**Public Release Summary**
**on**

# Evaluation of the new active

# IODOSULFURON-METHYL-SODIUM

# in the product

# HUSSAR SELECTIVE HERBICIDE

**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 cooperation 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 (NOHSC) 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.

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

| | |
|---|---|
| **ac** | active constituent |
| **ADI** | Acceptable Daily Intake (for humans) |
| **AHMAC** | Australian Health Ministers Advisory Council |
| **ai** | active ingredient |
| **ANZFA** | Australia New Zealand Food Authority |
| **BBA** | Biologische Bundesanalstalt fur Land – und forstwirschaft |
| **bw** | Bodyweight |
| **d** | Day |
| **DM** | Dry Matter |
| **DAT** | Days After Treatment |
| **$DT_{50}$** | Time taken for 50% of the concentration to dissipate |
| **EA** | Environment Australia |
| **$E_bC_{50}$** | concentration at which the biomass of 50% of the test population is impacted |
| **$EC_{50}$** | concentration at which 50% of the test population are immobilised |
| **EEC** | Estimated Environmental Concentration |
| **$E_rC_{50}$** | concentration at which the rate of growth of 50% of the test population is impacted |
| **FAO** | Food and Agriculture Organisation of the United Nations |
| **EUP** | End Use Product |
| **$F_o$** | original parent generation |
| **g** | Gram |
| **GAP** | Good Agricultural Practice |
| **GC- MSD** | Gas Chromatography with Mass Selective Detector |
| **GCP** | Good Clinical Practice |
| **GLP** | Good Laboratory Practice |
| **GVP** | Good Veterinary Practice |
| **h** | Hour |
| **ha** | Hectare |
| **Hct** | Haematocrit |
| **Hg** | Haemoglobin |
| **HPLC** | High Pressure Liquid Chromatography *or* High Performance Liquid Chromatography |
| **HPLC-UV** | High Performance Liquid Chromatography with Ultra-Violet detector |
| **id** | Intradermal |
| **im** | Intramuscular |
| **ip** | Intraperitoneal |
| **IPM** | Integrated Pest Management |
| **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 |
| **$K_{oc}$** | Organic carbon partitioning coefficient |
| **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 |
| **LOD** | Limit of Detection – level at which residues can be detected |
| **LOQ** | Limit of Quantitation – level at which residues can be quantified |

| | |
|---|---|
| **mg** | Milligram |
| **mL** | Millilitre |
| **MRL** | Maximum Residue Limit |
| **MSDS** | Material Safety Data Sheet |
| **NDPSC** | National Drugs and Poisons Schedule Committee |
| **NEDI** | National Estimated Daily Intake |
| **ng** | Nanogram |
| **NHMRC** | National Health and Medical Research Council |
| **NOEC/NOEL** | No Observable Effect Concentration Level |
| **OC** | Organic Carbon |
| **OM** | Organic Matter |
| **PHI** | Pre-Harvest Interval |
| **po** | Oral |
| **ppb** | parts per billion |
| **PPE** | Personal Protective Equipment |
| **ppm** | parts per million |
| **Q-value** | Quotient-value |
| **RBC** | Red Blood Cell Count |
| **s** | Second |
| **sc** | Subcutaneous |
| **SC** | Suspension Concentrate |
| **SPE** | Solid Phase Extraction |
| **STMR** | Supervised Trials Median Residue |
| **SUSDP** | Standard for the Uniform Scheduling of Drugs and Poisons |
| **TGA** | Therapeutic Goods Administration |
| **TGAC** | Technical grade active constituent |
| **TRR** | Total Radioactive Residues |
| **T-Value** | A value used to determine the First Aid Instructions for chemical products that contain two or more poisons |
| **µg** | Microgram |
| **vmd** | volume median diameter |
| **WG** | Water Dispersible Granule |
| **WHO** | World Health Organisation |
| **WHP** | Withholding Period |

# INTRODUCTION

This publication provides a summary of the data reviewed and an outline of the regulatory considerations for the proposed registration of *HUSSAR® SELECTIVE HERBICIDE (HUSSAR®)*, which contains the new active ingredient iodosulfuron-methyl-sodium (a sulfonylurea compound). The product also contains mefenpyr-diethyl, a crop-safener which exists in some currently registered products.

Responses to this Public Release Summary (PRS) will be taken into account by the National Registration Authority (NRA), in deciding whether the product should be registered, and in determining appropriate conditions of registration and product labelling.

Copies of full technical evaluation reports on iodosulfuron-methyl-sodium, covering toxicology, occupational health and safety aspects, residues in food and environmental aspects are available from the NRA upon request (see order form on last page). They can also viewed at the NRA Library, located at the NRA's offices, Ground Floor, 22 Brisbane Avenue, Barton, ACT.

Written comments should be submitted by **17 April 2001**, and addressed to:

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**Applicant**
Aventis CropScience Pty. Ltd.

**Product Details**
It is proposed to register *HUSSAR®*, containing 50g/kg iodosulfuron-methyl-sodium and 150 g/kg mefenpyr-diethyl, as a water dispersible granule. The product will be imported fully formulated and packaged in 3 kg and 6 kg packs, from Switzerland.

Iodosulfuron-methyl-sodium is a member of the sulfonylurea group of herbicides. Its mode of action is to inhibit the biosynthesis of essential amino acids in susceptible plants, through inhibition of acetolactate synthase (ALS). With respect to weed resistance, iodosulfuron – methyl-sodium is a member of the sulfonylurea chemical group and classed as a Group B herbicide.

The application is for early post-emergence use (both with respect to the crop and weeds) in wheat. The weeds controlled or suppressed are annual ryegrass (*Lolium rigidium*), wild oats (*Avena* spp), annual phalaris (*Phalaris paradoxa* only) and various broadleaf weeds.

The rationale behind the product *HUSSAR®*, is that it is an ALS-inhibitor herbicide for **post-emergence** use in wheat, to control annual ryegrass, annual phalaris, wild oats and a range of broadleaf species. This allows a single product to address the above weed spectrum, without the need to tank-mix a number of existing registered chemicals.

The rate of product use is 150-200 g/ha, depending upon the target weed. *HUSSAR*® is proposed for registration in all states.

It is not expected that this product would increase the rate of evolution of herbicide-resistance, or environmental load, by sulfonylurea herbicides, as it is expected to replace existing sulfoynlureas. Additionally, as this product may replace tank-mixes in wheat which use Group-A herbicides (for grass control), then it may provide an alternative that could reduce the evolution of Group-A herbicide resistance.

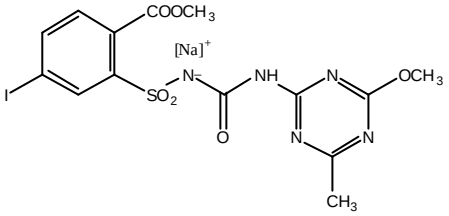
Iodosulfuron is registered for use in South Africa, Turkey, Italy, Austria and Hungary, and provisionally registered in Saudi Arabia. The company expects registration in all countries where wheat is commercially grown, by the end of 2001.

# CHEMISTRY AND MANUFACTURE

The active constituent iodosulfuron-methyl-sodium is manufactured by Lonza AG, CH-4002 Basel, Munchensteiner Strabe 38, Switerland on behalf of Aventis CropScience.

## ACTIVE CONSTITUENT

*Chemical Characteristics*

| | |
|---|---|
| Common name: | iodosulfuron-methyl-sodium (SA, proposed ISO) |
| Synonyms and code number: | AE F115008; Hoe 115008 |
| Chemical name: | methyl 4-iodo-2-[3-(4-methoxy-6-methyl-1,3,5-triazin-2-yl)-ureidosulfonyl]benzoate,sodium salt (IUPAC) |
| | 4-iodo-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl] benzoic acid methyl ester, monosodium salt (CAS) |
| CAS Number: | 144550-36-7 |
| Molecular formula: | $C_{16}H_{18}C_{l2}N_2O_4$ |
| Molecular weight: | 529.27 |
| Chemical structure: |  |



*Physical and Chemical Properties*

| | |
|---|---|
| Physical state: | Crystalline powder |
| Colour: | Beige |
| Odour: | Weak, non-characteristic |
| Melting point: | 148-155°C |
| Density/specific gravity: | 1.76 g/cm$^3$ |
| Solubility in water | 60 (pH 7.6 unbuffered); 0.02 (pH 4); 0.17 (pH 5); 25 (pH 7); 65 (pH 9); 45 (pH 10), all in g/L |
| Solubility in organic solvents | Acetone >380; dichloromethane >500; ethyl acetate 23; n-hexane $1.2 \times 10^{-3}$; methanol 12, n-heptane $1.1 \times 10^{-3}$; 2-propanol 4.4; toluene 2.1; acetonitrile 52; dimethyl sulfoxide >500, polyethylene glycol 87 (all in g/L) |
| $pK_a$ values: | 3.22 |
| Octanol/water partition coefficient: | Log $P_{OW}$ = 1.96 (pH 4), 1.07 (pH 5), 0.07 (pH 6), -0.70 (pH 7), -1.22 (pH 9), -1.15 (pH 10) |
| Vapour pressure: | $2.6 \times 10^{-9}$ (20°C); $6.7 \times 10^{-9}$ (25°C); $1.6 \times 10^{-8}$ (30°C) |
| Hydrolysis: | $DT_{50}$ = 3-4 days (pH 4); >1 year (pH 7) |

| | |
|---|---|
| Photolysis: | $DT_{50}$ = 49-50 days (in water, pH 7, 25°); 6.33 days (in air, estimated) |
| Flammability: | Not flammable |
| Autoflammability: | No self-ignition occurs up to 400°C |
| Oxidising properties: | None |
| Storage stability: | Stable for at least 3 years at ambient temperature in sealed containers |
| Chemical type: | Herbicide |
| Chemical family: | Sulfonylurea |

**Summary of the NRA's Evaluation of iodosulfuron-methyl-sodium TGAC**

The Chemistry and Residues Evaluation Section of the NRA has evaluated the chemistry aspects of iodosulfuron-methyl-sodium TGAC (manufacturing process, quality control procedures, batch analysis results and analytical methods) and found them to be acceptable. On the basis of the data provided it is proposed that the following minimum compositional standards be established for iodosulfuron-methyl-sodium TGAC:

*Active constituent*

| | |
|---|---|
| Iodosulfuron-methyl-sodium | Not less than 870 g/kg on a dry weight basis |

**PRODUCT**

| | |
|---|---|
| Distinguishing name: | *HUSSAR® SELECTIVE HERBICIDE* |
| Formulation type: | Water Dispersible Granule |
| Active constituent concentration: | 50 g/kg iodosulfuron-methyl-sodium, 150 g/kg mefenpyr-diethyl |

*Physical and Chemical Properties of the Product*

| | |
|---|---|
| Physical state: | Free flowing granules |
| Colour: | Brown |
| Odour: | Aromatic |
| Density or specific gravity: | 690 g/L (before compaction), 760 g/L (after compaction) |
| pH value: | 8.9 (1% dispersion), 8.4 (10% dispersion) |
| Flammability: | Not flammable |
| Auto-flammability: | Self ignition temperature is 378°C |
| Explodability: | No danger of explosion under thermal or mechanical stimulation |
| Dust explosibility: | Lower explosible limit is 70 $g/m^3$ |
| Suspensibility: | Minimum of 99% of iodosulfuron-methyl-sodium and 95% of mefenpyr-diethyl in solution after 30 minutes (0.4-2% solution in hard water) |
| Dispersibility: | 101% in hard water |
| Particle size: | Traces of residue on 150 µm and 75 µm sieves |
| Particle size distribution: | >90% on a 250 µm sieve, <10% on 1000 µm sieve |
| Dust content: | Nearly dust free. |

| | |
|---|---|
| Foaming properties: | 0.1% solution gave 10 mL foam after 1 minute and no foam after 12 minutes. 1% solution gave no foam after 1 or 12 minutes. |
| Wettability: | 45 seconds (CIPAC MT 53.3.1) |
| Storage stability: | Stable for at least 2 years when stored at ambient temperature |

Specifications and Material Safety Data Sheets (MSDSs) for the inactive constituents of the product were provided and are acceptable.

