Pest Management Regulatory Agency
Agence de réglementation de la lutte antiparasitaire

Proposed Regulatory Decision Document PRDD2003-02

3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm

The active ingredient, 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, and the associated end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, for the control of the tomato pinworm in greenhouse tomatoes, is proposed for full registration under Section 13 of the Pest Control Products Regulations (PCPR).

This Proposed Regulatory Decision Document provides a summary of data reviewed and the rationale for the proposed full registration of these products. The Pest Management Regulatory Agency (PMRA) will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to the Publications Coordinator at the address below.

(publié aussi en français)

February 21, 2003

This document is published by the Alternative Strategies and Regulatory Affairs Division, Pest Management Regulatory Agency. For further information, please contact:

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ISBN: 0-662-33556-2
Catalogue number: H113-9/2003-2E-IN

Foreword

Health Canada's Pest Management Regulatory Agency (PMRA) has reviewed the submission for full registration of the active ingredient 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, manufactured by Bedoukian Research Inc., and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, manufactured by 3M Canada Company, London, Ontario for use against the tomato pinworm, *Keiferia lycopersicella*, in greenhouse tomatoes.

These submissions have been reviewed by the PMRA under the User Requested Minor Use Registration Program (URMUR). Reviews from the United States Environmental Protection Agency (U.S. EPA) were provided with the submissions as required for URMURs. This URMUR has been supported by the The Ontario Greenhouse Vegetable Growers and endorsed by the Minor Use Coordinator of the Ontario Ministry of Agriculture, Food and Rural Affairs.

This new biopesticide product can reduce or prevent the target pest from mating by interfering with chemical communication between males and females. The resulting decrease in the number of eggs and larvae makes this pheromone an important addition to integrated pest management (IPM) strategies for dealing with pests in greenhouse tomatoes.

Biopesticides such as pheromones are increasingly being investigated for use as alternatives to conventional pesticides. They control pests by modifying the mating behaviour of the pests rather than killing them. They are more target-specific than conventional insecticides, are used at concentrations close to those occurring in nature, and dissipate fairly rapidly. For these reasons it is expected that pheromone products will pose low potential risk to human health and the environment compared with conventional pesticides.

The PMRA has carried out an assessment of available information in accordance with Section 9 of the PCPR and has found it sufficient pursuant to Section 18(*b*) to allow a determination of the safety, merit and value of the active ingredient, 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm. The PMRA has concluded that the use of the active ingredient, 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm in accordance with the label has merit and value consistent with Section 18(*c*) of the PCPR and does not entail an unacceptable risk of harm pursuant to Section 18(*d*). Therefore, based on the considerations outlined above, the use of the active ingredient, 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm for use against the tomato pinworm is proposed for full registration, pursuant to Section 13 of the PCPR.

The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document to allow interested parties an opportunity to provide input into the proposed registration decision for this product.

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1.0 Introduction

3M TPW Technical Pheromone and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, is manufactured by 3M Canada Company of London, Ontario. Both products contain (E) and (Z) tridecen-1-yl acetate.

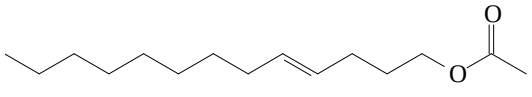
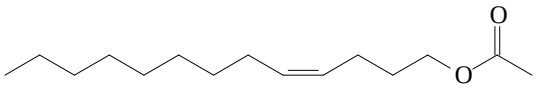
The pheromone for the tomato pinworm has not previously been registered for pest control in Canada. 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, has been proposed for behavioural mating disruption of the tomato pinworm in greenhouse tomatoes under the use conditions described in Section 7.1.1.

(E) and (Z) tridecen-1-yl acetate are straight-chained lepidopteran pheromones (SCLPs). This category of pheromone products is generally considered to pose a low risk to human health and the environment based on available studies.

