and Veterinary Chemical Products" which can be obtained from the NRA.

This Public Release Summary is intended as a brief overview of the assessment that has been completed by the NRA and advisory agencies. The document 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 occupational health and safety aspects, environmental impact, and residues in food are available from the NRA on request.

The NRA welcomes comment both on the usefulness of this document and on suggestions for further improvement. Comments should be forwarded to the National Registration Manager, National Registration Authority for Agricultural and Veterinary Chemicals, PO Box E240, Queen Victoria Terrace, Parkes, ACT, 2600.

ABBREVIATIONS AND ACRONYMS WHICH MAY APPEAR IN THIS DOCUMENT

ac	Active constituent
ADI	Acceptable Daily Intake (for humans)
AHMAC	Australian Health Ministers Advisory Council
ai	Active ingredient
d	Day
EHSU	Environmental Health and Safety Unit (Department of Human Services and Health)
EC50	Concentration at which 50 % of the test population are immobilised
EUP	End Use Product
Fo	Original Parent Generation
h	Hour
HPLC	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
LC50	Concentration that kills 50 % of the test population of organisms
LD50	Dosage of chemical that kills 50 % of the test population of organisms
mg	Milligram
mL	Millilitre
MRL	Maximum Residue Limit (a legal 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
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 Periods

1. EXECUTIVE SUMMARY

INTRODUCTION

The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) has before it an application for registration of the product SHIRLAN FUNGICIDE and now invites comment from any person on whether Shirlan Fungicide should be registered. This invitation is being made as the active constituent contained in Shirlan Fungicide *(fluazinam)* is new to agricultural products in Australia.

The purpose of this document is to provide a summary of the data evaluated, and of the regulatory considerations reached, during the evaluation by the NRA of Shirlan Fungicide which is proposed as a control of grey mould and bunch rot in wine grapes and club root of broccoli, Brussels sprouts, cabbage, cauliflower and kohl rabi. Further details of the product and its uses are in the draft label at Annex 1.

Having completed its evaluation of the proposed use of *fluazinam* in Shirlan Fungicide, the NRA provides the following decription of that evaluation for public comment:

AGRICULTURAL ASPECTS

Shirlan Fungicide is a broad spectrum fungicide containing 500 g/L *fluazinam* and is intended for use as a soil drench around brassicas and as a direct spray on grapes. Efficacy trials carried out in Australia, New Zealand and Japan show that the product gives good control of grey mould and bunch rot on wine grapes, and of club root in brassicas (when applied as a post-planting seedling drench).

Phytotoxicity trials showed that treated brassicas were slower growing than untreated plants but, as the season progressed, the treated plants tended to catch up to the untreated plants so much-so that there was no difference in plant size at harvest. No phytotoxicity resulted from use on grapes.

The availability of Shirlan Fungicide for use on brassicas would be desirable as club root is one of the most important diseases of brassicas in temperate Australia. The availablity of Shirlan for use on grapes would again be desirable as it could be used in alternation with dicarboximide fungicides so as to develop a resistance management strategy for grey mould in grape vines.

ENVIRONMENTAL ASPECTS

Fluazinam is a dinitroaniline derivative and is structurally similar to the dinitroaniline herbicides such as pendimethalin and trifluralin. Like the dinitroaniline herbicides, *fluazinam* has low water solubility, high partition coefficient, relatively high vapour pressure and a high susceptibility to photolysis. It sorbs strongly to soils where it is subject to microbial degradation. Moderate persistence is suggested by laboratory data, but field data indicate that the fungicide is non-persistent in soils. *Fluazinam* differs from the dinitroaniline herbicides in having weakly acidic properties.

Fluazinam has low toxicity to birds, mammals and terrestrial invertebrates, but is highly toxic to aquatic organisms. However, significant aquatic exposure to *fluazinam* is not expected due to limited persistence, strong retention by soil, and lower drift potential in vineyards compared to orchards.

Data provided in support of the submission are sufficient to demonstrate that use of *fluazinam* according to label and good agricultural practice should not result in significant environmental contamination or poisoning of non-target organisms.

PUBLIC HEALTH AND SAFETY ASPECTS

Toxicology

Evaluation of the animal toxicity data indicates that *fluazinam* has low acute toxicity, is a severe eye irritant and has dermal sensitisation potential. Shirlan Fungicide is expected to have low acute toxicity, slight skin and eye irritation, and to possess dermal sensitisation potential.

Short and long term studies showed that the liver and eye are the main target organs of *fluazinam.* Effects also occurred on the kidney, testis, pancreas and bone marrow in the rat and only after prolonged exposure. *Fluazinam* caused reproductive and developmental toxicity, impairing foetal growth and survival and increasing the incidence of hernia, facial/palatal clefts and skeletal anomalies. Foetal effects were observed only at doses which caused maternal toxicity. Evidence from genotoxicity studies suggests *fluazinam* does not have adverse effects on genetic material.

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 use of Shirlan Fungicide.

Residues in Food

Evaluation of chemistry and residue data indicates that the use of *fluazinam* is unlikely to result in measurable residues in any of the brassicas permitted by the proposed label. The use of *fluazinam* in wine grapes however does result in a finite residue at harvest and an MRL of 5 mg/kg has been proposed to allow for the monitoring of this use. Processing data confirms that there is no detectable residue *fluazinam* in wine.

IMPLICATIONS FOR TRADE

Australia exports wine and some brassica vegetables. The proposed MRL for brassicas is *0.01 mg/kg which is at or about the limit of analytical determination. No residues have been detected in wine made from grapes containing residues of *fluazinam* at approximately 4 mg/kg. Thus the use of Shirlan Fungicide - when used in accordance with the proposed use patterns - is not expected to have any adverse trade implications for Australia.

OCCUPATIONAL HEALTH AND SAFETY ASPECTS

Fluazinam and Shirlan Fungicide are hazardous substances, as determined by Worksafe Australia in accordance with the National Occupational Health and Safety Commission (NOHSC) Approved Criteria for Classifying Hazardous Substances.