**Recommendation**

Based on a review of the details provided by the applicant, registration of *HUSSAR®* , in relation to its chemistry and manufacture, is supported.

# TOXICOLOGICAL ASSESSMENT

## Evaluation of Toxicology

The toxicological database for iodosulfuron-methyl-sodium, 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 that are high compared with likely human exposures. The use of high doses increases the likelihood that potentially significant toxic effects will be identified. Findings of adverse effects in any one species do not necessarily indicate such effects might be generated in humans. From a conservative risk assessment perspective however, adverse findings in animal species are assumed to represent potential effects in humans, unless convincing evidence of species specificity is available.

Where possible, considerations of the species-specific mechanisms of adverse reactions weigh heavily in the extrapolation of animal data to likely human hazard. Equally, consideration of the risks to human health must take into account the likely human exposure levels compared with those, usually many times higher, which produce effects in animal studies. 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

Single oral doses of 10 mg/kg bw radiolabelled iodosulfuron-methyl-sodium were rapidly absorbed **in rats**. Peak blood levels were attained in 2-4 hours followed by a biphasic elimination with half-lives of around 3 and 40 hours, respectively. Within 72 hours, over 90% of the dose was recovered in the urine indicating that absorption was nearly complete. Faecal excretion accounted for about 5% of the radioactivity. Tissue levels at 72 hours accounted for only 0.5% of the total dose. Approximately 90% of the dose was excreted unchanged with less than 5% in the form of 5 identified metabolites. The main degradation pathways appeared to be hydrolysis of the methylester of benzoic acid, O-demethylation of the triazine, hydroxylation at the 6-methyl group of the triazine, deiodination, and breakdown of the sulfonylurea bridge. Apart from a slightly lower extent of absorption and a slight increase in metabolism, there were no significant differences when single high doses (500 mg/kg bw) or repeated doses (7 x 100 mg/kg bw) were administered. Dermal absorption in rats amounted to less than 1% of the dose in 8 hours and up to 5% after 120 hours.

**In dogs**, a single oral dose of 6 mg/kg bw radiolabelled iodosulfuron-methyl-sodium was rapidly absorbed. Peak blood levels were obtained within 2 hours and subsequently decreased in a triphasic manner with half-lives of about 1, 5 and 150 hours, respectively. Some 90-95% of the dose was excreted in 168 hours, with over 70% in the urine indicating high absorption. At 168 hours, low levels of radioactivity were still evident in tissues presumably due to the long terminal half-life. Radioactivity in the plasma and excreta was mainly in the form of unchanged iodosulfuron-methyl-sodium (≥87%) with around 12% as metabolites in urine. The pattern of metabolites was similar to that found in rats. An oral dose of 200 mg/kg bw resulted in a more prolonged absorption phase and peak blood levels occurred after 5 hours. Elimination was biphasic, again with a long terminal half-life. Other kinetic and metabolic parameters were similar to the lower dose.

**Acute Studies**

Iodosulfuron-methyl-sodium showed acute oral $LD_{50}$ values of 2449 mg/kg bw and 1947 mg/kg bw in female and male **rats**. Also in rats, the acute dermal $LD_{50}$ was >2000mg/kg bw and the acute inhalation $LC_{50}$ was >2810 mg/m$^3$. It was a moderate eye irritant **in rabbits** but did not cause skin irritation in rabbits or skin sensitisation **in guinea-pigs**.

*HUSSAR*® (containing 50 g/kg iodosulfuron-methyl-sodium and 150 g/kg mefenpyr-diethyl) had acute oral and dermal $LD_{50}$'s of >5000 mg/kg bw in rats. Severe eye irritation was seen in rabbits while moderate erythema was produced within 24 hours in rabbit skin but reversed at 72 hours. Skin sensitisation was not observed in guinea-pigs.

**Short-Term Studies**

**Dogs** were administered iodosulfuron-methyl-sodium in their diet for 28 days. The dose levels used were 0, 800, 2400, 7200 and 20000/15000 ppm (equivalent to approximately 0, 40, 120, 380 and 520 mg/kg bw/day). Due to poor palatability the 20000 ppm dose was reduced to 15000 ppm on day 13 of the study. Food consumption in these animals was markedly reduced and the animals lost weight; weight-gain was reduced in the 7200 ppm dogs. The malnutrition in the high-dose group led to wasting and an obvious general deterioration in the health of the animals. These general effects, in conjunction with iodosulfuron-methyl-sodium induced anaemia were probably instrumental in the development of respiratory infection (bronchopneumonia) with its attendant pathology in the dogs of the 7200 and 20000/15000 ppm dose-groups. The principal compound-related findings that were observed in both the 20000/15000 and the 7200 ppm groups were reductions in erythrocyte counts, haemoglobin concentrations and haematocrits, slight to moderate haemopoietic hyperplasia in the bone marrow, and renal tubular dilatation and atrophy.

**Mice** were fed 0, 700, 2100 or 7000 ppm iodosulfuron-methyl-sodium in their diet for 13 weeks. No iodosulfuron-methyl-sodium related deaths occurred during the study and no clinical signs could be attributed to iodosulfuron-methyl-sodium dosage. A reduction in body-weight gain was restricted to the 7000 ppm males; these weight effects were associated with a reduction in food conversion. No iodosulfuron-methyl-sodium related changes in haematological parameters were seen, and the only clinical chemistry finding was an increase in alkaline phosphatase levels in the blood of the 7000 ppm males. A dose-related increase in liver weights was present in 2100 and 7000 ppm males, and in 7000 ppm females. Centrilobular hepatocyte enlargement was present in the males of all treatment groups and the 2100 and 7000 ppm females. Centrilobular fat deposition was noted in the females of all treatment groups; in male mice this finding was restricted to animals in the 2100 and 7000ppm groups. In the 2100 and 7000 ppm males, lipofuscin (a product that is formed when subcellular organelles are degraded) was found in some of the centrilobular hepatocytes. No lipofuscin granules were found in iodosulfuron-methyl-sodium treated female mice. Since iodosulfuron-methyl-sodium related centrilobular hypertrophy (males) and centrilobular fat deposition (females) occurred at the lowest dose level used the LOEL is 700 ppm equal to 130 mg/kg bw/day.

**Rats** were fed on a diet containing 0, 200, 1000, 5000 or 10000 ppm iodosulfuron-methyl-sodium for a period of 13 weeks.

At the end of the treatment period 10 rats/sex of all groups were sacrificed for organ-weight and histopathology studies, and 10 rats/sex of the 0, 5000 and 10000 ppm groups were transferred to an iodosulfuron-methyl-sodium free diet for a further 4 weeks to determine the reversibility of any compound-induced changes. No iodosulfuron-methyl-sodium related deaths or clinical/behavioural signs were noted during the study and no ophthalmological or blood chemistry changes could be ascribed to iodosulfuron-methyl-sodium treatment. Reductions in body-weight gains were noted in males and females in the 5000 and 10000 ppm dose groups alongside small reductions in food intake. During the 4 week recovery period food intake was restored to control levels and this was associated with a small increase in body-weight gains when compared with controls. There were reversible reductions in the erythrocyte count, the haemoglobin concentration and in the haematocrit of the 10000 ppm females. In the 10000 ppm males the only effect noted was a reduction in the erythrocyte count. In the 1000 ppm females, liver weight was increased and in the male rats in the 10000 ppm group, histological investigations revealed enlargement of the centrilobular hepatocytes without any signs of associated hepatotoxicity. These effects were reversible as indicated by their absence in the recovery group. The NOEL for this study is 1000 ppm equal to 70 mg/kg bw/day.

**Dogs** were fed iodosulfuron-methyl-sodium in their diet at levels of 0, 200, 1200 or 7200 ppm for a period of 13 weeks. At 7200 ppm, all of the dogs suffered from respiratory disease and 3/8 were killed *in extremis.* It is likely that the poor health of these animals was secondary to the severe degree of anaemia produced by this high dose of iodosulfuron-methyl-sodium. Both the 7200 ppm and the 1200 ppm animals displayed reduced erythrocyte and white cell counts, decreases in haemoglobin concentration and decreased haematocrits. Signs of compensatory activity in these groups were haemopoietic hyperplasia in the bone marrow and the initiation of extramedullary haemopoiesis in the liver and spleen. Marrow smears indicated a preponderance of immature cells. In addition to the clinical and pathological signs more specifically associated with bronchial infection, animals in the 7200 ppm group showed poor weight-gain, conjunctivitis, a slight reduction in food consumption, increases in kidney, liver and spleen weights, increases in alanine- and aspartate-aminotransferases, creatinine phosphokinase and globulin concentrations and minor decreases in glucose and calcium concentrations. The NOEL for iodosulfuron-methyl-sodium in this study is 200 ppm equal to 8 mg/kg bw/day.

**Long-Term Studies**

**Mice** were fed iodosulfuron-methyl-sodium in their diet at levels of 0, 35, 350 or 1750 ppm for a period of 80 weeks. Iodosulfuron-methyl-sodium dosage did not affect mortality, clinical signs, body-weight gain, food consumption or haematological parameters. Neoplastic activity was not affected by iodosulfuron-methyl-sodium exposure. The neoplastic lesions found in the animals were typical of those found in aged mice, and their incidence was not enhanced in a dose-related manner by iodosulfuron-methyl-sodium. In both the male and the female mice liver weights were increased in the 1750 ppm group. At a microscopic level, centrilobular hepatocyte enlargement was noted in the 1750 ppm females and in the 350 and 1750 ppm males. Males in these two groups also displayed centrilobular mononuclear cell infiltration. This was not evident in the female mice. Two other indications of hepatotoxic activity that were absent in females were pigmented centrilobular hepatocytes and centrilobular fat deposits. These effects were both observed in 1750 ppm males. The NOEL for iodosulfuron-methyl-sodium in this study is 35 ppm equal to 5 mg/kg bw/day.