2.0 Product chemistry

2.1 Identity of the active substance and preparation containing it

Active substance	(E)-4-Tridecenyl acetate plus (Z)-4-Tridecenyl acetate
Function	Insecticide
Chemical name	
1. International Union of Pure and Applied Chemistry (IUPAC)	(E)-tridec-4-en-1-yl acetate (Z)-tridec-4-en-1-yl acetate
2. Chemical Abstracts Service (CAS)	(E)-4-tridecen-1-ol acetate (Z)-4-tridecen-1-ol acetate
CAS number	72269-48-8 65954-19-0
Molecular formula	$C_{15}H_{28}O_2$
Molecular weight	240.4

Structural formula	 (E)-4-Tridecenyl acetate  (Z)-Tridecenyl actate
Nominal purity of active	(E)-4-Tridecenyl Acetate 95.0% (limits 93.95–98.44%) (Z)-4-Tridecenyl Acetate 3.5% (limits 2.96–4.3%)
Identity of relevant impurities of toxicological, environmental or other significance	The technical grade (E)-4-tridecenyl acetate plus (Z)-4-tridecenyl acetate does not contain any impurities or microcontaminants known to be Toxic Substances Management Policy (TSMP) Track-1 substances as listed in Appendix II of DIR99-03

2.2 Physical and chemical properties of technical and end-use product(s)

Table 2.2.1 Technical product: 3M TPW Technical Pheromone

Property	Result	Comment
Colour and physical state	Light yellow liquid	
Odour	Herbaceous	
Melting point or range	N/A	
Boiling point or range	125°C at 0.5 mm Hg	
Specific Gravity	0.87 ± 0.1	
Vapour pressure	1.6×10^{-3} mm Hg (0.213 Pa)	
Henry's Law constant at 20°C	3.419 Pa m^3/mol	Volatile from water and moist soil
Ultraviolet (UV)—visible spectrum	Not expected to absorb at $\lambda > 300$ nm	
Solubility in water	Estimated to be 15 ppm	
Solubility in organic solvents	Soluble in alcohol	
n-Octanol–water partition coefficient (K_{ow})	Estimated to be 4.4×10^5	

Property	Result	Comment
Dissociation constant (pK_a)	There are no dissociable moieties.	
Stability (temperature, metal)	Stable thermally but reactive to strong oxidizing agents.	

Table 2.2.2 End-use product: 3M Sprayable Pheromone

Property	Result
Colour	Bone or pale yellow
Odour	Paraffinic (waxy)
Physical state	Aqueous suspension with approx. 30% solids
Formulation type	Microencapsulated suspension
Guarantee (nominal)	(E)-4-Tridecenyl acetate 19.29% (limits 18.33–20.25%) (Z)-4-Tridecenyl acetate 0.71% (limits 0.63–0.78%)
Formulants	Contains a formulant, Solvent 100 (Light Aromatic Solvent Naphta) at 10.0%, which is on the EPA List 2 Potentially Toxic Inerts.
Container material and description	HDPE bottles
Density	1.01 g/cm^3
pH of 1% dispersion in water	7.5–8.5
Oxidizing or reducing action	N/A
Storage stability	Stable for 1 month when stored at 50°C.
Explodability	Product is not potentially explosive

2.3 Method for analysis of the active substance as manufactured

Table 2.3.1 Methods for analysis of the active substance as manufactured

Product	Analyte	Method Type	RSD (%)	Method
Technical	Active and major impurities	GC/FID	0.43	Acceptable
Technical	Active and major impurities	GC/MS	0.22	Acceptable

2.4 Method for analysis of formulation

Table 2.4.1 Methods for formulation analysis

Product	Method	Linearity range (%)	% Mean recovery	Standard deviation	Method
3M Sprayable Pheromone	GC/FID	77.8–118	99.5 (n = 9)	4.13	Acceptable

2.5 Product chemistry conclusions

The product chemistry data for 3M TPW Technical Pheromone used in the end-use product 3M Sprayable Pheromone are complete. The technical material was fully characterized and the specifications were supported by the analysis of five batches for active ingredients and impurities using specific validated methods of analysis. Based on the starting materials and the manufacturing process used, the technical material does not contain any TSMP Track-1 substances as identified in Appendix II of Regulatory Directive DIR99-03. With the exception of a one-year ambient temperature storage stability study, all other physical and chemical properties of the technical material and of the end-use product were provided. A gas chromatography (GC) method for the determination of active ingredients in the formulation was submitted.