The end use product is imported in bulk and repacked into sales packs in Australia. The main health hazards faced by workers handling the product are inhalational toxicity, skin and eye irritation and skin sensitisation. Incidents of delayed hypersensitivity have been reported in fanners using fluazinam overseas.

Control measures in place to minimise contact with the product during repacking include isolation and mechanisation of the process, good ventilation, appropriate personal protective equipment, good housekeeping, safety procedures and training of workers.

Shirlan Fungicide can be handled safely during transport, retailing and cleaning up spills, with the information available in the Material Safety Data Sheet and on the label and the equipment available in the transport vehicle.

End users are most likely to come in contact with the product when opening containers, preparing spray, using the prepared spray and cleaning up spills. The label safety directions require end users to wear cotton overalls, face shield and elbow-length PVC gloves, to avoid contact with eyes and skin and not to inhale the vapour. The risk of exposure to the product when handling the prepared spray is low because the product is used highly diluted.

A re-entry statement appears on the product label. It refers to use of the product on grapes and extends to the end of the harvest period. Workers re-entering treated areas may come in contact with residues and therefore must wear protective clothing as described on the label. Shirlan Fungicide can be used safely if handled in accordance with the control measures specified in the Material Safety Data Sheet and on the label.

2. INTRODUCTION

The purpose of this document is to provide the public with a summary of the data evaluated, and of the regulatory considerations reached, in the evaluation by the NRA of SHIRLAN FUNGICIDE.

The use of Shirlan Fungicide is proposed as a control of grey mould and bunch rot in wine grapes and club root of broccoli, Brussels sprouts, cabbage, cauliflower and kohl rabi. The NRA now invites comment from any person on whether Shirlan Fungicide should be registered

Comments should be sent by 8 November 1995 to:

Mr Colin Byrnes
Manager, Agricultural Registration
National Registration Authority
PO Box 240
Queen Victoria Terrace ACT 2600

Tel: 06 272 4850
Fax: 06 272 3218

APPLICANT

The applicant, Crop Care Australasia Pty Ltd, has applied for the registration of Shirlan Fungicide, which contains a new active constituent, *fluazinam.*

PRODUCT DETAILS

Shirlan Fungicide is formulated as a suspension concentrate and contains 500 g/L *fluazinam.* Shirlan will be imported into Australia as a fully formulated end use product.

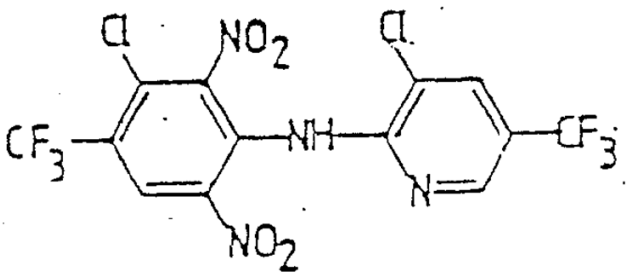
OVERSEAS REGISTRATION STATUS

Countries having registrations of products containing *fluazinam* are shown below –

Country	Crop	Product	Reg/n No &	Date
Holland	Potatoes, tulips, lillies, onion bulbs	500 g/L SC	10710	16 Nov 1990
Japan	Wheat, apples, pears, grapes, peach, citrus, potato, cabbage, kidney beans, adzuki beans, tea	500 g/L SC	17556	10 Apr 1990
New Zealand	Grapes	500 g/L	EC 3504	14 Oct 1988

3. PROPERTIES OF THE CHEMICAL ACTIVE CONSTITUENT

The chemical active constituent *fluazinam* is manufactured in France and has the following properties:

Common name:	*fluazinam*
Chemical name:	3-chloro-N-(3-chloro-5-trifluoromethyl-2-pyridyl) -α,α,α-trifluoro-2, 6-dinitro-p-toluidine
Product name:	Shirlan Fungicide
CAS Registry Number	79622-59-6
Molecular formula:	$C_{13}H_4Cl_2F_6N_4O_4$
Molecular weight:	465.1
Appearance (colour):	pale yellow
Odour:	odourless
Physical state:	crystalline powder
Relative density:	1.757 g/mL@ 20°C
Structural formula:	

4. AGRICULTURAL ASSESSMENT

JUSTIFICATION FOR USE

A need exists for new fungicides in viticulture because of the development of grey mould resistance to currently available benzimidazole and dicarboximide alternatives. Club root in brassicas is usually treated with the organochlorine derivative quintozene, but rates are very high and control tends not to last the season. Wetting agents are also used, but tend to have adverse effects on soil structure at the high rates applied.

Fluazinam products have been registered in New Zealand for use on grapes since 1988. Japanese and Dutch registrations for use on a range of crops have existed since 1990.

PROPOSED USE PATTERN

On Wine Grapes

Shirlan is to be applied to wine grapes at early and late flowering, pre-bunch closure, veraison, and pre-harvest. Alternate use of, or tank mixing with, a dicarboximide fungicide will provide a fungicide resistance management strategy. Mixing of Shirlan is with water and a suitable wetting agent such as "Agral". The application rate is 100 mL/100L or 1L/ha.

On Brassicas

Use of Shirlan Fungicide on broccoli, Brussels sprouts, cabbage, cauliflower, and kohl rabi is at the maximum rate of 50 mL/100L water where severe club root has occurred previously. The diluted mixture is applied immediately after transplanting to the area around the base of each plant to ensure thorough wetting of the collar region.

EVALUATION OF EFFICACY

The applicant, Crop Care Australasia Pty Ltd, provided efficacy data to support the claims of Shirlan Fungicide. The reviewer of this data was satisfied that the claims for Shirlan Fungicide were supported by the data presented. Details of the efficacy data are:

On Wine Grapes

Fluazinam was first registered in New Zealand for control of bunch rot in 1988, under the name Shirlan. The development of the fungicide in New Zealand was rapid because of the occurrence of dicarboximide resistance in *Botrytis cinerea* (which causes bunch rot in grapes).

In four field trials conducted in 1986, 1987, 1988 and 1989 in New Zealand, *fluazinam* gave control of *Botrytis cinerea* at rates of application of 0.5 - 1 kg ai/ha when applied in an early season program of 2-3 sprays beginning at flowering and ending at pre-bunch closure.