**Rats** were fed 0, 70, 700 or 7000 ppm iodosulfuron-methyl-sodium in their diets for 2 years. At the end of the first year 10 rats/sex/dose-group were sacrificed for macroscopic and microscopic examinations. Body-weight gains were reduced at 700 and 7000 ppm while food conversion and food consumption were lower in 7000 ppm rats. Iodosulfuron-methyl-sodium ingestion had no effect on mortality, clinical signs, the number of palpable masses, haematological, biochemical and urinary assessments, or on ophthalmological signs. At the interim necropsy no iodosulfuron-methyl-sodium related macroscopic or microscopic effects were noted. Following 24 months of treatment with iodosulfuron-methyl-sodium the only non-neoplastic finding that might be related to treatment was a lobular atrophy in the submandibular salivary glands of the 7000 ppm male and female rats. Iodosulfuron-methyl-sodium did not produce or promote neoplastic activity. The NOEL in this study is 70 ppm equal to 3 mg/kg bw/day.

**Beagle dogs** were fed iodosulfuron-methyl-sodium in their diets at levels of 0, 30, 200 and 1200 ppm for a period of 12 months. No mortalities occurred during the study and no iodosulfuron-methyl-sodium related effects were noted on body-weight gains, food consumption, water consumption and ophthalmoscopic, haematological and urinary parameters. Blood chemistry changes were restricted to an increase in cholesterol levels at 6 and 12 months in the 1200 ppm females. The liver weights of the 1200 ppm females were increased. In the absence of histological changes the liver hypertrophy possibly represented an adaptive response. No macroscopic findings appeared to be related to iodosulfuron-methyl-sodium ingestion and the only histopathological change noted was a haemopoietic hyperplasia in 5/6 females of the 1200 ppm group. A bone marrow smear from one of these females revealed increased numbers of normoblasts and early myeloid series cells. The NOEL for iodosulfuron-methyl-sodium in this study is 200 ppm equal to 7 mg/kg bw/day.

## Reproduction and Developmental Studies

In a range-finding study, **rats** were fed iodosulfuron-methyl-sodium at 0, 1000, 5000 or 10000 ppm in the diet. The parents were treated for 3 weeks before the mating phase of the study. During this phase body-weight gains in the 5000 and 10000 ppm males and the 10000 ppm females were reduced. The reduced body weight in the 10000 ppm females was continued through gestation and lactation. No other iodosulfuron-methyl-sodium related signs were apparent. Iodosulfuron-methyl-sodium did not affect mating or the reproductive performance of the males or the females. However, at parturition, the mean litter size of the 10000 ppm group was slightly reduced. During lactation, the pups of the 10000 ppm dams had a higher mortality rate, particularly during days 1-4 of lactation and also gained less weight than did those of the other groups. Some weanlings were fed on the respective iodosulfuron-methyl-sodium-containing diets for a further week after the end of the lactation period. Those in the 10000 ppm group gained weight at a slower rate than did the animals in the other groups. At autopsy no iodosulfuron-methyl-sodium related macroscopic abnormalities were noted. A small increase in the liver and in the kidney organ-weight/body-weight ratios in the 10000 ppm pups is of uncertain biological significance.

A two-generation reproduction study utilised **rats** continuously fed iodosulfuron-methyl-sodium in their diets at 50, 500 or 5000 ppm. The results obtained in the two generations were essentially the same. Iodosulfuron-methyl-sodium ingestion had no effects on behaviour, clinical signs, food intake or reproductive performance of the parental rats (as judged by mating success, male fertility, pregnancy rates, effects on parturition and on the duration of pregnancy).

However, both males and females in the 5000 ppm group had lower body-weights than the rats in the other groups. At autopsy, no biologically significant effects related to iodosulfuron-methyl-sodium ingestion were apparent in the parental animals. In the 5000 ppm group there were indications of iodosulfuron-methyl-sodium related foetotoxicity as indicated by increases in the numbers of pups born dead and associated decreases in the number of live-born pups. The weights of the pups and the sex-ratio were unaffected. During the lactation phase, survival of pups was reduced especially during the first four days of lactation, together with reduced weight-gain at 5000 ppm. At autopsy no iodosulfuron-methyl-sodium induced changes were noted. The NOEL based on reductions in parental body weight gain, foetotoxicity and post natal toxicity is 500 ppm equal to 37 mg/kg bw/day in males and 52 mg/kg bw/day in females.

In a pilot study, iodosulfuron-methyl-sodium (500 or 1000 mg/kg bw/day) was administered by gavage to inseminated **rats** on days 7-16 of gestation. On day 21 of gestation the pups were delivered by Cesarean section and the dams were killed. No deaths or abnormal clinical signs were noted during the study. Body weights and food consumptions were marginally reduced in the 1000 mg/kg animals when compared with those in the 500 mg/kg group. Foetal development did not appear to be adversely affected by iodosulfuron-methyl-sodium treatment and the pups showed no external dysmorphogenic effects. The weights of the pups and their crown-rump lengths also appeared to be unaffected by iodosulfuron-methyl-sodium treatment of the dams.

In the main study, iodosulfuron-methyl-sodium (0, 100, 315 or 1000 mg/kg bw/day) was administered by gavage to inseminated **rats** on days 7-16 of gestation. On day 21 of gestation the pups were delivered by Caesarean section and the dams were killed. No mortalities occurred in the dams during the course of the study. The only clinical sign observed was increased salivation in some of the 1000 mg/kg dams during the treatment period. Food consumption and body-weights of the 315 and 1000 mg/kg dams were slightly reduced. No iodosulfuron-methyl-sodium related macroscopic abnormalities were noted in the dams. A number of retardations that did appear to be related to iodosulfuron-methyl-sodium treatment were noted in the 1000 mg/kg foetuses (low foetal weights and delays in ossification) as well as two minor defects (blood in the abdomen and distended renal pelves) which occurred at a significantly higher rate. The NOEL in dams is 100 mg/kg bw/day and for foetotoxic effects is 315 mg/kg bw/day.

In a pilot study using **rabbits**, inseminated dams were administered iodosulfuron-methyl-sodium by gavage on days 6-18 of gestation. The doses used were 200 or 500 mg/kg bw/day. On day 29 of gestation the dams were killed and the foetuses were delivered by Caesarean section. No parental mortalities occurred during the study. One dam in the 200 mg/kg group aborted and one dam in the 500 mg/kg group had a much reduced food consumption and a marked drop in body-weight from day 14 of gestation. In the remaining rabbits food consumption was decreased during the treatment period and body-weight gains were either stabilised or reversed. In the three non-aborted rabbits there were no signs of foetotoxicity. The foetuses of the 500 mg/kg dam that had a much reduced food consumption and a significant weight loss had low body-weights and crown-rump lengths. No gross abnormalities were observed in the dams or their foetuses

Virgin female **rabbits** were inseminated and divided into four groups. They were dosed by gavage with 0, 25, 100 or 400 mg/kg bw/day of iodosulfuron-methyl-sodium on days 6-18 of gestation.

On day 29 of gestation the dams were killed and the foetuses were delivered by Caesarean section. No iodosulfuron-methyl-sodium induced mortality was produced in the dams. Food consumption was reduced and there was a reduction in defecation in the 100 and 400 mg/kg groups and dams at the highest dose lost weight during treatment. At Caesarean section no differences were apparent in gravid uterine weights, placental weights, implantation sites, corpora lutea, live and dead foetuses, resorptions, foetal weights, crown-rump lengths or sex ratios. Examination of the dams revealed no iodosulfuron-methyl-sodium related adverse effects. Examination of the foetuses revealed no developmental effects. The NOEL for the dams in this study is 25 mg/kg bw/day based on decreased food intake and reduced defecation during the treatment period. Iodosulfuron-methyl-sodium did not appear to have foetotoxic or teratogenic actions at the highest dose used in the present study.

### Genotoxicity Studies

Iodosulfuron-methyl-sodium and a number of its metabolites were tested for mutagenic potential in **bacterial** assays and cultured **mammalian** cells, for chromosome damaging potential in mammalian cells *in vitro*, for DNA damage in primary cultured hepatocytes and for micronuclei production in mouse bone marrow. All tests were negative.

## PUBLIC HEALTH STANDARDS

### Poisons Scheduling

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.

On the basis of its toxicity, the NDPSC has included iodosulfuron-methyl-sodium in **schedule 5** 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.

### NOEL/ADI

The overall NOEL for iodosufuron-methyl-sodium is 3 mg/kg bw/day. This figure was based on reductions in body-weight gains produced by higher intakes in a 2 year rat study. Hence an ADI of 0.03 mg/kg bw/day is appropriate for iodosulfuron-methyl-sodium.

# Conclusion

Based on an assessment of the toxicology, it was considered that there should be no adverse effects on human health from the use of this product, when used in accordance with the label directions.

# RESIDUES ASSESSMENT

The Chemistry and Residues section of the NRA has undertaken a residues assessment of a formulated product based on the new active constituent iodosulfuron-methyl-sodium. Data concerning residues in wheat, metabolism in plants and animals, and chemistry were considered as part of the residue evaluation of the application.

## Metabolism

In **wheat**, the radioactive residues were distributed differently in grain and straw. In grain the largest proportion of radioactivity was due to the metabolite AE 0031838 (15% TRR [Total Radioactive Residues]). The parent compound and two other metabolites each comprised approximately 3% TRR. In straw these 4 compounds each contributed approximately 13% TRR. In hay and forage the parent compound accounted for greater than 50% TRR and other metabolites were present at much lower levels. There was some chromatographic evidence of polar compounds however these were not present at significant levels. In wheat grain, greater than 77% TRR was typically extracted. In straw greater than 82% of the TRR was typically extracted. No transformation products of the parent compound were identified.

In **rats** iodosulfuron-methyl was extensively eliminated in urine (69-97% of total dose) and faeces (4-26% of total dose) 72-168 hours following a single oral dose. The TRR in tissues at sacrifice accounted for 0.25-1.33% of the dose. $^{14}C$ residues were highest in offal (1.8-8.8% of total dose).

In **dogs** iodosulfuron-methyl was extensively eliminated in the urine (69-72% of total dose) and faeces (15-18% of total dose) 168 hours following a single oral dose. The parent compound comprised 54-61% of the total dose in urine and 8-11% in faeces.

In **hens** 92% of the administered dose was recovered in excreta. Residue levels were highest in the gastro-intestinal tract at 0.194 mg/kg. Skeletal muscle and subcutaneous fat were both 0.005 mg/kg. The parent compound was the main metabolite, accounting for 23% total radioactivity in liver, 33% in skin, 11% in egg yolks and 18% in egg whites. In eggs, residues peaked at 0.022 mg/kg in egg yolks and 0.017mg/kg in egg whites. The parent compound accounted for 11 and 18% in yolks and whites respectively. No individual metabolite was present in tissues or eggs at greater than 0.1 mg/kg.