3.0 Toxicology evaluation

3.1 Human health and safety

Reduced toxicological data requirements have been established for SCLPs. SCLPs are poorly soluble in water, are products of fatty acid metabolism and are biodegradable by enzyme systems present in most living organisms. Health studies have indicated that these substances pose minimal risk and provide effective pest control at low concentrations, similar to those occurring in nature[1].

The formulated end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, is encapsulated, and so the potential for direct human exposure to the formulation ingredients is considered to be negligible. In addition, since capsule size is 25 to 30 microns, it is not considered to pose any hazard via the inhalation route to applicators.

A detailed review of the toxicity database available for 3M TPW Technical Pheromone and its formulation, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, has been completed. The data submitted satisfactorily addressed the current toxicological requirements for registration of a pheromone technical active ingredient and a pheromone end-use product.

3.2 Acute toxicity—technical and formulation

3M TPW Technical Pheromone was considered to be of low acute toxicity via the oral, dermal and inhalation routes, and minimally irritating to the skin and eyes. It was not considered to be a skin sensitizer.

3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, containing ~20.0% (E,Z-4)-tridecenyl acetate, was considered to be of low acute toxicity by the oral route in Sprague Dawley rats (LD_{50} > 5000 mg/kg bw), and of low acute toxicity by the dermal route to New Zealand White rabbits (LD_{50} > 2000 mg/kg bw). It was mildly irritating when applied to the skin of New Zealand White rabbits, and minimally irritating when instilled into the eyes of the same species. Results of skin sensitization testing using Hartley-derived albino guinea pigs, employing the modified Buehler method, were positive.

An acute inhalation study was not conducted since the microcapsules of the 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm are between 25 and 30 microns and hence the acute inhalation hazard of this product is considered to be low. This product is encapsulated and so the potential for direct human exposure to the formulation ingredients is considered to be negligible.

3.3 Mutagenicity—technical

Data provided by the applicant indicated that 3M TPW Technical Pheromone was not a mutagenic agent.

3.4 Acceptable daily intake (ADI) and acute reference dose (ARfD) determination

Based on the chemical, physical, biological and toxicological properties of SCLP compounds, it is considered that they pose little or no risk of eliciting any adverse, toxicological effects. Data indicate that SCLPs pose a minor potential impact on human/animal health due to their inherent safety and use patterns. Adverse human health effects resulting from exposure to pheromone products have never been reported. It is therefore not considered necessary to establish an ADI or an ARfD for 3M TPW Technical Pheromone due to the inherent lack of toxicity of this compound, and since it does not pose any significant residue concerns.

3.5 *Food Quality Protection Act* (FQPA) considerations and endocrine disruptor potential

Based on all of the available data for SCLPs, there is no evidence of increased susceptibility of infants and children in comparison with adults which may result from exposure to SCLPs, nor of any potential to disrupt endocrine activity in humans.

4.0 Occupational and bystander exposure assessment

4.1 Exposure assessment

Based on the toxicological profile of the technical active ingredient, a quantitative estimate of exposure was not required for this product. Exposure is anticipated to be primarily dermal and could occur during mixing, loading and application of the product and during reentry activities for greenhouse tomatoes. Bystander exposure is considered negligible.

4.2 Risk assessment

Based on the toxicological profile of the active ingredient, it is concluded that the use of the proposed product is not likely to present a risk to workers when used according to label directions.

5.0 Food residue exposure

Neither the technical grade active ingredient nor the end-use product are considered to pose any significant residue concern. Furthermore, no ADI or ARfD were established for 3M Sprayable Pheromone for the Mating Disruption of Tomato Pinworm technical due to the inherent lack of toxicity concerns to any segment of the population.

6.0 Environmental assessment

The PMRA has determined that exposure of the environment to the end-use product will be very limited because the product is to be used in greenhouses for control of the pest.