These results were further supported by two trials conducted in the 1991-92 season in which various formulations *of fluazinam* at rates of 375, 500 and 625 g ai/ha showed *fluazinam* to be efficacious. In these trials the application regime was again limited to three sprays from flowering to pre-bunch closure.

In Australia, *fluazinam* has been evaluated at rates of application similar to those used in New Zealand. Several of the trials included treatments which simulated management strategies. The trials, held in 1987-88, 1988-89, 1989-90 and 1990-91, were mostly conducted in cooperation with the NSW Department of Agriculture. Trials were also conducted in Victoria and South Australia. Results showed that *fluazinam* reduced the incidence of bunch rot at harvest by 50% to 80% and that treatment was most effective when applied soon after veraison and at two weeks pre-harvest.

On Brassicas

Two trials were conducted on chinese cabbage in Japan in 1989 and 1990, using a dust formulation containing 0.5 % *fluazinam.*

In the first trial, *fluazinam* treatments were applied pre-planting at rates of 1.5 and 2 kg ac/ha (300 and 400 kg of product), with and without lime at 800 kg/ha. The materials were broadcast, then incorporated. In the second trial, there was one treatment *with fluazinam* applied at 2 kg ac/ha, and the lime rate was increased to 2500 kg/ha. In both trials, *fluazinam* tended to reduce the severity of disease, and increased yield in comparison with untreated plants.

Trials in Australia used a suspension concentrate formulation containing *fluazinam* at 500 g/L (as is proposed in Shirlan Fungicide). This formulation is the same as sold in New Zealand under the product name Shirlan. The trials in Australia were carried out in Tasmania and Victoria from 1990 to 1992.

The results .of the Australian trials showed that *fluazinam* is effective against club root in brassicas at all rates tested when applied as a post-planting seedling drench. When applied pre-planting, much higher rates were necessary to achieve efficacy. It is therefore proposed that the use of Shirlan Fungicide be limited to a post-planting drench of 12.5 or 25 g of active per 1000 plants. This corresponds to 25 or 50 mL of Shirlan, the 500 g ac/L SC formulation, per 1000 plants.

PHYTOTOXICITY

On Wine Grapes

No phytotoxicity to fruit or foliage resulted from application of *fluazinam* in any of the trials.

On Brassicas

Fluazinam acted as a growth retardant in the early stages of crop growth, but not serious enough to offset the beneficial effects of treatment. As the season progressed, the treated plants tended to catch up to the untreated plants and there was no difference in plant size at harvest. No other unusual symptoms were displayed on the treated plants.

CONCLUSION

The introduction of Shirlan Fungicide to viticulture will permit the development of a resistance management strategy to grey mould which has developed some resistance to benzimidazole and dicarboximide fungicides. Shirlan has shown to be efficacious as a fungicide on brassicas and wine grapes.

5. ENVIRONMENTAL ASSESSMENT

INTRODUCTION

Crop Care Australasia Pty Ltd has applied for registration of Shirlan® Fungicide containing the technical grade active constituent fluazinam, a dinitroaniline derivative. Fluazinam is structurally similar to the dinitroaniline herbicides, such as pendimethalin and trifluralin. Shirlan® is a suspension concentrate that will be used to control grey mould and bunch rot in wine grapes and club root of broccoli, Brussels sprouts, cabbage, cauliflower and kohl rabi

CHEMISTRY AND FORMULATION

Fluazinam is a dinitroaniline derivative with low water solubility (0.07 $mg.L^{-1}$ at neutral pH), high partition coefficient, and relatively-high vapour pressure. It becomes more hydrophilic at alkaline pH as a result of weak ionisation.

Shirlan® Fungicide is an aqueous suspension concentrate containing 500 $g.L^{-1}$ fluazinam together with a range of other ingredients, none of which appear to be new.

ENVIRONMENTAL EXPOSURE

Shirlan® Fungicide (1 $L.ha^{-1}$) and a suitable wetting agent are to be mixed with water and applied to grapevines as a directed spray to the flower bunches at early and late flowering (25-100 % cap fall), pre-bunch closure, veraison and pre-harvest. An alternative fungicide will be used for the remainder of the season.

For brassicas, Shirlan® Fungicide will be applied as a soil drench after seedlings have been transplanted. Label instructions are to pour the solution around the plant to ensure thorough wetting of the collar region. Application rates are 25-50 mL Shirlan® Fungicide diluted in 100-200 L water for every thousand seedlings.

Approximately 54 000 ha is planted with bearing grape vines in the wine making States (NSW, Vic, SA, WA and Tas) where registration is sought. Broccoli and cauliflowers occupy areas of 4 000 and 3 500 ha, respectively.

ENVIRONMENTAL FATE

Following application, fluazinam is expected to become mainly associated with soil organic matter. A portion may volatilise and disperse.

Degradation rates and routes

Fluazinam readily undergoes base catalysed hydrolysis and is very susceptible to photodegradation in solution. Degradation in aerobic soils is microbially mediated and proceeds with laboratory half-lives between 37 and 224 d. Degradation in the field was consistently more rapid, with half-lives between 6 and 15 d recorded. The nitro groups are rapidly reduced to amines in anaerobic soils.

Metabolites

Abiotic hydrolysis generates the corresponding nicotinic acid, while the main metabolite in aerobic soils is the phenol formed from hydrolytic dechlorination. Aerobic metabolism in soils generates at least eleven metabolites, but tends to lead to soil bound residues with only small amounts of carbon dioxide liberated. Anaerobic metabolism mainly involves reduction to diamine and triamine metabolites.

Mobility

Fluazinam is strongly bound to soils. Once bound in the soil, it would be expected to remain immobile. However, the moderate vapour pressure of fluazinam may favour its volatilisation to the atmosphere, particularly soon after application. Atmospheric persistence is not expected, however, in view of rapid photodegradation in solution.

Conclusion

Fluazinam is expected to largely remain associated with the soil following application, where it degrades. Significant environmental contamination is not expected given the infrequency of use and ready degradation.