In a **lactating cow** iodosulfuron-methyl was extensively eliminated in urine (mean daily recovery was 71% of total dose) and faeces (mean daily recovery was 21% of total dose). At sacrifice, liver accounted for 0.447-0.517% (0.537-0.689 ppm parent equivalents) of the dose. $^{14}C$ residues in the total milk output accounted for 0.7-0.8% of the total dose. The maximum concentration in milk was 0.017 ppm parent equivalents. The parent compound was the major residue component in milk (15% of TRR), liver (24% of TRR,), kidney (26% of TRR) and renal fat (10% of TRR). Metabolite AE F075736 was the only metabolite present in any tissue at >10%, it was present in kidney.

## Residue definition

The parent compound is considered adequate for the purposes of monitoring Good Agricultural Practice (GAP). The residue definition will therefore be as follows:

Iodosulfuron methyl iodosulfuron methyl

**Analytical methods**

A validated analytical method for determination of iodosulfuron-methyl residues in wheat grain, straw and forage was provided. The practical Limit of Quantitation (LOQ) in **wheat grain** was 0.01 mg/kg, in **wheat straw** 0.05 mg/kg and in **wheat forage** 0.05 mg/kg. Iodosulfuron-methyl was determined by GC-MSD as a single chromatographic peak, following sequential extraction with phosphoric acid/hexane, phosphoric acid/ethyl acetate and phosphoric acid/toluene and SPE cleanup. HPLC-UV methods for determination of iodosulfuron-methyl residues in crop samples (including grain, straw and forage) and animal tissues (muscle, fat, kidney, liver, milk and eggs) were also provided. Samples were extracted with various organic solvents with cleanup on SPE cartridges. Determination was by HPLC-UV.

**Storage stability**

Iodosulfuron-methyl residues in wheat shoots were shown to be stable for at least 26 months when stored at -18°C. The maximum frozen storage interval for residue trial samples was 18 months, a period that was covered by the storage stability trials. The maximum period between tissue collection and analysis was 6 months. Milk and eggs were assayed fresh.

**Residue trials**

The proposed maximum application rate is 200g product/ha when used in conjunction with the crop safener mefenpyr-diethyl. This is equivalent to 10g iodosulfuron–methyl/ha. The applicant provided residue data from 8 Australian trials and 5 European trials that were considered to comply with proposed Australian GAP.

In trials conducted according to proposed Australian GAP (7-13 g iodosulfuron–methyl/ha, 83-155 days PHI) residues in wheat grain, straw and forage were <LOQ. Taken as a whole the residue data support the establishment of a Maximum Residue Limit (MRL) of *0.01 mg/kg for **wheat grain**, and *0.05 mg/kg for **wheat straw and wheat forage** (fresh weight), with a 28 day PHI for wheat forage.

Mefenpyr-diethyl has been evaluated as a crop safener and its use in wheat is associated with an MRL set at the Limit of Quantitation (cereal grain 0.01mg/kg). Residue data showed that the use of mefenpyr-diethyl as a crop safener in conjunction with ***HUSSAR***® should not exceed the present MRL's .

*Processing studies*

No processing data was presented. Finite residues are unlikely to occur in processed wheat products.

**Animal Feed Commodity MRLs**

A 4 week grazing restraint is recommended for **wheat forage**. The residue data support the establishment of an MRL of *0.05 mg/kg for wheat forage (fresh weight)

**Animal Commodity MRLs**

In a **dairy cow** metabolism study the feed level was equivalent to 14.03 ppm in the diet (approximately 0.29 mg/kg bw/day based on a 758 kg animal consuming 15.68 kg DM/day) for 7 days.

At this feed level the maximum residues in fat (omental, renal and subcutaneous), milk and offal (kidney and liver) were 0.037 mg equivalents parent compound/kg tissue, 0.017 mg/kg and 0.161 mg/kg respectively. Residues in meat [in the fat], milk and offal would be undetectable as a result of feeding 100% wheat grain or 100% wheat forage containing iodosulfuron-methyl at the MRL. It is recommended that animal commodity (mammalian products) MRLs be set at the Limit of Quantitation. The appropriate MRLs are *0.01 mg/kg for **meat, mammalian [in the fat]**, *0.01 mg/kg for **edible offal, mammalian** and *0.01 mg/kg for **milk**.

In a poultry metabolism study, laying **hens** fed radiolabelled test substance at 11.48 ppm in the diet for 5 days, maximum residues in skin, egg yolk, egg white and liver were 0.014, 0.021, 0.016 and 0.029 mg equivalents parent compound /kg tissue respectively. The parent compound ranged from 11% of the TRR in egg yolks to 64% in excreta. Based on the predicted residue level in wheat grain the dietary burden for poultry is considered to be very low. Quantifiable residues are unlikely to occur in poultry products. It is recommended that animal commodity (poultry products) MRLs be set at the Limit of Quantitation. The appropriate MRLs are *0.01 mg/kg for **poultry meat [in the fat]**, *0.01 mg/kg for **poultry, edible offal**, and *0.01 mg/kg for **eggs**.

**Estimated Dietary Intakes**

The chronic dietary risk is estimated by the National Estimated Daily Intake (NEDI) calculation encompassing all registered/temporary uses of the chemical and dietary intake data from the 1995 National Nutrition Survey of Australia. The NEDI calculation is made in accordance with the *Guidelines for Predicting Dietary Intake of Pesticide Residues (revised)* (WHO, 1997). The calculation has been revised to reflect the *expected* residue levels in commodities (STMRs) rather than the *maximum* residue levels (MRLs). This is consistent with the principles for assessing chronic dietary intake, which is considered to occur through a lifetime of exposure.

The refined NEDI for iodosulfuron-methyl is equivalent to less than 0.37% of the ADI. It is concluded that the chronic dietary exposure is small and the risk is acceptable.

**Bioaccumulation potential**

Pure iodosulfuron-methyl has a log $P_{OW}$ value of 1.96 at pH 4 and –1.15 at pH 10. According to the FAO definition[#] the compound should therefore be designated as not fat soluble.

This was supported by metabolism studies in a **cow, hens and rats**, that indicated that the highest radioactive residues occurred in offal (0. 1 ppm in cow, 0.029 ppm in hens and 0.002 ppm in rats). There was no preferential accumulation in the fat. In the lactating cow metabolism study residues in whole milk did not accumulate, but fluctuated with dose.

**Recommendations**

Registration of *HUSSAR*® for use on wheat is supported, on the basis of evaluation of the residue data.

[#] FAO Manual on the Submission and Evaluation of Pesticide Residues Data, Food and Agriculture Organisation of the United Nations, Rome, 1997, p 36.

**Recommended amendments to the MRL Standard:**

**Table 1**

| Compound | Food | | MRL (mg/kg) |
|---|---|---|---|
| **ADD:** | | | |
| **Iodosulfuron methyl** | GC 0654 | Wheat | *0.01 |
| | MM 0095 | Meat (mammalian) [in the fat] | *0.01 |
| | ML 0106 | Milks | *0.01 |
| | MO 0105 | Edible offal (mammalian) | *0.01 |
| | PM 0110 | Poultry meat [in the fat] | *0.01 |
| | PO 0111 | Poultry, edible offal | *0.01 |
| | PE 0112 | Eggs | *0.01 |

**Table 3**

| *Compound* | **Residue Definition** |
|---|---|
| **ADD:** | |
| **Iodosulfuron methyl** | Iodosulfuron methyl |

**Table 4**

| Compound | Animal Feed Commodity | | MRL (mg/kg) |
|---|---|---|---|
| **ADD:** | | | |
| **Iodosulfuron methyl** | AS 0654 | Wheat, straw and fodder, dry | *0.05 |
| | AS 0654 | Wheat forage (fresh weight) | *0.05 |

* at or about the Limit of Quantitation (LOQ)

The MRL recommendations indicated above will be conveyed to the Australia and New Zealand Food Authority (ANZFA) for consideration for incorporation into Standard A14 of the Food Standards Code and consequent adoption into the State/Territory food legislation.

The following Withholding Periods (WHP's) are recommended in relation to the above MRL:

Harvest:
Wheat: **NOT REQUIRED WHEN USED AS DIRECTED.**

Grazing/Stock-food:
Wheat: **DO NOT GRAZE OR CUT FOR STOCK-FOOD FOR 4 WEEKS AFTER APPLICATION.**

# ASSESSMENT OF OVERSEAS TRADE ASPECTS OF RESIDUES IN FOOD

## Commodities exported and main destinations

Australia produced 22,108 ktonne of wheat in 1998/99. 16,387 ktonne were exported, with around 50% of this exported to Iran, Egypt, Indonesia, Pakistan, Iraq, Japan and South Korea (each more than 1m tonnes). The total value of wheat exports was $3.47 billion. (Figures from ABARE, Australian Commodity Statistics 1999).

Australian exports of beef/veal and live cattle in 1998/99 were 855.3 kt and 511.2 kt respectively. Major export markets for beef/veal were US (285.2 kt) and Japan (320.9 kt). The value of beef/veal exports to these two markets alone was worth over $2 billion in 1998.

## Overseas registration status

Aventis advised that iodosulfuron-methyl is currently registered in South Africa, Turkey, Italy, Hungary, Austria and provisionally registered in Saudi Arabia. Registrations in all countries where cereal crops are grown commercially are being pursued. The expected registration date for most countries is some time in 2001.

Aventis advised that the following related MRLs were established in relation to registration of iodosulfuron-methyl in South Africa and Turkey:

| Country | Commodity | MRL (mg/kg)* |
|---|---|---|
| South Africa | Cereal grain | 0.01 |
| Turkey | Cereal grain | 0.01 |

***** at or about the Limit of Quantitation (LOQ)

## CODEX Alimentarius Commission MRLs

Iodosulfuron-methyl has not been considered by CODEX.

## Potential risk to Australian export trade

Since finite residues are unlikely to be present in **wheat grain** when iodosulfuron-methyl is used according to GAP, it is unlikely that the use of iodosulfuron-methyl will adversely affect Australian trade. This trade risk assessment for wheat-grain is further supported by the recommended Australian wheat-grain MRL of 0.01 mg/kg, which is at the Limit of Quantitation (LOQ) for wheat-grain.

The likelihood of finite tissue residues occurring in **cattle** as a result of feeding treated wheat products is considered to be small. A grazing restraint will apply to wheat forage and straw. The risk to trade from the export of processed fractions is expected to be minimal. This trade assessment for wheat-forage/fodder is further supported by the recommended Australian wheat-forage/fodder MRL of 0.05 mg/kg, which is at the Limit of Quantitation (LOQ) for wheat-forage/fodder.

# OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT

The National Occupational, Health and Safety Commission (NOHSC) has conducted a risk assessment on *HUSSAR*® containing 50 g/kg iodosulfuron-methyl-sodium, as a new technical grade active constituent and 150 g/kg mefenpyr-diethyl, as a registered active constituent. *HUSSAR*® is a water dispersible granule product for use on wheat. *HUSSAR*® can be safely used by workers when handled in accordance with the control measures indicated in this assessment.