7.0 Value assessment

7.1 Effectiveness

7.1.1 Intended uses

3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm is a timed-release, microencapsulated pheromone liquid concentrate containing 19.4% (E)-4-tridecenyl acetate and 0.6% (Z)-4-tridecenyl acetate. The end-use product is proposed for management of tomato pinworm (TPW), *Keiferia lycopersicella* (Walsingham) (Lepidoptera: Gelechiidae), in greenhouse tomatoes by mating disruption. The product is proposed for application at a rate of 200 mL product/ha (40 g a.i./ha) by high-volume hydraulic sprayers (300–450 L water/ha) or low-volume foggers (10 L water/ha). The product should be applied as soon as adult male moths are detected in monitoring traps, with repeat applications at 3–4 week intervals until time of fruit harvest.

7.1.2 Mode of action

3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm acts through mating disruption rather than by directly killing the pest. This non-toxic mode of action differs from that of traditional chemical insecticides. “Mating disruption” refers to the process of releasing synthetic pheromone into the air at concentrations which disrupt communication between male and female moths and prevent successful mating. Although the exact mechanism by which disruption occurs is not known, the end result is that normal mating activities between male and female moths are interfered with, resulting in suppression of pest populations. To be effective in reducing insect damage, the product must be applied prior to the beginning of the adult moth flight, and an ambient level of pheromone sufficient to disrupt communication must continue throughout the entire mating period of the insect.

(E)-4- tridecen-1-yl acetate has been identified as the sex pheromone for the tomato pinworm. In nature, the sex pheromone is produced and released into the air by the female moth and is used to attract a mate.

7.1.3 Nature of the pest problem

The tomato pinworm is primarily a pest of solanaceous crops, including tomato, potato and eggplant, in tropical and subtropical areas, but it has also infested greenhouse tomatoes in Canada several times since 1946. The most recent infestation in the Leamington area of southwestern Ontario grew from 1.2 ha in 1991 to 32 ha in 1998, and then to 87 ha in 1999, representing 22% of the greenhouse tomato acreage.

TPW larvae mine and feed in the tomato leaves and also bore into the fruits, leaving pinholes which make the fruit unmarketable. When larvae are abundant, almost all the fruits are infested. After 4 moults in about 10 days, TPW pupate in the soil, under surface debris, in the folds of leaves or in the fruits. The small, greyish-brown adult moths emerge after 8–10 days, and mate 1–2 days after emergence. The female produces a sex pheromone that attracts males. Eggs are laid on the tomato leaves shortly after mating, and hatch after 4–8 days. The life cycle takes from 26 days at 24–26°C to 100 days at 10–13°C. The TPW is reported to be unable to overwinter outdoors in Canada, but has been known to emerge from cull piles and (or) from infested plants outdoors to re-infest greenhouses.

7.1.4 Effectiveness against the pest

Trials were conducted in commercial greenhouse operations in Essex County, Ontario in 1998 and 1999 using 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm. In the first trial, conducted from January to June 1998, assessments were made by comparing numbers of males captured in pheromone-baited traps, numbers of larvae per plant, and percentage of plants with TPW damage in pheromone-treated and untreated control areas. In the second set of trials, conducted at various times during 1998 and 1999, assessments were made using pheromone-baited traps only.

Essex County, Ontario, January to June 1998
A trial was carried out on two commercial greenhouse operations in Essex County, Ontario, from January to June, 1998 to examine the efficacy of 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm for managing TPW. At Pyramid Farms, tomato plants in each of three sections (0.3–1.2 ha in size) of one greenhouse were sprayed with 40 g a.i./ha (200 mL product/ha) using high volume hydraulic spray equipment (spray volume = 300–450 L water/ha), low volume fogging equipment (spray volume = 8.3 L water/ha), or were used as an untreated control area. At C & B Farms, 1.1 ha of tomatoes were sprayed with 40 g a.i./ha using high volume applicator equipment; there was no untreated control area. Each pheromone treatment was applied 5 times, starting in late January, at 4-week intervals. The effects of the treatments were assessed by weekly catches of males in pheromone-baited traps, weekly counts of the numbers of larvae per plant and percentages of plants with TPW damage. Weekly weights of fruits rendered unmarketable due to TPW damage were assessed from late April to early June at Pyramid Farms only. Monitoring began one day before the first treatment (late January) and continued until one week after the last (mid-June)