ENVIRONMENTAL EFFECTS

Avian Toxicity

Acute oral end-points tabulated below indicate that fluazinam is slightly toxic to bobwhite quail and practically nontoxic to mallard ducks.' Signs of intoxication in bobwhite included subdued behaviour and ruffled feathers. Fluazinam is practically nontoxic to both species by the dietary route.

Test	Species	Result
Acute oral	Mallard duck	LD50 > 4190 $mg.kg^{-1}$
Acute oral	Bobwhite quail	LD50 = 1782 $mg.kg^{-1}$
5 d dietary	Mallard duck	LC50 > 10600 ppm
5 d dietary	Bobwhite quail	LC50 > 10500 ppm

Aquatic Toxicity

Results tabulated below indicate that fluazinam is highly toxic to fish, daphnids and algae. The no effect concentration in the *Daphnia* reproduction test, in which the test medium was renewed every 48 h, refers to growth inhibition. The no effect level for reproduction was 0.05 $mg.L^{-1}$.

Non-target Terrestrial Invertebrates

Results tabulated below indicate that fluazinam is practically nontoxic to bees and earthworms with respect to lethality. Although lethal effects on earthworms exposed to fluazinam were not observed, weight loss and aggregation of test organisms were noted at concentrations of 100 $mg.kg^{-1}$ and above. The no effect level was 10 $mg.kg^{-1}$.

Test	Species	Result
48 h acute oral	Honey bee	LD50 > 100 µg/bee
48 h acute contact	Honey bee Earthworm	LD50 > 200 µg/bee
28 d artificial soil	Earthworm	LC50 > 1000 $mg.kg^{-1}$

Phytotoxicity

Fluazinam is structurally similar to the dinitroaniline herbicides, which are most active towards germinating plant seedlings, particularly grasses. However, no herbicidal effects were noted in early screening work, which included testing at exaggerated rates for pre-emergence herbicidal activity against a range of crop and non-crop plants, including grass species (wild oats, *Setaria viridis* and winter wheat). Efficacy trials on brassicas revealed a retardation of growth following treatment with fluazinam. However, there was no difference from controls in plant size at harvest.

ENVIRONMENTAL HAZARD

Like the dinitroaniline herbicides, fluazinam is particularly susceptible to photolysis and volatilisation. However, low water solubility and strong sorptive tendencies mean that residues in soil are expected to be immobile. Persistence in the field is limited. Significant environmental contamination from the proposed use is not expected.

Terrestrial organisms

Application at 500 $g.ha^{-1}$ would leave residues in the order of 50-100 ppm on vegetation, well below toxic levels determined in acute studies on birds and mammals. Chronic effects would not be expected because of limited persistence.

In terms of residues, the above rate equates to less than 1 $mg.kg^{-1}$ dispersed in the top 5 cm of soil, well below the no effect level of 10 $mg.kg^{-1}$ recorded in laboratory tests on earthworms. Lower residues would prevail in the field because of interception by the crop. Hazard to earthworms is low.

The above application rate equates to 5 $\mu g.cm^{-2}$, well below toxic levels for bees. Hazard to bees is low. Hazard to non-target plants appears low as no adverse effects were noted in stringent pre-emergence tests on a range of species. Furthermore, the mode of application (soil drench for brassicas and directed spray for grapes) should ensure minimal off-target movement and therefore limited exposure of non-target plants.

Aquatic organisms

Application at 500 g.ha^{-1} would leave residues of 330 μg.L^{-1} in 15 cm of standing water, which is above acute end-points for aquatic fauna. However, direct overspray would not be expected from the proposed use pattern. Assuming drift of 10%, a concentration of about 30 μg.L^{-1} would result, below lethal concentrations in acute tests but still above the no effect concentration in the *Daphnia* reproduction test. Fluazinam must be regarded as hazardous to aquatic fauna as safety factors are narrow. However, hydrophobic tendencies will minimise aquatic exposure, and chronic effects would not be expected because of limited persistence.

Because of the fine droplets generated, air blast sprayers are prone to drift when used in orchards, particularly early in the season when foliage is sparse. However, drift potential is lower in vineyards as grapevines are smaller than fruit trees, allowing fungicide to be applied using modified air blast sprayers from above and alongside the canopy rather than from below as occurs in orchards. In addition, grapevines at blossom carry much more foliage than fruit trees, further reducing the amounts lost to atmospheric drift in vineyards. The main non-target exposure is expected to be to soil contaminated via dripping from treated vines. In short, given the mode of application and strong retention by soil, significant aquatic exposure to fluazinam is not expected.

OVERALL CONCLUSION

Data provided in support of the submission are sufficient to demonstrate that use of *fluazinam* according to label and good agricultural practice should not result in significant environmental contamination or poisoning of non-target organisms.

6. PUBLIC HEALTH AND SAFETY ASSESSMENT

EVALUATION OF TOXICOLOGY

The toxicological database for fluazinam, which consists primarily of toxicity tests conducted using animals, is quite extensive. In interpreting the data, it should be noted that toxicity tests generally use doses which 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

Rats absorbed up to half an oral dose of fluazinam, which was metabolised extensively and eliminated via faeces and urine. Low levels of fluazinam were retained in the liver, kidney and fat.

Acute Studies

The acute oral toxicity of fluazinam was low in rabbits, rats, mice, guinea pigs and dogs. Fatal oral doses were in excess of 5000 mg/kg body wt in all species tested, except the rabbit, where the LD50 was 568 mg/kg body wt. In rats, dermal toxicity was low and inhalational toxicity was moderate. Fluazinam did not cause skin irritation but was severely irritating to the rabbit eye and sensitised the guinea pig skin.

Based on studies using similar formulations of fluazinam, Shirlan Fungicide is expected to have low acute oral and dermal toxicity, slight skin and eye irritancy, and skin sensitisation potential. These data confirm the low risk of actute poisoning with the formulated product, but indicate the need to prevent exposure to the eyes and skin.