Iodosulfuron- methyl-sodium is not on the NOHSC *List of Designated Hazardous Substances*. Based on the information supplied, iodosulfuron-methyl-sodium cannot be classified as hazardous.

Iodosulfuron- methyl-sodium is in the form of a light beige crystalline powder with weak aromatic odour. It has low acute oral, dermal and inhalation toxicity in **rats**. It was a moderate eye irritant in **rabbits** but did not cause skin irritation in **rabbits** or skin sensitisation in **guinea pigs**.

*HUSSAR*® is a water dispersible granule product. It possesses low acute oral and dermal toxicity in rats. It is a slight skin irritant and a severe eye irritant but is not a skin sensitiser. *HUSSAR*® is a hazardous substance, according to NOHSC *Approved Criteria for Classifying Hazardous Substances*.

**Formulation, repackaging, transport, storage and retailing**

*HUSSAR*® will be formulated overseas and will be imported into Australia fully packaged and labelled ready for sale. Transport workers, store persons, and retailers will handle the packaged product and could only become contaminated if the packaging were breached.

Advice on safe handling of the active or the product during routine use is provided in the Material Safety Data Sheet (MSDS) for *HUSSAR*®.

**Use and exposure**

*HUSSAR*® is indicated for the post-emergence control of annual ryegrass, wild oats, annual phalaris and various broadleaf weeds in wheat. The draft label specifies that *HUSSAR*® not be applied by air. It should be applied **only** by ground application, using a standard boom spray, at the maximum application rate of 200 g/ha in a minimum spray volume of 50 L water/ha.

The primary route of occupational exposure is dermal and ocular. Workers can be exposed to *HUSSAR*® while mixing, loading, spraying and cleaning up spills and equipment or at re-entry.

*HUSSAR*® is a severe eye irritant. Goggles are recommended when opening the container and preparing the spray to protect against the possibility of eye irritation. The spray is not expected to be an eye irritant at the diluted use-rate of the product (0.4%).

*HUSSAR*® is a slight skin irritant. Gloves are recommended when opening the container and preparing spray to protect against skin irritation. PVC gloves are the most common gloves used in agriculture and are suitable for the use of *HUSSAR*®. It is not expected that spray concentration (0.4%) would cause any skin irritation.

In the absence of worker exposure data on iodosulfuron-methyl-sodium and the product, NOHSC used the UK Predictive Exposure Model (POEM). The results of POEM indicated that *HUSSAR*® can be used safely without the use of any personal protective equipment when iodosulfuron- methyl-sodium was assessed as an active constituent. However, when mefenpyr-diethyl was assessed as an active constituent, protection was better for workers when gloves are worn during mixing and loading. Therefore, the results indicated that protective equipment is needed to prevent exposure to the product. In particular, cotton overalls buttoned to the neck and wrist (or equivalent clothing) and a washable hat, goggles and elbow-length PVC gloves, should be worn during preparation of the spray.

**Entry into Treated Areas or Handling Treated Crops**

A nil re-entry period applies

**Recommendations for Safe Use**

Users should follow the instructions and Safety Directions on the product label. Safety Directions include the use of protective clothing, goggles and elbow-length PVC gloves for mixers and loaders of *HUSSAR*®.

**Information provision**

Material Safety Data Sheet (MSDS)

Aventis CropScience Pty Ltd has produced an MSDS for *HUSSAR*®. This should contain information relevant to Australian workers, as outlined in the NOHSC National Code of Practice for the Preparation of MSDS. Employers should obtain the MSDS from the supplier and ensure that their employees have ready access to it.

**Conclusion**

*HUSSAR*® can be used safely if handled in accordance with the instructions on the product label. Additional information is available on the MSDS for *HUSSAR*®.

# ENVIRONMENTAL ASSESSMENT

Iodosulfuron-methyl-sodium is to be used for post-emergence weed control in wheat. The main non-target contamination of soil and water is likely to be through run-off. The proposed use via ground application is expected to minimise contamination via spray-drift. The vapour pressure and Henry's Law Constant indicate that iodosulfuron-methyl-sodium has a low volatility and is unlikely to volatilise from water or moist soil surfaces. It has high solubility in water at common environmental pH and temperature ranges. The log $K_{OW}$ shows a low bioconcentration potential in aquatic organisms.

## Degradation and Metabolism

*Hydrolysis*

Hydrolysis is rapid in acid pHs (4 days at 20$^{o}$C and pH 4) but slow at neutral or alkaline pHs (> 300 days, extrapolated values). Aqueous photolysis of iodosulfuron-methyl-sodium has a calculated half-life of 49-50 days while in the air the calculated photooxidation half-life was 6.3 days. On soil surfaces, the half-life was about 1 day, indicative of ready breakdown.

*Aerobic and anaerobic soil metabolism*

Under aerobic conditions, there was ready soil metabolism of iodosulfuron-methyl-sodium in nine soils with DT50 values of 0.8-3.3 days. DT90 values were 2.5-11 days. A major degradation product was metsulfuron-methyl, itself a registered pesticide. Metsulfuron-methyl had calculated DT50s of 21 to 78 days and DT90s of 68 to about 260 days resulting in a classification of the metabolite as slightly to moderately persistent. Degradation times are affected by temperature and soil moisture content with high temperature and moisture contents most conducive to degradation of both iodosulfuron-methyl-sodium and metabolites. Under anaerobic conditions, iodosulfuron-methyl-sodium applied to two soils had DT50 values of 14 and 28 days and DT90s of 47 and 94 days, results which are indicative of non-persistence to slight persistence under anaerobic conditions. Metsulfuron-methyl was the only metabolite present under anaerobic conditions and it was considered persistent with a DT50 of 291 days in one soil and not calculable in another because of insufficient degradation.

*Degradation in water/sediment*

Degradation of iodosulfuron-methyl-sodium in two water/sediment systems indicated degradation was relatively rapid in both water (DT50s of 12and 19 days, DT90s 41and 64 days) and the whole system (DT50s of 13 and 25 days and DT90s of 43 and about 81 days). Consequently iodosulfuron-methyl-sodium in water/sediment systems is considered to be non to slightly persistent. Metsulfuron-methyl, again formed by degradation of iodosulfuron-methyl-sodium, was the main metabolite in the water/sediment systems and was classified as having slight to moderate persistence with DT50s of 34-55 days and DT90s of 114 and 183 days.

## Mobility Studies

*Adsorption/desorption*

Conventional batch adsorption/desorption studies with ten French, German, UK and US soils resulted in Koc values of 0.8-152 being determined. This indicates very high to high mobility. Metsulfuron-methyl Koc values from seven soils were between 2.9 and 27, also indicative of very high mobility.

*Leaching*

Leaching of iodosulfuron-methyl-sodium applied to outdoor lysimeters showed that after 3 years and a total of 2570 mm of precipitation/irrigation, only 4-5% of the originally applied material was found in the leachate with iodosulfuron-methyl-sodium never being detected. The majority (33%) of the applied radioactivity remaining in the soil after three years was in the top 30 cm with 17% detected at lower levels. Soil cores (15 cm deep) showed parent was ≤0.56% of the applied radioactivity by about 500 days after treatment. The main metabolite in the soil was metsulfuron-methyl with about 2% and 0.2% of the applied radioactivity found within a year and after two years respectively with a maximum mean concentration of 0.016 µg/L in one lysimeter leachate and 0.012 µg/L in the other.. In a second outdoor lysimeter study, the metabolite, metsulfuron-methyl, was present in leachate throughout the collection period and reached a peak concentration of 0.24 µg/L in year 2 of the study. In the top 15 cm of soil, parent had declined to 0.1% of the applied radioactivity by about 150 days after the initial treatment. Metsulfuron-methyl in the soil declined from 2.3% of the applied radioactivity in the first year to 0.3% in the third year. These lysimeter leaching studies did not identify iodosulfuron-methyl-sodium or its metabolite, metsulfuron-methyl, as significant leachers under the test conditions.

*Field dissipation*

Field dissipation studies conducted at six locations in Europe using iodosulfuron-methyl-sodium applied as a granular formulation containing about 5% of the active showed that DT50 times for the active were between 2 and 13 days and for metsulfuron-methyl, between 7 and 40 days. The maximum iodosulfuron-methyl-sodium concentration in the top 10 cm of soil following treatment at a use rate equivalent to that proposed in Australia was 6.7 µg/kg (dry soil basis) immediately after application. This declined to 0.6 µg/kg (dry soil basis) after 28 days and was not detectable [<0.03 µg/kg(dry soil basis)] at days 59 and 91. The maximum metsulfuron-methyl concentration following treatment at a rate equivalent to that proposed for Australia, was 2.2 µg/kg(dry soil basis) and at or below the limit of quantitation of 1 µg/kg(dry soil basis) from day 59 on. There was no detection of either iodosulfuron-methyl-sodium or metsulfuron-methyl at depths of 10 to 30 cm following treatment at a rate equivalent to that proposed for use in Australia. Significant leaching of iodosulfuron-methyl-sodium or metsulfuron-methyl is not expected to occur following use of *HUSSAR®*. Computer modelling confirmed this experimental finding.

*Bioconcentration*

The expected high water solubility of iodosulfuron-methyl-sodium under actual use conditions and the low Kow of the active indicate that bioaccumulation is not expected.

**Summary of Environmental Effects Studies**

*Birds*

Iodosulfuron-methyl-sodium was practically non-toxic to Japanese quail, Bobwhite quail and mallard duck by the single oral dose route with LD50 values greater than the highest doses tested of 2,000 mg a.i./kg-bodyweight. The active was also practically non-toxic to the same species in five day dietary exposures with LC50 values > 5000 ppm. Chronic exposure of breeding Japanese and Bobwhite quail gave NOAELs of 1000 ppm for systemic and reproductive toxicity.

*Fish*

Technical iodosulfuron-methyl-sodium was practically non-toxic to Rainbow trout and Bluegill sunfish with both having 96 hour LC50 values > 100 mg a.i./L. When iodosulfuron-methyl-sodium and mefenpyr-diethyl were used as a formulated product, the 96 hour LC50 to Rainbow trout was 10 mg/L. This measured LC50 was similar to a theoretical value of ~ 6 mg/L and indicated comparable toxicity between the iodosulfuron-methyl-sodium and the formulated product tested. Under conditions of chronic exposure, iodosulfuron-methyl-sodium had 28-day NOEC and LOEC values of 10 and 32 mg/L based on length increase, indicating very slight toxicity.

*Aquatic invertebrates*

Neonate water fleas were generally unaffected after 48 hour by technical iodosulfuron-methyl-sodium up to a concentration of 32 mg/L with the EC50 >100 mg/L. In contrast, exposure to formulated iodosulfuron-methyl-sodium and mefenpyr-diethyl was more toxic with the 48 hour EC50 and NOEC being respectively 7.8 mg/L and 1 mg/L.