The mean number of adults/trap/week, larvae/plant/week and percentage of damaged plants/week were all significantly lower in pheromone-treated plots than in the untreated control plot. Mean trap catch/week was reduced by 79–92% by high volume spray application, and by 50% for low volume spray application when compared to the untreated control plot. Graphs of weekly trap catches over time showed that the number of moths captured/week declined in all plots from an initial assessment of approximately 20 males/trap to almost zero adults/trap by mid-February. Trap catches remained low for the rest of the study in pheromone-treated plots, but began increasing again in the control plot during April, and reached about 9 adults/trap/week by the final assessment. Weekly larvae counts were low in all plots during the initial part of the study, and remained low in pheromone-treated plots, where they did not exceed 0.8 larvae/plant. In the control plot, larvae counts began increasing during early May, and reached a maximum of about 40 larvae/plant by late May. Over the entire study, the mean percentage of plants/week with larval feeding damage to the foliage was 8–13% in pheromone treated plots, and over 50% in the control. No damaged fruit were observed in any of the pheromone-treated areas at Pyramid Farms. In the control plot, unmarketable fruits reached a cumulative total of 3411 kg/ha by mid-June.

Essex County, Ontario, July to November 1998, 1999

Two series of operational trials were conducted on 1-8 ha plots in commercial greenhouse operations in the Leamington area from July to November 1998, and at various times in 1999. The purpose of these trials was to compare the efficacy of 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm at application rates ranging from 100 to 228 mL product/ha (20–46 g a.i./ha). Six farms participated in the first series of trials and six farms, which were not necessarily the same ones, participated in the second series. The product was applied 1–5 times to each plot, usually at the same dosage, and with various intervals between applications. All applications were as high volume sprays from a hydraulic sprayer, except for those at Half Acres in the first trial, which were as low volume mists. There were no untreated control plots and the method of assessment was by numbers of male TPW in pheromone-baited traps.

Results of these studies are difficult to interpret because of the irregular spraying and sampling regimes, a high rate of immigration of adults from cull piles and crop debris outside the greenhouse at some sites, high resident TPW populations that existed within some greenhouses, competition between the pheromone traps and the UV light traps used at some sites, and the absence of trap catch data from greenhouses not treated with pheromone. In order to analyse these data, the trap catch just before each pheromone spray was compared with the next catch (usually 1–3 weeks) after the spray. The numbers of occasions where decreases and increases in catch occurred were grouped according to the dosage of pheromone, and the mean decreases and increases were calculated. The results show that a decrease in catch after spraying (25 occasions) was more common than an increase in catch (6 occasions). This trend was consistent over the whole range of dosages, although these results do not support the use of this product at application rates lower than 200 mL product/ha (40 g a.i./ha). An application rate of 200 mL product/ha was used on 13 occasions, with a subsequent decrease in trap catch

on 9 occasions (mean % decrease = 61%) and a subsequent increase on 4 occasions (mean % increase = 139%).

Examination of results from individual greenhouses allowed general conclusions to be reached concerning the use of 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm in greenhouses. During cooler months (Nov–Apr), applications at 4-week intervals generally kept TPW counts in monitoring traps very low (<1–2 adults/trap). In some instances, only one application of the pheromone was made and virtually no TPW was observed in traps thereafter. In warmer months (May–Oct), application of the pheromone, particularly at lower rates tested in these trials, was not as effective as applications made during the cooler months. It appeared that TPW populations were able to establish on vegetation outdoors and eventually migrated into neighbouring greenhouses. Populations tended to begin, and were worse, close to doorways, along walkways, and wall vent openings.

7.2 Phytotoxicity to target plants (including different cultivars), or to target plant products

No adverse effects to the treated crop were reported in the efficacy trials conducted with 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm.

7.3 Observations on undesirable or unintended side effects e.g., on beneficial and other non-target organisms, on succeeding crops, other plants or parts of treated plants used for propagating purposes (e.g., seed, cutting, runners)

Due to its non-toxic mode of action, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm is not expected to negatively impact beneficial and other non-target organisms.

7.3.1 Impact on succeeding crops

3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm is not expected to impact on succeeding crops.

7.3.2 Impact on adjacent crops

3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm is not expected to impact on adjacent crops.