Short-Term and Long-Term Studies

Mice received fluazinam in the diet for 4 weeks at 1.5, 8, 40 and 455 mg/kg body wt/day. Enlarged kidneys' and abnormal liver pathology were found at 40 and 455 mg/kg body wt/day and weight gain was depressed at all doses. Fluazinam was applied dermally to rats at 10, 100 or 1000 mg/kg body wt/day for 3 weeks. Skin irritation and biochemical disturbances occurred at all doses, together with congested lungs at 100 and 1000 mg/kg body wt/day and liver enlargement at 1000 mg/kg body wt/day.

Rats received fluazinam in the diet at 0.16, 0.82, 4.1 and 41 mg/kg body wt/day for 13 weeks. Liver and testis became enlarged at 4.1 and 41 mg/kg body wt/day. At the highest dose, there was also inflammation of the liver and enlarged liver cells, accumulation of fluid in the uterus, increased heart and kidney weights, reductions in haemoglobin concentration and red blood cell and platelet counts, and depressed bodyweight gain. Liver enlargement reversed in rats allowed 4 weeks recovery. Dogs received 1, 10 or 100 mg/kg body wt/day fluazinam by mouth for 13 weeks. Reduced bodyweight gain and feed consumption, retinal discolouration, liver enlargement and bile duct proliferation were seen at 100 mg/kg body wt/day.

Fluazinam was administered to mice in the diet for 104 weeks at 0.1, 1, 11 or 112 mg/kg body wt/day. Hepatitis occurred at 11 and 112 mg/kg body wt/day, and liver tumours were increased among males receiving 112 mg/kg body wt/day but were within the historical control incidence for this strain of mice. Rats were fed fluazinam in the diet at 0.05, 0.4, 4.3 and 40 mg/kg body wt/day for 104 weeks. Liver injury (inflamed bile ducts and dilated sinusoids) and pancreatic atrophy, renal cysts and testicular striation and flaccidity occurred at 4.3 and 40 mg/kg body wt/day. Decreased white blood cell count, thyroid enlargement, fatty change in the liver, focal proliferation of the alveolar epithelium, and reduced bodyweight gain were seen at 40 mg/kg body wt/day. Dogs were dosed orally with fluazinam for 52 weeks at 1, 10 or 50 mg/kg body wt/day. Liquifaction of the gastrointestinal contents, increased myeloid:erythroid cell ratio in the bone marrow and excessive

multiplication of lymphoid cells in the gastric mucosa occurred at 10 and 50 mg/kg body wt/day. Dogs receiving 50 mg/kg body wt/day had reduced bodyweight gain, elevated white blood cell and platelet counts, depressed red blood cell count and reduced haemoglobin concentration and liver enlargement.

The toxicity profile of fluazinam is such that repeated exposures would result in a substantially greater potential for toxicity than single exposures and this supports the need to regulate it as a moderately toxic chemical. The species exhibiting the greatest sensitivity was the rat, in which the NOEL was 0.4 mg/kg body wt/day.

Reproduction and Developmental Studies

A 2-generation reproduction study was performed in rats at 2, 10 and 50 mg/kg body wt/day in the diet. Gestation was prolonged at 10 and 50 mg/kg body wt/ day, while implantation rate, weight gain and survival of F2 pups were reduced at 50 mg/kg body wt/day which was clearly toxic to parental rats.

Developmental studies in which fluazinam was administered orally during organogenesis, were performed in pregnant rats (10, 50 or 250 mg/kg body wt/day) and rabbits (2, 4, 7 or 12 mg/kg body wt/day). In rats, death of embryos, depressed foetal weight and skeletal aberrations were seen at 50 and 250 mg/kg body wt/day, with facial/palatal clefts and hernia at 250 mg/kg body wt/day; Abortions and deaths of embryos were increased in rabbits at and above 4 mg/kg body wt/day, bone formation was impaired at 7 and 12 mg/kg body wt/day, and minor bone, placental and vascular abnormalities occurred at 12 mg/kg body wt/day. In both species, adverse effects on foetal development were not seen in the absence of toxicity to the mother.

Genotoxicity

Fluazinam did not cause mutation in S.typhimurium, E. coli or mouse lymphoma cells, chromosomal aberrations in mouse and hamster bone marrow cells, or unscheduled DNA synthesis in cultured human fibroblasts and rat liver cells. A weak: positive response was obtained in the absence (but not in the presence) of metabolic activation in assays using yeast and cultured hamster fibroblasts.

PUBLIC HEALTH STANDARDS

The National Drugs and Poisons Schedule Committee of the Australian Health Ministers Advisory Council (AHMAC) considered the toxicity of the product and its active ingredient and assessed the necessary controls to be implemented under States' poisons regulations to prevent the occurrence of poisoning.

The NDPSC recommended that fluazinam be listed in Schedule 6 of the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP). There are provisions for appropriate warning statements and first -aid directions on the product label.

POTENTIAL FOR CHEMICAL RESIDUES IN FOOD

Fluazinam is a broad spectrum fungicide to be used as a soil drench around Brassicas to control Club root and as a direct spray on grapes for control of Bunch rot and Grey mould. The product is registered for use on cabbages and grapes in Japan, for grapes in New Zealand and for other crops in Japan and Holland. The formulation is a suspension concentrate containing 50% fluazinam.

There are no established Codex or Australian MRLs.

Metabolic Studies

Four reports of metabolism trials in rats and two reports of a potato trial were provided. These reports included proposed metabolic pathways.

Rats were dosed at 0.5 or 50 mg/kg bw with fluazinam labelled in the phenyl or pyridyl rings with ^{14}C: The majority of the administered dose was excreted in the faeces and over two-thirds was excreted in the first 24 hours. After 50 mg/kg, equivalent residues at 7 days, in the highest tissues were: liver 1-2.4 mg/kg; kidney 0.7-1.4 mg/kg; and fat 0.5-1.3 mg/kg. In a similar experiment, liver levels at 2 days were 5.5-11.3 mg/kg.

Potato plants were sprayed with ^{14}C-fluazinam, labelled in the pyridyl or phenyl rings. Four applications were made by spray to foliage at field application rate (2.4 kg ai/ha) and at three times this rate. Potatoes were harvested either 7 days after final application or two weeks after dessication, washed and peel and pulp separated. There appeared to be some translocation as some label was detected in potato pulp, but this was a very small proportion of the applied material. The equivalent residue in whole potato was up to 0.07 mg/kg following recommended application and approximately 0.1 mg/kg after triple application rate.