When daphnids were exposed for 21 days and assessed for immobility, the EC50 for the technical product was >56 mg/L while a formulated iodosulfuron-methyl-sodium and mefenpyr-diethyl product had a 21 day LC50 of 1.3 mg/L. Based on reproduction, the NOEC for the technical grade active was 10 mg/L while for the formulated product, the value was 0.56 mg/L for reproduction and size. The above are indicative of enhanced toxicity in the formulated product.

*Aquatic plants*

Technical iodosulfuron-methyl-sodium was very highly toxic to the green alga, *Pseudokirchneriella subcapitata* with a 96 hour EC50 of 0.15 mg/L for effect on growth rate and 0.06 mg/L for effect on biomass. Exposure to formulated iodosulfuron-methyl-sodium and mefenpyr-diethyl resulted in a 96 hour EC50 of 1 mg/L based on effect on growth rate and 0.08 mg/L for the effect on biomass. In contrast, iodosulfuron-methyl-sodium was practically non-toxic to the freshwater diatom, *Navicula pelliculosa*, with the 96 hour EC50s for biomass and for growth rate both > 100 mg/L.

The metabolite [and registered pesticide in its own right] metsulfuron-methyl obtained from iodosulfuron-methyl-sodium degradation was highly toxic to *Pseudokirchneriella subcapitata* with a 96 hour EC50 value for effect on biomass of 0.12 mg/L and at worst highly toxic with respect to effect on growth rate with a 96 hour EC50 of > 0.56 mg/L. As with iodosulfuron-methyl-sodium, metsulfuron-methyl was practically non-toxic to *Navicula pelliculosa*, with the 96 hour EC50s for biomass and for growth rate both > 100 mg/L.

2-Amino-4-methoxy-6-methyl-1,3,5-triazine, also a metabolite from iodosulfuron-methyl-sodium, was practically non-toxic to *Pseudokirchneriella subcapitata*, with the 96 hour EC50s for biomass and for growth rate both > 100 mg/L.

The freshwater macrophyte duckweed was the most sensitive species tested with respect to exposure to iodosulfuron-methyl-sodium. The 14 day EC50 value for such exposure was ~0.8 µg/L, a value classifying iodosulfuron-methyl-sodium as very highly toxic to duckweed. Exposure to formulated iodosulfuron-methyl-sodium and mefenpyr-diethyl indicated the formulated product is less toxic than iodosulfuron-methyl-sodium itself (7 day EC50s of 0.034 mg/L [growth rate] and 0.048 mg/L [biomass]). As yellowing of fronds was seen at concentrations of 0.01 mg/L and above, the formulation's NOEC was 0.0056 mg/L.

Metsulfuron-methyl was also very highly toxic to duckweed with biomass and growth reduction 7 day EC50 values being 0.42 to 0.52 µg/L. The metabolite, 2-amino-4-methoxy-6-methyl-1,3,5-triazinewas practically non-toxic to duckweed (7 day EC50s > 100 mg/L [biomass and for growth]).

Exposure of the macrophytes *Myriophyllum spicatum* and *Elodea canadensis* to iodosulfuron-methyl-sodium gave indications of a 96 h EC50 for inhibition of oxygen production being 2.5-3 µg/L for *M. spicatum* and 0.3-0.4 µg/L after 24 hours for *E. canadensis*. The 96 hour LC50 for biomass was > 10 µg/L and 1 µg/L respectively. While the study results may have been confounded by the presence of non-homogeneous starting materials, evidence was presented that the exposure had an algistatic rather than algicidal effect.

*Terrestrial invertebrates*

Iodosulfuron-methyl-sodium, as either the technical substance or formulated with mefenpyr-diethyl in the same proportions as proposed for use in Australia, is expected to be at worst, "very slightly toxic" to earthworms under acute exposure. Metsulfuron-methyl and 2-amino-4-methoxy-6-methyl-1,3,5-triazine, both metabolites from the breakdown of iodosulfuron-methyl-sodium, were, at worst, very slightly toxic to earthworms. The chronic NOEC of metsulfuron-methyl to earthworms was set at 50 g/ha. This is approximately equivalent to ca. 70 g iodosulfuron-methyl-sodium/ha, a value well in excess of the proposed maximum use rate of 10 g iodosulfuron-methyl-sodium/ha in the product *HUSSAR*®.

Both technical and formulated iodosulfuron-methyl-sodium were classified as relatively non-toxic to adult worker honey bees when administered topically or orally with 48-h LD50 values of >80 and >150 µg/bee for the technical and >450 and >75 µg/bee for the formulated material (containing 5% iodosulfuron-methyl-sodium and 15% mefenpyr-diethyl respectively).

Exposure of predatory mites (*Typhlodromus pyri*) under laboratory conditions to formulated iodosulfuron-methyl-sodium (5%) and mefenpyr-diethyl (15%) at 200 g/ha (equal to the proposed Australian use rate) resulted in a corrected mortality of 28% and a ranking of harmless. Reduction in beneficial capacity was at worst slightly harmful.

Carabid beetles (*Poecilus cupreus*) were not harmed by exposure to formulated iodosulfuron-methyl-sodium (5%) and mefenpyr-diethyl (15%) at 200 g/ha (equal to the proposed Australian use rate) under laboratory conditions with no mortalities recorded after 14 days exposure. A similar result was recorded when Green lacewing (*Chrysoperla carnea*), a foliage dwelling predator, was exposed to the same rate of formulated product under laboratory conditions with the overall effect of 9% being ranked as harmless and the percentage of larvae surviving to emergence being ~90% in both the control and exposed groups. harmful.

Parasitic wasps (*Aphidius rhopalosiphi*), however, were moderately susceptible to formulated iodosulfuron-methyl-sodium (5%) and mefenpyr-diethyl (15%) under laboratory conditions with 87% mortality after 48 hours when placed in contact with glass surfaces sprayed at 200 g/ha. When exposed to the same concentration of formulated material under semi-field conditions (oat seedlings previously sprayed at the same rate as before) there was only a 10% mortality and the exposure was classed as harmless.

*Soil nitrification and respiration*

Concentrations of iodosulfuron-methyl-sodium of 10 and 50 g iodosulfuron-methyl-sodium/ha [1 to 5X the proposed rate for iodosulfuron-methyl-sodium] had negligible impact on soil nitrification.. Similarly, concentrations of 0.2 and 1 kg/ha [also 1 to 5X the proposed Australian use rate] of formulated iodosulfuron-methyl-sodium (5%) and mefenpyr-diethyl (15%) resulted in generally negligible impact on soil nitrification and respiration at the lower rates and either negligible or tolerable effects at the higher. Actual field exposures are expected to have at worst a tolerable effect on both nitrification and respiration.

*Sludge respiration and bacterial inhibition*

Activated sewage sludge exposed to iodosulfuron-methyl-sodium showed an approximate 16% inhibition after 3 hours with an EC50 of >1000 mg/L. Exposure of *Pseudomonas putida* to iodosulfuron-methyl-sodium as part of a classification of the active's hazard to water, showed that the EC50 was 26 mg/L.

**Hazards Arising from Use and Conclusions**

Iodosulfuron-methyl-sodium sprays in wheat fields are likely to contaminate the soil within the target area due to droplets hitting the ground directly and from spray run-off from the leaves. The hazard of iodosulfuron-methyl-sodium to terrestrial organisms is expected to be minimised by the use of single seasonal applications at relatively low rates and its expected lack of persistence in soil environments and the generally low toxicity to the organisms. Contamination of water bodies is considered most likely to occur via spray-drift or run-off.

The contamination of food items by the proposed use of *HUSSAR*® for Japanese quail, Bobwhite quail and mallard ducks is not expected to result in an acute or chronic hazard to these birds through consumption of iodosulfuron-methyl-sodium.

No acute or chronic hazard is expected for earthworms or to honey bees and most predatory/parasitic arthropods present in or near treated wheat field. Use of *HUSSAR*® is not expected to pose a significant hazard to respiration or nitrogen fixing processes of soil micro-organisms.

While trout and daphnids are not indicated as being at risk from 10% drift after a single spray, risk to duckweed and some algae is unacceptable. A refined assessment of the risk from spray-drift shows that with realistic buffers of 3 or more metres, and with an appropriate label statement drawing attention of the toxicity of iodosulfuron-methyl-sodium to certain aquatic plants and duckweed, the hazard is expected to be acceptable. Similarly, run-off also poses potential hazard to certain algae and duckweed. The fairly quick break down of iodosulfuron-methyl-sodium lowers the potential of the run-off to be a hazard to aquatic species as does its water solubility which will result in its being carried into the soil in rain situations rather than being solely lost through run-off. Adherence to the label instruction that there must be an eight hour interval between application and any expected rainfall further reduces the run-off potential.

While metsulfuron-methyl can be expected to be formed from degradation of iodosulfuron-methyl-sodium, calculations show that there will not be a significant aquatic hazard from this chemical via spray-drift. Run-off of metsulfuron-methyl containing soil could be a potential hazard to duckweed but calculations again show that this is not expected to be significant. Leaching into ground water of iodosulfuron-methyl-sodium or of metsulfuron-methyl, a degradation product, is not expected to be a major route of contamination. Despite the herbicide nature of iodosulfuron-methyl-sodium, the risk to non-target plants is not expected to be a concern given adherence to the proposed label use pattern.

# EFFICACY AND CROP-SAFETY ASSESSMENT

This summarises the field trials conducted in Australia with *HUSSAR*®. Information is provided in relation to efficacy and crop safety of the product.

The application is for the early post-emergence use (both with respect to the crop and weeds), in wheat, for the control and/or suppression of:

annual ryegrass (*Lolium rigidium*);
wild oats (*Avena* spp);
annual phalaris (*Phalaris paradoxa* only); and
various broadleaved weeds.

The broadleaf weeds controlled are:

charlock (*Sinapsis arvensis*);
clover (*Trifolium* spp);
deadnettle (*Lamium amplexicaule*);
doublegee/3-corner-jack/spiny-emex (*Emex australis*);
fumitory-denseflower (*Fumaria densiflora*);
fumitory-wall (*Fumaria muralis*);
indian hedge mustard (*Sisymbrium orientale*);
lupin [volunteer] (*Lupinus angustifolius*)
medic (*Medicago* spp);
tree hogweed (*Polygonum patulum*).
wild radish (*Raphanus raphanistrum*); and
wireweed/hogweed (*Polygonum aviculare*).

Some seven broadleaf weeds are suppressed by the product:

Bedstraw (*Galium tricornutum*); black bindweed (*Fallopia convulvus*);
peas [volunteer] (*Pisum sativum*);
sheepweed/white-ironweed/corn-gromwell (*Buglossoides arvense*);
stonecrop (*Crassula sieberana*); tares/wild-vetch (*Vicia sativa*); and
toadrush (*Juncus bufonius*).

