Public Release Summary
on

Evaluation of the new active
THIAMETHOXAM

in the product

CRUISER 350 FS INSECTICIDE SEED TREATMENT

National Registration Authority
for Agricultural and Veterinary Chemicals

January 2001

Canberra
Australia

Similarly, predatory bugs and parasitic wasps were harmed by exposure to thiamethoxam applied as a spray. Ground dwelling beetles exposed to treated seeds were adversely affected.

Laboratory earthworm tests with *Eisenia foetida* indicated that thiamethoxam was practically non-toxic over a 14 day exposure period at a concentration of 1000 $mg.kg^{-1}$ dry soil although there were significant differences in burrowing times and weight losses in the exposed worms. Exposure of worms to thiamethoxam containing formulations gave no indications of toxicity or adverse effects. A study of the effect of thiamethoxam on soil microflora indicates that it should not have long term effects on the microbial respiration or nitrogen metabolism.

Environmental hazard

The hazard assessment conducted by Environment Australia indicates that thiamethoxam will not result in unacceptable adverse effects of birds and mammals provided the treated seed is effectively planted and covered and that spills are immediately cleaned up. Consequently, it is unlikely that the proposed use of the Cruiser formulations is a hazard to birds or mammals. A 10% runoff produces levels of contamination indicated as without adverse effect on aquatic organisms.

Thiamethoxam is highly toxic to honeybees by oral or contact exposure but there was no apparent effect on bees gathering pollen and nectar from plants grown from seeds dressed with thiamethoxam with an observed decline in hive quality not conclusively linked with the seed treatment. Thiamethoxam is hazardous to predatory bugs and parasitic wasps when exposure occurs by spray application. Ground dwelling beneficials which come in contact with treated seeds or soil containing thiamethoxam can be expected to suffer some mortality but numbers will be limited in areas sown. Significant effects on earthworms exposed to thiamethoxam in the soil are not expected.

Thiamethoxam is a “probable leacher” or "tentative leacher" with very high mobility based on laboratory adsorption/desorption studies. However, a lysimeter study and soil dissipation studies show that there is little likelihood of significant movement of thiamethoxam through the soil. Consequently, there is also low likelihood of any significant transfer to aquatic environments from the proposed use as a seed dressing.

Efficacy and crop safety aspects

Thiamethoxam is a new nitromethylene derived compound with contact, stomach and systemic activity and acts on the nervous system of the insect. The compound mimics acetylcholine and binds to the acetylcholine receptor site, which damages the target insect’s nervous system causing death. Other nitromethylene class compounds are used for soil insect control, however, this compound falls into a different subclass.

The data presented supported the claim for control of eastern false wireworm and southern false wireworm in sorghum, cotton, maize and sweet corn crops, striate or large false wireworm in maize and sweet corn, and cotton seedling thrips, tomato thrips and cotton aphid on cotton. A claim of protection of sorghum, cotton, maize and sweet corn from damage by sugarcane (true) wireworm and protection of sorghum from damage by black field earwig was also supported. The design,

INTRODUCTION

This publication provides a summary of the data reviewed and an outline of the regulatory considerations for the proposed application of the chemical thiamethoxam (Cruiser 350FS Insecticide Seed Treatment) as a seed treatment to control eastern false wireworm and southern false wireworm in sorghum, cotton, maize and sweet corn crops, striate or large false wireworm in maize and sweet corn, cotton seedling thrips, tomato thrips and cotton aphid on cotton, and for the protection of sorghum, cotton, maize and sweet corn from damage by sugarcane (true) wireworm and protection of sorghum from damage by black field earwig.

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

Copies of full technical evaluation reports on thiamethoxam, covering toxicology, occupational health and safety aspects, environmental impacts and residues in food, are available from the NRA on request. They can also be viewed at the NRA library located at the NRA's offices, 22 Brisbane Ave, Barton, ACT.

Written comments should be received by the NRA by 30 January 2001. They should be addressed to :

Pat Robinson
Product Evaluator
Agricultural Chemicals Evaluation Section
National Registration Authority
PO Box E240
KINGSTON ACT 2604
Fax 02 62723218
E-mail: probinso@nra.gov.au

Applicant

Novartis Crop Protection Australasia Limited

Product details

Thiamethoxam will be marketed under the trade name Cruiser (containing 350g/L thiamethoxam) as a suspension concentrate formulation.

Cruiser will be formulated overseas and imported into Australia in sale packs.

Novartis Crop Protection Australasia Limited intend to market Cruiser in all States and Territories.

Corrosion characteristics: non-corrosive toward galvanised sheet metal, stainless steel DIN 1.4541 and polyethylene. Slightly corrosive toward iron steel ST 37 and tin plate.
Pesticide type: insecticide
Chemical family: nitroguanidine

PRODUCT
Distinguishing name or trade name: Cruiser 350 FS Insecticide Seed Treatment
Formulation type: suspension concentrate for seed treatment
Active constituent concentration: 350 g/L
Mode of Action: Thiamethoxam acts on the nicotinic acetylcholine receptor of insects where it mimics the messenger chemical acetylcholine and binds to the receptor site, irreparably damaging the insects nervous system and eventually leading to insect death.