Analytical Methodology

Residues in samples were extracted using methanol and dichloromethane. Analaysis was by HPLC using a UV/VIS detector.

For brassicas, the limit of determination was 0.01 mg/kg and recoveries at 0.05 mg/kg were cabbages 85 %; cauliflower 91 %; broccoli 82 %.

For other samples the limits of determination were grapes 0;02 mg/kg; dried friut 0.04 mg/kg; wine 0.005 mg/L. Recoveries were grapes at 1.0 mg/kg - 65%; dried fruit at 3.0 mg/kg - 67%; wine at 0.05 mg/L - 65%.

Residue Definition

The limited metabolic data indicates that there could be some metabolites which' may be of toxicological significance, but it also appears that these are a small part of the actual residue. However, actual residues of fluazinam or its metabolites are not detected in brassica. In grapes, metabolites were determined in only one set of trials and none were detected.

The residue definition is the parent molecule, fluazinam.

Residue Trials

Grapes

A total of eight trials were reported, three conducted in Australia and five in New Zealand. At Angle Vale, SA, in 1992, grapes were sprayed with two or four applications of Shirlan Fungicide at 500 mg/L. Grapes were collected at 25 days after four treatments and 105 days after two applications. The residue was 0.34 mg/kg and <0.01 mg/kg respectively.

Tabulated data was supplied covering three trials in New Zealand in 1987-88 - at Blenheim, Hastings and Huapai, but trial data were incomplete. Plots were treated twice at 500 or 1,000 g ai/ha. Following treatment at 500 or 1000 g/ha in these three trials, the residues, after approximately 100 days after the last spray, was less than 0.01 mg/kg.

Pinot Noir grapes at Summertown were sprayed with Shirlan 500 SC Fungicide 2, 3 or 5 times at 500 or 1,000 g ai/ha. Grapes were sampled at 1, 7 and 15 days following five treatments. Wine was made from grapes but no residues were detected in the wine. Residues in grapes did not change much with time. Following five treatments at 500 g/ha, residues at 1-15 days were 2.30-2.44 mg/kg while after 1000 g/ha, 3.6-6.8 mg/kg were detected.

Sultana grapes at Irymple were similarly treated. Grapes were sampled at 0, 1 and 14 days following five treatments. Dried fruit and wine were made from grapes. No residues were detected in the wine. Residues in grapes reduced with time. Following five treatments at 500 g/ha, residues at 0-1 days were 2.76-3.22 mg/kg dropping to 1.06 mg/kg at 14 days while after 1000 g/ha, residues at 0-1 days were 8.4-9.0 mg/kg dropping to 2.9 mg/kg at 14 days.

Grapes in two trials in New Zealand during 199311994 were sprayed with four applications of Shirlan Fungicide at 500 g/ha. Grapes were collected 27, 33 and 42 days after the final treatment. Fluazinam residues dropped slightly with time from 0.44-0.59 mg/kg at 26-27 days to 0.24-0.37 mg/kg at 42-44 days.

Of the eight trials reported only two (at Irymple, Vic and Summertown, *SA)* used the current maximum treatment regime. After the maximum treatment regime, residues varied from about 1 - 2.5 mg/kg at 14 days after the fifth application. The data support an MRL of 5 mg/kg for grapes at it withholding period of 14 days.

Wine made from grapes with high residues (up to 4.1 mg/kg) contained no detectable residues (<0.005 mg/L).

Brassicas

A total of six residue trials were evaluated, five in Australia and one in Japan. At Werribee, Vic, in 1992, Shirlan 500 SC Fungicide was applied at the plant base of cauliflowers and broccoli at rates of 25 or 50 mg/plant 1x and 2x maximum recommended). 37 days after application, curd was sampled from 12 plants in each plot. Fluazinam residues were not detected (<0.01 mg/kg). Three trials were conducted at Griffith, NSW, during 1994-95:

Shirlan Fungicide was applied around the base of cabbages, broccoli and cauliflowers after transplanting, at rates of 50 or 100 mL formulation/1000 plants (1x and 2x maximum recommended). 21 days after application cabbages were sampled from both treatments. Samples were also taken 28 and 35 days after the higher application. Fluazinam residues were not detected (<0.01 mg/kg).

Since the use is a soil treatment at transplanting, it is apparent that the compound does not translocate into these plants. It is therefore appropriate to set a group MRL of *0.01 mg/kg. The withholding period is imposed by the use pattern. Residues should not be detected even at early harvest, so a specific withholding period is not appropriate.

CONCLUSION

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 use of Shirlan Fungicide.

7. OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT

INTRODUCTION

Active constituent

Fluazinam is a hazardous substance and has been classified for health effects by Worksafe Australia according to the National Occupational Health and Safety Commission (NOHSC) Approved Criteria for Classifying Hazardous Substances.

As a pure chemical, fluazinam is classified as toxic by the inhalational route, an eye irritant, a skin sensitiser and capable of causing severe effects after repeated or prolonged exposure (prolonged administration for 2 years resulted in liver injury in rats).

Substances containing fluazinam are hazardous when it is present in concentrations above 1 %.

The Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) classification for fluazinam is Class 9 (miscellaneous). This classification was provided by Crop Care Australasia Pty Ltd.

Technical fluazinam is a pale yellow odourless crystalline powder. It is non-flammable and non-volatile.

End Use Product

Shirlan Fungicide is determined by Worksafe Australia to be a hazardous substance. It was screened through the Health Effects Criteria, in the order given in the NOHSC Approved Criteria for Classifying Hazardous Substances, until it was determined to be hazardous.

The Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) classification for Shirlan Fungicide is Class 9 (miscellaneous). This classification was provided by Crop Care Australasia Pty Ltd.

Hazardous substances are subject to the workplace controls outlined in the National Health and Safety Commission (NOHSC) Control of Workplace Hazardous Substances. Future end use products should also be classified according to the NOHSC Approved Criteria for Classifying Hazardous Substances.