**Justification for Use**

*HUSSAR*® is an ALS-inhibitor (Group-B) herbicide for **post-emergence** use in wheat, to control annual ryegrass (*Lolium rigidum*), annual phalaris (*Phalaris paradoxa),* wild oats (*Avena* spp.) and a range of broadleaf species.

This has significant merit for the Australian farming community, as currently such control of these weeds is gained through tank mixes using Group A chemicals. Hence this product provides an alternative to Group A chemicals, which is important in management of weed resistance to them, providing there is no existing cross-resistance.

However, being a Group B herbicide, strong guidelines on use need to be implemented. As described in a number of the trial data presented, there is already growing evidence of weeds resistant to this chemistry.

To date these weeds include *Lolium rigidum, Fallopia convolvulus, Brassica tournefortii, Raphanus raphanistrum, Sinapis arvensis, Rapistrum rugosum,* and a number of *Sisymbrium* species.

There are also populations of *Polygonum aviculare* suspected of being resistant to Group B herbicides. Cross resistance may be present in *Avena* spp as Group A resistance is already widespread.

***Effficacy***

- **Trial design in relation to provision of controls, treatment group size, number of replicates, age and type of animal, plant varieties and stage of growth etc:**
  The product has been trialed over six consecutive seasons from 1993, covering the main wheat growing areas of Australia. The trial designs used by the majority of the applicant's field officers and consultants were very acceptable, with appropriate replicates, treatments and analysis of results.

- **Experimental conditions in relation to relevant variables, such as pest/disease pressure, weather conditions, soil type etc:**
  There was an adequate spread and number of trials over a range of soil types and climatic conditions.

- **Analysis of trial data and its interpretation, including efficacy relative to dose/application rate and application/administration:**
  Adequate statistical analysis has been conducted by the majority of the field operatives and consultants, using standardised analyses.

- **Trial validation with respect to the person responsible for the trial, location of the trial, date of trial:**
  Protocols were well established and implemented. However, whilst most of the applicant's staff used the Zadock's scale adequately to describe the development stage of grasses, many consultants did not. This made interpreting some of the data very difficult.

- **General applicability of the trial data to the use of the candidate preparation under commercial conditions:**
  Data sets have been well presented and are generally easy to follow. Trial protocols have been established to gather data relevant to the registration process: i.e. relevant to the commercial use of the product.

- **Presentation of Data**
  Presentation of data was acceptable, except for the problem of some researchers not giving full Zadoks growth stages, which made clear interpretation of these data sets difficult.

- **Efficacy data supporting the label claims:**
  Data have covered those claims which appear on the latest draft label.

- **Directions for Use; including adequacy of supporting data for application rate/dosage and method of application/administration:**
  Supporting data for yield response, phyto-toxicity, crop-rotation (re-cropping) intervals, application and equipment, compatibility, and wetting agents is adequate.

The company has agreed that the product will be included in the Wagga and Towoomba cereal sensitivity projects. Note that there are some 60 varieties that have been tested, and this list is displayed on the label.

Suggested label improvements, such as: clarification of the Zadock's stages for grasses (including the crop); use of Group-B instead of ALS inhibitor where appropriate; non-use of product in paddocks where there is a high risk of weed resistance to Group-B herbicides; alerting users to specific weeds known to be resistant to Group-B herbicides; using Group-B herbicides in an area once a year only; and notes to alert users to consider Integrated Weed Management have been adopted and placed on the label.

***Crop Safety***

- *HUSSAR*® was applied in herbicide tolerance trials over three consecutive seasons, at the highest proposed recommended rate. Crop effects were seen at some sites, although *HUSSAR*® showed no adverse effect on crop yield. Some trial data shows significantly increased phyto-toxicity from waterlogging. Label statements have been added to alert users to this.

***Conclusions***

Sufficient data from suitably designed, scientifically conducted and statistically analysed trials has been presented to substantiate the claims for use as shown on the proposed label. When the product is used according to label instructions and Good Agricultural Practice (including planning and use of suitable strategies to prevent weed resistance), it should be suitable for the intended purpose.

**LABELLING REQUIREMENTS**
**(DRAFT LABEL)**

MAIN PANEL

# CAUTION

**KEEP OUT OF REACH OF CHILDREN**
**READ SAFETY DIRECTIONS BEFORE OPENING OR USING**

# Hussar®

*SELECTIVE HERBICIDE*

**Active Constituent: 50 g/kg IODOSULFURON-METHYL-SODIUM**
**Crop Safener: 150 g/kg MEFENPYR-DIETHYL**

| GROUP | B | HERBICIDE |
|---|---|---|

* kg
NET

For the Post-Emergent Control of Annual Ryegrass, Wild Oats, Annual Phalaris and Certain Broadleaf Weeds in Wheat as per the DIRECTIONS FOR USE Table in the attached BOOKLET

**IMPORTANT: READ THE ATTACHED BOOKLET BEFORE USE.**

Aventis

(label code)

* 3 or 6 kg

REAR PANEL (and front page of BOOKLET)

**HUSSAR SELECTIVE HERBICIDE**

Active Constituent: 50 g/kg IODOSULFURON-METHYL-SODIUM
Crop Safener: 150 g/kg MEFENPYR-DIETHYL

**Protection of Wildlife, Fish, Crustaceans and Environment**
Very toxic to aquatic plants and certain algae. DO NOT contaminate streams, rivers or waterways with this product or used containers.

**Protection of Crops, Native and other Non-target Plants**
DO NOT apply under weather conditions, or from spraying equipment, that may cause spray to drift onto nearby susceptible plants/crops, cropping lands or pastures.

**Storage and Disposal**
Store in the 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 spray 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.

**SAFETY DIRECTIONS**
Product will damage the eyes and will irritate the skin. Avoid contact with eyes and skin. If product in eyes, wash it out immediately with water. When opening the container and preparing spray, wear cotton overalls buttoned to the neck and wrist (or equivalent clothing) and a washable hat, elbow-length PVC gloves and goggles. Wash hands after use. After each day's use wash gloves, goggles and contaminated clothing.

**FIRST AID**
If poisoning occurs contact a doctor or Poisons Information Centre (telephone 13 11 26).

**Material Safety Data Sheet**
Additional information is listed in the Material Safety Data Sheet available from Aventis CropScience Pty. Ltd.

**Exclusion of Liability**
This product as supplied is of a high grade and suitable for the purpose for which it is expressly intended and must be used in accordance with the directions. The user must monitor the performance of any product as climatic, geographical or biological variables and/or developed resistance may affect the results obtained. No responsibility is accepted in respect of this product, save for those non-excludable conditions implied by the Trade Practices Act or any State or Federal legislation.

NRA Approval No.: 52171/
Hussar® is a Registered Trademark of Aventis CropScience.

**IMPORTANT: READ THIS BOOKLET BEFORE USE***
**IMPORTANT: READ THE ATTACHED BOOKLET BEFORE USE****

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* Statement on front of booklet
** Statement on rear panel

***REAR PANEL***

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| IN A TRANSPORT EMERGENCY<br>DIAL 000<br>POLICE OR FIRE BRIGADE | FOR 24 HOUR SPECIALIST ADVICE<br>IN EMERGENCY ONLY<br>PHONE 1800 033 111 |
|---|---|


BAR
CODE


Aventis CropScience Pty. Ltd.
A.C.N. 000 226 022
391-393 Tooronga Rd
East Hawthorn Vic. 3123

Phone: (03) 9248 6888
Fax: (03) 9248 6800
Website: www.aventis.com.au

Batch Number:
Date of Manufacture:

(label code)

BOOKLET

**DIRECTIONS FOR USE**

**Restraints**

DO NOT apply if rainfall is expected within 8 hours.
DO NOT apply to crops undersown with legumes.
DO NOT apply to wheat before the 3-leaf stage (Z13).
DO NOT apply to wheat that is physically damaged (e.g. by hail, wind, insect attack).
DO NOT apply without surfactant/wetting agent[#].
DO NOT apply to paddocks where there is a high risk of weeds resistant to Group B herbicides.
DO NOT make more than one application of a Group B herbicide per season

[#]: see 'Use of surfactant/wetting agent' under 'General Instructions'.

**Note**

Hussar is a sulfonylurea herbicide. Hussar will substantially reduce the growth of many weeds rather than give complete plant kill. Refer to the critical comments in the Directions for Use Table below, for directions on specific weeds.

| CROP | WEED | STATE | WEED STAGE | RATE g/ha | CRITICAL COMMENTS |
|---|---|---|---|---|---|
| | **Grass Weeds** | | | | |
| Wheat* ≥ 3 leaf (Z13) and ≤ 5 tillers (Z25) | Annual ryegrass *(Lolium rigidum)* | NSW, Vic, SA, WA only | 1 to 3 leaf (Z11 to Z13) | 150 g | Apply generally within 4 to 7 weeks after sowing, but only to wheat with at least 3 leaves (Z13) and not more than 5 tillers (Z25). Do not use for control of dense ryegrass populations (>300 plants/$m^2$). Do not use on weeds resistant to Group B herbicides. |
| | | | Early tillering (Z13, 21 to Z13, 22) | 200 g | |
| *Refer to `Crop Safety' for varieties tested. | Wild oats (*Avena* spp.) | All States | 1 to 3 leaf (Z11 to Z13) | 200 g | Apply generally within 4 to 7 weeks after sowing, but only to wheat with at least 3 leaves (Z13) and not more than 5 tillers (Z25). Do not use for control of dense wild oat populations (>150 plants/$m^2$). |
| | | | | 150 g | **Suppression of wild oats.** Will substantially reduce the growth of wild oats and their ability to compete with the crop and will reduce seed set of wild oats but may not give a significant reduction in plant numbers. Critical comments above for wild oat control apply. |

| CROP | WEED | STATE | WEED STAGE | RATE g/ha | CRITICAL COMMENTS |
|---|---|---|---|---|---|
| | **Grass Weeds (cont.)** | | | | |
| | Annual phalaris, paradoxa grass (*Phalaris paradoxa* only) | All States | 1 to 3 leaf (Z11 to Z13) | 200 g | Apply generally within 4 to 7 weeks after sowing, but only to wheat with at least 3 leaves (Z13) and not more than 5 tillers (Z25). Do not use for control of dense phalaris populations (>300 plants/$m^2$). **Other phalaris species may not be adequately controlled with Hussar.** |
| | | | | 150 g | **Suppression of phalaris.** Will substantially reduce the growth of phalaris and its ability to compete with the crop and will reduce seed set of phalaris but may not give a significant reduction in plant numbers. Critical comments above for phalaris control apply. |