Physical and Chemical Properties of the product

Physical state: liquid
Colour: red
Odour: like chalk, weakly sweetish
Specific gravity: 1.15-1.19 g/cm^3 at 20 °C
pH value for a 1% in deionised water: 6.8
Viscosity:

Shear rate (s^{-1})	Viscosity at 20°C (mPa.s)	Viscosity at 40°C (mPa.s)
5	525	452
250	51.9	38.3

Surface tension:
Supernatants of 1.0 g/L suspension 44.0-44.6 mN/m (time independent)
Supernatants of 150 g/L suspension 37.5-38.0 mN/m (time independent)
Supernatants of 750 g/L suspension 29.0-35.3 mN/m (after 20 min)
Storage Stability: The applicant provided data to show that the formulation is stable on storage at 30°C for at least 18 weeks and at 54 °C for at least 2 weeks.
Flash point: negative to 100 °C
Flammability: auto-ignition at 410 °C
Explodability: not explosive
Corrosion Characteristics: not corrosive to stainless steel DIN 1.4541, tin plate or polyethylene, slightly corrosive to galvanised sheet metal, corrosive to iron steel ST 37 (weight loss 0.05 g/m^2.h)

The active constituent to be used in the product has been approved by the NRA (Approval number: 51873).

Review of the product chemistry data has been completed. The available data supports the registration of Cruiser 350 FS Insecticide Seed Treatment for the proposed use.

A chronic 28 day exposure study with Rainbow trout and thiamethoxam had an NOEC of 100 $mg.L^{-1}$ which indicates thiamethoxam is "very slightly toxic" [NOEC > 1 $mg.L^{-1}$]. Rainbow trout embryos exposed to concentrations of thiamethoxam of up to 20 $mg.L^{-1}$ for a 28 days hatching period followed by a 60 day post-hatch exposure gave indications of the exposure being "very slightly toxic" with a NOEC of 20 $mg.L^{-1}$ reported. NOA 407475, a significant aquatic metabolite of thiamethoxam, was reported as having a 96 h LC_{50} of >100 $mg.L^{-1}$ for rainbow trout, a value that suggests NOA 407475 is "practically non-toxic" to rainbow trout.

- **Aquatic invertebrates**

Daphnid acute toxicity studies (48 h) with thiamethoxam or as WS 70 and WG 25 formulations and as the metabolite CGA 322704 were carried out under static conditions. EC_{50} values for thiamethoxam, the WG 25 formulation and CGA 322704 were all >100 mg thiamethoxam.L^{-1}, a result indicative of "practically non-toxic" effects [EC_{50} >100 ppm]. For the WS 70 formulation the 48 h EC_{50} was 39 $mg.L^{-1}$, rating a classification of "slightly toxic" [10 ppm <EC_{50} ≤ 100 ppm]. When based on the their thiamethoxam concentrations, the formulations are at worst "slightly toxic". Eastern oysters exposed to thiamethoxam for 96 hours in a shell deposition study produced an LC_{50} value of >119 $mg.L^{-1}$, again indicative of "practically non-toxic" effects. In contrast, there were mortalities in mysid shrimp exposed to thiamethoxam for 96 hours with the LC_{50} being reported as 6.9 $mg.L^{-1}$, identifying thiamethoxam as "moderately toxic" to these marine organisms [10 ppm <LC50 ≤ 10 ppm]. The metabolite NOA 407475 had 48 hour EC_{50}s of 83 and 92 $mg.L^{-1}$, indicative of a slight toxicity to *Daphnia magna* (EC_{50} 10 to ≤100 $mg.L^{-1}$).

Under chronic exposure conditions and based on a reproduction NOEC of 100 $mg.L^{-1}$ (and an EC_{50} of greater than 100 $mg.L^{-1}$), thiamethoxam is "very slightly toxic" to *D. magna* Straus [NOEC > 1 $mg.L^{-1}$]. The metabolite NOA 407475 had a NOEC for emergence rate and development rate of 1 $mg.kg^{-1}$ sediment (dry weight) after a 28 day exposure period. Under these conditions, NOA 407475 is rated as at worst slightly toxic to sediment dwelling *Chironomus riparius* larvae (NOEC 0.1-1.0,

- **Algae and aquatic plants**

Acute exposure of the green alga, *Selenastrum capricornutum*, to thiamethoxam, WS 70 and a WG 25 formulations and as the metabolite CGA 322704 (all up to nominal 100 $mg.L^{-1}$ concentrations of the relevant material) resulted in EC_{50} values of >82 $mg.L^{-1}$ and >100 $mg.L^{-1}$ for thiamethoxam, and >100 $mg.L^{-1}$ for the formulations and the metabolite. Thiamethoxam is classified as "slightly toxic" (10 < EC_{50} ≤ 100 ppm) or "practically non-toxic" (EC_{50} > 100 ppm) and the formulations and the metabolite as "practically non-toxic" with the formulations classified as at worst "slightly toxic" if based on their thiamethoxam concentrations. With a 72 h E_bC_{50} (biomass) of 14 $mg.L^{-1}$ and a 72 h E_rC_{50} (growth rate) of 34 $mg.L^{-1}$, the metabolite NOA 407475 is "slightly toxic" (EC_{50} of 10 to ≤100 ppm) to *Scenedesmus subspicatus*.