Shirlan Fungicide is a yellow mobile, non-volatile liquid.

MANUFACTURE, TRANSPORT AND SALE

The fully formulated end use product will be imported into Australia in bulk (200L steel drums) and repacked into sales packs (1L and 5L poly bottles). Australian workers will be involved in the transport, repacking, storage, retailing and use of the product.

The main hazards faced by workers handling the product are inhalational toxicity, skin and eye irritation and skin sensitisation.

Repacking

<u>Exposure</u>

Workers involved in the repacking of Shirlan Fungicide into smaller packs could be exposed to the product during Ibis process.

Risk

A mechanised process and sealed vessels should be used for filling-off the product to minimise operator exposure. General extraction ventilation and local exhaust ventilation will minimise inhalational exposure.

Personal protective equipment (PPE) should be worn by workers where the above controls are not adequate. The recommended PPE are long sleeved overalls, safety boots, goggles, PVC gloves, hard hat and respirator, to minimise skin, eye and nasal contact with the product. Instruction on the safe handling of the product is available on the label and in the Material Safety Data Sheet (MSDS).

Transport and sale

Exposure

Worker exposure during transport and sale of the product is only possible if packaging is breached.

Risk

The transport vehicle should carry the PPE specified in the ADG Code for Class 9, to enable workers to safely handle spills.

The label and MSDS provide adequate information on the safe handling of spills.

Conclusion:

Shirlan Fungicide can be repacked and transported safely with the exposure control measures described above.

END USE

Exposure

Shirlan Fungicide is sprayed onto grapes, at a rate of 100 mL/100L (0.1 %) or 1L per hectare, diluted with 500-1000L water. It maybe applied from early flowering to pre-harvest and as an alternative fungicide for the remainder of the season.

In brassicas, it is used as a seedling drench, at a rate of 25 to 50 mL product diluted in 100- 200L of water. Between 100-200 mL is poured around the base of each plant, immediately after transplanting. The range of concentrations of the product in the prepared spray for brassicas between 0.0125 % and 0.05 %.

End users could come in contact with the product when opening containers, preparing and using spray, cleaning up equipment and spills, re-entering treated fields and harvesting crops. The main route of potential end user exposure is expected to be dermal. Inhalational exposure is not likely because the product is not volatile and label safety directions warn end users not to inhale vapour.

Risk

As the product is to be used highly diluted the risk of exposure when handling the spray is low. However incidents of workers developing hypersensitivity reactions when using a similar fluazinam product have been reported overseas. Accordingly, the label safety directions instruct users to wear cotton overalls buttoned to neck and wrist, face shield and elbow-length PVC gloves at all times when using the product.

Apart from sensitisation, the risk of workers suffering health effects following short-term or long term exposure to the product or spray is expected to be low, as fluazinam is only slowly absorbed across human skin.

Re-entry

Fluazinam is rapidly degraded in sunlight. However it is possible for workers re-entering treated areas to become contaminated with residues. A restricted entry statement is incorporated on the Shirlan Fungicide label. It requires workers to wear protective clothing when re-entering areas of treated grapes.

Conclusion:

Shirlan Fungicide can be used safely with the recommended PPE and information available in the MSDS and on the label.

RECOMMENDATIONS

Workers involved in repacking of the formulated product should be protected by the process being carried out in sealed vessels, ventilation, safe work practices, good housekeeping, and training. They should wear long sleeved overalls, safety boots, goggles, PVC gloves and a respirator, where processes are not fully contained.

Workers transporting goods in Class 9 of the ADG Code are required to carry an eye wash kit filled and ready for use.

Users should follow the instructions and Safety Directions on the Product label. Safety Directions include the use of cotton overalls buttoned to neck and wrist, face shield and elbow-length PVC gloves.

NOHSC has not established an exposure standard for fluazinam. Worksafe Australia does not recommend that one be established at this time.

NOHSC has not placed fluazinam on the Schedule for Health Surveillance (Schedule 3 Hazardous Substances for which Health Surveillance is Required). Worksafe Australia does not recommend that NOHSC place fluazinam on this schedule at this time.

The re-entry statement proposed by Crop Care Australasia Pty Ltd should appear on the product label. It refers to use of the product on grapes and extends to the end of the harvest period. Workers entering areas of treated grapes should wear cotton overalls buttoned to neck and wrist, washable hat and and elbow-length PVC gloves.

Should fluazinam be imported as a pure chemical, it should be labelled in accordance with NOHSC National Code of Practice for the Labelling of Workplace Substances.

Manufacturers and importers should produce a MSDS for fluazinam (where imported as a pure chemical) and Shirlan Fungicide. These should contain information relevant to Australian workers, as outlined in the NOHSC National Code of Practice for the Preparation of Material Safety Data Sheets. Employers should obtain the MSDS from the supplier and ensure that their employees have ready access to it.

Workers using fluazinam or any hazardous products containing fluazinam, should read the relevant MSDS.

ANNEX 1

POISON

NOT TO BE TAKEN

KEEP OUT OF REACH OF CHILDREN

READ SAFETY DIRECTIONS BEFORE OPENING

SHIRLAN© FUNGICIDE

ACTIVE CONSTITUENT: 500 g/L FLUAZINAM

For control of grey mould and bunch rot in wine grapes and
club root of broccoli, Brussels sprouts, cabbage, cauliflower and kohl rabi.

NET LITRE

DIRECTIONS FOR USE

RESTRAINTS – GRAPES

Do NOT in warm weather apply within ten days after applying wettable sulphur.

Do NOT tank-mix with wettable sulphur.

Do NOT use on table grapes.