| | **Broadleaf weeds** | | | | |
|---|---|---|---|---|---|
| **WEEDS CONTROLLED** | | | | | |
| Wheat* ≥ 3 leaf (Z13) and ≤ 5 tillers (Z25)<br>* Refer to `Crop Safety' for varieties tested. | Charlock (*Sinapis arvensis*) | All States | cotyledon to 8 leaf | 150 g | Do not apply to weeds thought to be resistant to Group B herbicides. |
| | Clover (*Trifolium* spp.) | | cotyledon to 6 leaf | | - |
| | Deadnettle (*Lamium amplexicaule*) | | cotyledon to 4 leaf | | - |
| | Doublegee, spiny emex, three corner jack (*Emex australis*) | | cotyledon to 4 leaf | 200 g | - |
| | Fumitory, denseflower (*Fumaria densiflora*), Fumitory, wall (*Fumaria muralis*) | | cotyledon to 4 leaf | 150 g | Not all fumitory species are adequately controlled with Hussar. Ensure species identification is correct before applying Hussar. |
| | Indian hedge mustard (*Sisymbrium orientale*) | | 2 to 6 leaf | | Do not apply to weeds thought to be resistant to Group B herbicides. |
| | Lupins (volunteer) (*Lupinus angustifolius*) | | cotyledon to 4 leaf | | Lupins that emerge after application will not be controlled. |
| | Medic (*Medicago* spp.) | | cotyledon to 4 leaf | | - |

| | | | | | |
|---|---|---|---|---|---|
| | **Broadleaf weeds (cont.)** | | | | |
| | Wild radish (*Raphanus raphanistrum*) | | cotyledon to 4 leaf | 200 g | Heavy populations (>50 plants/$m^2$) or those suffering moisture stress may not be adequately controlled. A follow-up application of a suitable herbicide may be required to control remaining plants or plants that emerge after application. Do not apply to weeds thought to be resistant to Group B herbicides. |
| | Wire weed, hogweed (*Polygonum aviculare*), tree hogweed (*Polygonum patulum*) | | cotyledon to 4 leaf | 150 g | - |
| **WEEDS SUPPRESSED** | | | | | |
| Wheat* ≥ 3 leaf (Z13) and ≤ 5 tillers (Z25)<br><br>* Refer to `Crop Safety' for varieties tested. | Bedstraw (*Galium tricornutum*) | All States | cotyledon to 4 whorls | 200 g | Suppression only. |
| | Black bindweed (*Fallopia convolvulus*) | | 2 to 6 leaf | 150 g | Suppression only. Do not apply to weeds thought to be resistant to Group B herbicides. |
| | Peas (volunteer) (*Pisum sativum*) | | 3 to 4 node | | Suppression only. Peas that emerge after application will not be controlled. |
| | Sheepweed, white ironweed, corn gromwell (*Buglossoides arvense*) | | cotyledon to 4 leaf | | Suppression only. |
| | Stonecrop (*Crassula sieberana*) | | 2 to 4 leaf | | Suppression only. |
| | Tares, wild vetch (*Vicia sativa*) | | 2 to 4 leaf | | Suppression only. |
| | Toadrush (*Juncus bufonius*) | | up to 2 leaf | | Suppression only. |

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

**WITHHOLDING PERIODS**

**Harvest NOT REQUIRED WHEN USED AS DIRECTED**

**Grazing/Stock-food DO NOT GRAZE OR CUT FOR STOCKFOOD FOR 4 WEEKS AFTER APPLICATION**

## GENERAL INSTRUCTIONS

Hussar is a selective sulfonylurea herbicide. It is predominantly a foliar herbicide with less activity via the soil. Hussar will not reliably control weeds that emerge after spraying. Results are best under good growing conditions and application to weeds or crop under stress should be avoided.

### Use of Surfactant / Wetting Agent

Hussar must always be applied with the addition of a surfactant such as a non-ionic wetting agent (e.g. BS1000® at 0.25% v/v) or Hasten® (at 1% v/v), even when tank mixing with other products.

### Crop Safety

- Do not apply to any crop other than wheat.
- Wheat should be between the 3 leaf stage (Z13 growth stage), and the 5 tiller stage (Z25 growth stage) before application of Hussar.
- Do not apply Hussar if a previous application of a Group B herbicide has been made to the crop area in the past 18 months.
- Some crop yellowing and growth retardation may occur within 5 weeks of application. Growth retardation will be increased if the crop is affected by root disease, (e.g. cereal cyst nematode, rhizoctonia, take-all (haydie)), nutritional stress, waterlogging, and drought stress, excessively cold conditions or previous herbicide treatment.
- Application to very dry sandy soils followed by soaking rainfall may cause significant crop effects.
- Crop damage will be increased in highly alkaline soils (soil pH > 8.5 as determined by soil in water suspension).
- Do not apply to crops not actively growing due to cold and wet conditions or drought stress.
- Do not overlap when spraying or double spray corners.
- The following wheat varieties have been tested for crop safety. Application to wheat varieties other than those listed below may result in crop damage.

| | | | | | |
|---|---|---|---|---|---|
| Amery | Cunderdin | Kamilaroi | Oxley | Sunco | Tasman |
| Angus | Cunningham | Krichauff | Pelsart | Suneca | Tatiara |
| Arrino | Datatyne | Kronos | Rosella | Sunfield | Tincurrin |
| Barunga | Dollarbird | Lawson | Rowan | Sunland | Trident |
| Batavia | Frame | Leichardt | Silverstar | Sunlin | Wallaroi |
| Bowey | Goldmark | Machete | Snipe | Sunmist | Westonia |
| Brookton | Goroke | Mercury | Spear | Sunstate | Wilgoine |
| Cadoux | Halberd | Meering | Stiletto | Sunvale | Yallaroi |
| Calingiri | Hartog | Miskle | Stretton | Sun 230 A | Yarralinka 13/9 |
| Cocamba | Janz | Ouyen | Sunbrook | Tamaroi | Yanac |

### Crop Rotation Recommendations

Minimum re-cropping intervals apply for all crops following Hussar application.
The application of a Group B herbicide in the crop following Hussar use may result in increased crop effects. Consult the manufacturer of Hussar for advice in these situations.
Rainfall of less than 250 mm following Hussar use will result in extended re-cropping intervals. Use on soils with a pH greater than 8.5 (soil in water) has not been extensively tested and is not recommended.

For advice on crops not listed below, contact the manufacturer, Aventis CropScience Pty. Ltd.

| CROP | MINIMUM RECROPPING INTERVAL |
|---|---|
| wheat | 1 day |
| beans | 21 months |
| canola | 9 months |
| lentils | 21 months |
| lupins | 9 months |
| medic | 21 months |
| peas | 21 months |

**Resistant Weeds Warning** **GROUP B HERBICIDE**

Hussar is a member of the sulfonylurea group of herbicides and has the inhibitor of ALS mode of action. For weed resistance management Hussar is a Group **B** herbicide. Some naturally-occurring weed biotypes resistant to Hussar, and other herbicides that inhibit ALS, may exist through normal genetic variability in any weed population. These resistant individuals can eventually dominate the weed population if these herbicides are used repeatedly. These resistant weeds will not be controlled by Hussar or other Group **B** herbicides.

Do not rely exclusively on Hussar for weed control. Use as part of an integrated weed management program involving herbicides with other modes of action and non-chemical methods of control. Avcare resistance management strategies are available from your local agricultural chemical supplier. Refer to these strategies for details of how to manage the build up of resistant weeds on your farm.

Since occurrence of resistant weeds is difficult to detect prior to use Aventis CropScience Pty. Ltd. accepts no liability for any losses that may result from the failure of Hussar to control resistant weeds.

**Export of Treated Produce**

Growers should note that suitable MRLs or import tolerances might not be established in all markets for produce treated with Hussar. If you are growing produce for export, please check with Aventis CropScience Pty. Ltd. for the latest information on MRLs and import tolerances BEFORE using Hussar.

**Application**

Ensure that complete and even spray coverage of all weeds is achieved.

**Mixing**

Half fill the spray tank with water, then with agitators in motion, add the correct amount of Hussar directly into the spray tank. Add other relevant compatible herbicides, then wetting agent or crop oil as recommended. Complete filling the tank with agitators in motion. Agitation must continue before and during spraying.

**Equipment**

**Ground Sprayers** – Standard boom sprayers only are recommended and must be fitted with by-pass or mechanical agitation. It is recommended that 50 to 80 L water/ha is applied with a droplet size of 200 to 300 microns.

**Aircraft** – Do not apply Hussar by aircraft.

**Sprayer Clean Up**

The sprayer must be thoroughly decontaminated before being used again to spray crops.

Ensure that the following operation is carried out in an area that is clear of waterways, desirable vegetation and tree roots, and preferably in an area where drainings can be contained.

1. Drain sprayer completely and wash out tank, boom and hoses with clean water.
2. Drain again.
3. Fill the tank with clean water and add 300 mL of chlorine bleach (containing 4% chlorine) per 100 L of water with agitation running.
4. Flush some bleach solution through booms and hoses and allow remainder to agitate in tank for 10 minutes.
5. Remove nozzles and filters and leave to soak in a bleach solution of 500 mL per 10 L of water while tank cleaning is in progress.
6. Briefly run the pump at periodic intervals to refresh chlorine solution in spray lines.
7. Drain tank and repeat the procedure of flushing with bleach solution.
8. Flush the tank, boom and hoses with clean water.

**Compatibility**

Hussar may be mixed with Lontrel® without any loss of efficacy or adverse crop effects. Do not mix Hussar with the following herbicides, as decreased efficacy on grass weeds and/or adverse crop injury may occur:

- Bromoxynil MCPA (e.g. Bromicide® MA, Buctril® MA)
- Tigrex®
- LVE MCPA
- Igran®
- Other sulfonylurea herbicides

**Protection of Wildlife, Fish, Crustaceans and Environment**

Very toxic to aquatic plants and certain algae. DO NOT contaminate streams, rivers or waterways with this product or used containers.

**Protection of Crops, Native and other Non-target Plants**

DO NOT apply under weather conditions, or from spraying equipment, that may cause spray to drift onto nearby susceptible plants/crops, cropping lands or pastures.

**Undersown Clovers and Medics**

DO NOT apply to crops undersown with legumes.

**Storage and Disposal**

Store in the 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 spray 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.

**SAFETY DIRECTIONS**

Product will damage the eyes and will irritate the skin. Avoid contact with eyes and skin. If product in eyes, wash it out immediately with water. When opening the container and preparing spray, wear cotton overalls buttoned to the neck and wrist (or equivalent clothing) and a washable hat, elbow-length PVC gloves and goggles. Wash hands after use. After each day's use wash gloves, goggles and contaminated clothing.

**FIRST AID**
If poisoning occurs contact a doctor or Poisons Information Centre (telephone 13 11 26).

**Material Safety Data Sheet**
Additional information is listed in the Material Safety Data Sheet available from Aventis CropScience Pty. Ltd.

**Exclusion of Liability**
This product as supplied is of a high grade and suitable for the purpose for which it is expressly intended and must be used in accordance with the directions. The user must monitor the performance of any product as climatic, geographical or biological variables and/or developed resistance may affect the results obtained. No responsibility is accepted in respect of this product, save for those non-excludable conditions implied by the Trade Practices Act or any State or Federal legislation.



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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. |

# References

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# NRA PUBLICATIONS ORDER FORM

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National Registration Authority for Agricultural and Veterinary Chemicals
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