After a seven day study of the effect of thiamethoxam on duckweed (*Lemna gibba* G3), the reported EC_{50} (for either growth rate or biomass) was >90 $mg.L^{-1}$. Such a value suggests thiamethoxam is at worst "slightly toxic" (EC_{50} of 10 to ≤100 ppm) to *Lemna gibba* G3.

Conclusions for non-target invertebrates

- **Honey bees**

In bees exposed to oral doses of 0.002 to 0.02 µg thiamethoxam.bee^{-1}, mortalities were recorded at all concentrations above 0.002 µg thiamethoxam.bee^{-1} with the 24 and 48 hour oral LD_{50} values both calculated as 0.005 µg thiamethoxam.bee^{-1}. This value identifies thiamethoxam as "highly toxic" to bees . When bees were exposed by contact to thiamethoxam at doses of 0.005 to 0.05 µg.bee^{-1},

fifty per cent mortality occurred between 0.02 and 0.03 µg.bee^{-1}, leading to a contact LD_{50} of 0.027 (24 hours) and 0.024 (48 hours) µg.bee^{-1}. On this basis, thiamethoxam is "highly toxic" to bees via contact exposure. Exposure to bees to the metabolite CGA 322407 at doses of 0.0016 to 0.0625 µg CGA 322407.bee^{-1}, by either the oral or contact routes, gave calculated 48 hour LD_{50} values of 0.017 (oral) and 0.028 (contact) µg.bee^{-1} which identify CGA 322704 as also being "highly toxic" to bees via oral and contact exposure.

A semi-field study of the effect of thiamethoxam as a 25 WG formulation on bees showed that treatments at 0.2 and 0.8 kg formulation.ha^{-1} caused irritation, aggression, reduced foraging activity and increased mortality compared to untreated hives. Thiamethoxam exposure is expected to be harmful to foraging bees. Two further semi-field studies using rape and sunflower grown from seeds dressed with thiamethoxam formulations showed no difference in parameters such as mean mortalities, flight intensities, duration of flower visits, foraging activity, behaviour. Both studies noted declines in the colonies after the exposure but noted this could have been related to the test conditions rather that a specific effect of the seed treatments.

- **Beetles**

In two laboratory studies, Rove beetles (*Aleochara bilineata*) and the ground beetle, *Poecilus cupreus*, were exposed to cotton seeds treated with a 70 WS formulation (ca. 71% thiamethoxam) at a rate of 300 g formulation.100 kg^{-1} seed. After five days exposure, the corrected Rove beetle mortality was 90% and no eggs had been laid by the beetles exposed to the treated seeds. Based on the corrected mortality value, the 70 WS formulation was "moderately harmful" (IOBC rating, 80% ≤ corrected mortality ≤ 99%). There was a 67% mean cumulative mortality seen in the exposed *Poecilus cupreus* after 14 days exposure with behavioural changes seen within two hours of exposure to the treated seeds. Based on the mean cumulative mortality value, the 70 WS formulation was "slightly harmful" (IOBC rating, 30% = Mortality <80%). In a semi-field study, *Poecilus cupreus* were exposed to soil treated twice with a 25 WG formulation at rates of 12.5 or 100 g thiamethoxam.ha^{-1} with a 13 day interval between applications. Of the beetles exposed to the two applications, 50% were dead by 27 days after the initial treatment. Behavioural abnormalities were recorded shortly after the two applications but had ceased 13 days later. At the higher rate, there was a 68% mortality 27 days after the initial treatment with similar behavioural abnormalities reported and being more extended after the first exposure. Food consumption had declined in treated beetles (22 and 46% reduction for the 12.5 and 100 g.ha^{-1} rates compared to untreated controls). Corrected mortalities for the lower treatment rate were -9% and 39% and 24 and 93% for the higher treatment rate. Based on IOBC ratings for corrected mortalities, the formulation was "harmless" (corrected mortality <25%), "slightly harmful" (25%≤ corrected mortality ≤ 50%) or "harmful" (corrected mortality > 75%), depending on the number of applications and the concentration applied. These results show that some mortality among beetles exposed to thiamethoxam from seed treatment can be expected.

- **Predatory bug**

In a semi-field study, the predatory bug, *Orius laevigatus*, was exposed to apple trees that had been treated twice with a 25 WG formulation at an estimated rate of ca. 210 g thiamethoxam.ha^{-1}. Juveniles and adults were exposed and oviposition and egg hatch monitored for periods of up to 14 days. One hundred per cent mortality was seen in both juveniles and adults. There was 94% mortality in nymphs added to the trees three days after the last treatment (a persistence study). The

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