<table>
<tr><th>Crop</th><th>Disease</th><th>States
Where
Applicable</th><th>Rate</th><th>Critical Comments</th></tr>
<tr><td>Wine Grapes</td><td>Grey mould, Bunch rot
(Borrylls cinerea)</td><td>N.S.W., Vic.,S.A., W.A.& Tas only</td><td>100mL
per 100
or 1 L/ha</td><td>Apply in a program of sprays at early and late flowering (25% -100% capfall), pre-bunch closuro, veraison and pre-harvest. This fungicide: may be alternated or tank-mixed with a dicarboximide fungicide in a resistance management strategy. Use an alternative fungicide for the remainder of the season. Use a directed spray and sufficient water to ensure thorough wetting of flower bunches. Add a wetting agent such as ‘Agral’ to spray mix at a rate of 20 mL per 100 L</td></tr>
<tr><td>Broccoli
Brussels sprouts
Caggabage
Cauliflower
Kohlrabi</td><td>Club root (Plasmodiophoro brassicae)</td><td>All States</td><td>Seedling drench 25-50mL per 1000 plants</td><td>Use the high rote in fields where severe club root has occurred previously. According to the dilution table shown below, apply the required amount of the diluted mixture immediately after transplanting around the base of each plant t to ensure thorough wetting of the collar region.
<table>
<tr><th>Rate of Shirlan Volume per 1,000 plants</th><th>Amount of Shirlan per 100L of Water</th><th>Volume of mixture to apply per Per 1,000 plants</th></tr>
<tr><td>25 mL</td><td>25 mL</td><td>100 L</td></tr>
<tr><td>25 mL</td><td>12.5 mL</td><td>200 L</td></tr>
<tr><td>50 mL</td><td>50mL</td><td>100 L</td></tr>
<tr><td>50 mL</td><td>25 mL</td><td>200 L</td></tr>
</table>
Disease control depends on protection of the lap root from infection.

NOTE: This product may delay the start of harvest by up to 8 days and shorten the harvest period, without adverse effects on final yield.</td></tr>
</table>

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

WITHOLIDG PERIOD

DO NOT SPRAY THE FOLLOWING CROPS LATER THAN THE 'NUMBER OF WEEKS/DAYS SHOWN DEFORE HARVEST.

GRAPES

BROCCOLI, BRUSSELS SPROUTS, CABBAGE, CAULIFLOWER, KOLHRABI TREATED CROPS NOT TO BE GRAZED OR FED TO ANIMALS 14 DAYS NOT REQUIRED

Note - Resistance

Some fungal diseases may develop resistance to particular fungicides resulting in failure to control. This occurrence cannot be predicted and may occur at any time. It is not due to a fault in the product and Crop Care Australasia Pty Ltd cannot accept responsibility for loss or damage to crops arising from resistance. However, resistance should not be assumed without first reviewing the method of application, the coverage and the timing of application.

MIXING

Add the required amount of product to the party-filled spray tank with the agitator in operation. Fill the lank with water, and continue agitation during spraying and after a stoppage.

PROTECTION OF LIVESTOCK, WILDLIFE, FISH, CRUSTACEANS AND ENVIRONMENT. Do NOT contaminate stream, rivers or waterways with SHIRLAN FUNGICIDE or used containers.

STORAGE AND DISPOSAL

Store in the closed original container In a well-ventilated area as cool as possible and away from children, animals, food, feedstuffs, seed and fertilizers. DO NOT store for prolonged periods in direct sunlight. Triple or (preferably)·pressure rinse containers before disposal. Add rinsings·to spray tank mix. DO NOT dispose of undiluted chemicals' on-site. Break, crush, puncture and bury the containers below 500 mm in a disposal pit specifically marked and set up for this purpose clear of waterways, vegetation and roots. Do not burn empty containers or product.

CAUTION

GRAPES: Do NOT allow entry into treated areas until after harvest unless wearing cotton overalls buttoned to the neck and wrist, washable hat and elbow-length PVC gloves. Clothing must be laundered after each day's use.

SAFETY DIRECTIONS

Harmful if swallowed. Poisonous if inhaled. Will irritate the eyes and skin. Avoid contact with eyes and skin. Repeated exposure may cause allergic disorders. Do not inhale vapour. Individuals who experience any adverse skin reaction should stop working with SHIRLAN or handling treated plants once sensitisation has been identified.

WHEN MIXING AND USING

When opening the container, preparing spray and using the prepared spray wear cotton overalls buttoned to the neck and wrist and a washable hat, elbow-length PVC gloves and face shield.

AFTER USE

After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water. After each day's use, wash gloves, face shield and contaminated clothing. (Refer MSDS No. 40449)

FIRST AID

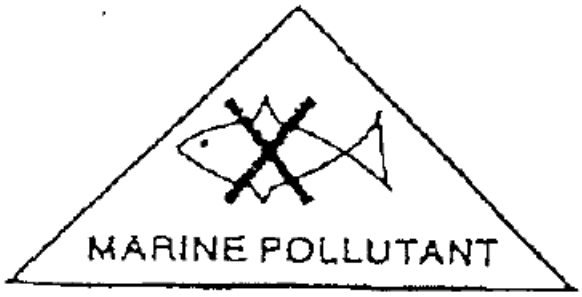
If poisoning occurs contact a doctor or Poisons Information centre. If swallowed, and if more than 15 minutes from a hospital induce vomiting, preferably using Ipecac Syrup APF.

Conditions of sale

Crop Care Australasia Pty Ltd will not· accept any responsibility whatsoever and howsoever arising and whether for consequential loss or otherwise in connection with the supply of these goods other than responsibility for the merchantable quality of the goods and such responsibilities mandatorily imposed by Statutes applicable to the sale or supply of these goods. To the extent allowed by such

Statutes the liability of Crop Care Australasia Pty Ltd is limited to the replacement of the goods or the refund of the price paid and is conditional upon a claim being made in writing and where possible sufficient part of the goods to enable proper examination being returned to Crop Care Australasia Pty Ltd within thirty days of delivery.

UN NO,: 3082	ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID N.O.S. (CONTAINS FLUAZINAM)
In a Transport Emergency Dial 000 Police or Fire Brigade	SPECIALIST ADVICE IN EMERGENCY ONLY **1 800 033 111** ALL HOURS - AUSTRALIA-WIDE
PG III	HAZCHEM 2X



BN

DOM

NRA approval number:

Crop Care Australasia Pty Ltd
ACN 061 362 347
77 Tingira St. Pinkenba Qld 4008