7.4 Economics

An initially unrecognized TPW infestation in 1.6 ha of Ontario greenhouse tomatoes in 1994 resulted in premature termination of the crop and an estimated yield loss of 5% by weight. If the entire 221 ha of greenhouse tomatoes in Ontario was infested, a 5% loss, based on a farm gate value of the crop of $\$126 \times 10^6$, would be $\$6.3 \times 10^6$. A 5% loss in the 48 ha known to be infested now would be equivalent to $\$1.3 \times 10^6$, based on similar estimates of crop value.

7.5 Sustainability

7.5.1 Survey of alternatives

No insecticides are registered for control of TPW. The following are alternative control methods and IPM practices for TPW:

1. Weekly monitoring, using pheromone traps;
2. Visual checking of transplants to ensure they are free of eggs and larvae;
3. Hand picking and destruction of infested leaves;
4. Destruction or deep (>9 cm) burial of crop debris;
5. Disinfestation of crates and boxes;
6. Use of egg parasites, such as *Trichogramma pretiosum* or *T. brassicae*.
7. Use of light traps to attract and kill adult moths (although this can attract adult moths from outside the greenhouse, which can enter through the air vents).

7.5.2 Compatibility with current management practices including integrated pest management (IPM)

No data were provided on the effects of 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm on non-target organisms found in commercial tomato greenhouses, but its use should be compatible with management practices for TPW and other greenhouse pests. Since pheromones are highly specific in their effects, the use of TPW pheromone is unlikely to affect the behaviour of other pests, or beneficial insects, in the greenhouse. The use of pheromone sprays can affect host-finding by predators and parasites that use the target insect's pheromone as a kairomone to locate their prey/hosts, but pheromones are less harmful than insecticides would be. According to researchers and growers involved in the efficacy studies in Essex County, during trials with the TPW pheromone in 1998, observations indicated that parasitism by *Encarsia formosa* of the greenhouse whitefly, and pollination of flowers by bumblebees were not adversely affected.

The efficacy of the pheromone is likely to be reduced during summer when the greenhouses require extra ventilation for cooling (see Section 7.1.4 above).

7.5.3 Contribution to risk reduction

Due to the non-toxic mode of action of 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, the use of this product would contribute to risk reduction.

7.5.4 Information on the occurrence or possible occurrence of the development of resistance

No clear evidence of development of resistance to pheromone products has been established.

7.6 Conclusions from value assessment

Efficacy data showed that 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm was effective in disrupting pheromone communication between adult TPW moths when used at an application rate of 200 mL product/ha (40 g a.i./ha) at 3–4 week intervals, using high volume hydraulic sprayers (300–450 L water/ha) or low volume foggers (10 L water/ha). The data did not demonstrate that mating was prevented, but did demonstrate reductions in the numbers of larvae, damaged plants, and fruits in pheromone-treated areas. Efficacy trials demonstrated that 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm is not a “stand alone” product, but must be used as part of an IPM program, particularly during the warmer months (May to October). Acceptable uses of 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm are shown in the table below.

Table 7.6.1. Value summary for 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm.

Site	Greenhouse tomato (USC 5)
Product	3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm (19.4% (E)-4-tridecenyl acetate and 0.6% (Z)-4-tridecenyl acetate)
Rate of application	40 g a.i./ha (200 mL product/ha) by high volume (300–450 L water/ha) or low volume (10 L/ha) application
Application methods and timing	Apply by high-volume hydraulic sprayers in 300–450 L water per hectare, or by low-volume foggers in 10 L of water per hectare at 3–4 week intervals. Continual monitoring with pheromone traps and routine inspection of foliage and fruit for the presence of larvae or larval damage is strongly recommended to determine the need for and timing of initial and repeat applications. This product should be applied as soon as adult male moths are detected in monitoring traps, with repeat applications at 3–4 week intervals until time of fruit harvest. Treatment may be less effective near to doorways and wall vent openings, and during the summer and fall months, when increased ventilation will reduce the concentration of pheromone in the air. In these places and during these months, other methods to control the Tomato Pinworm should be intensified. Consult your local pest advisor for information on trap monitoring and timing of product application. This product should be used as part of an IPM program for Tomato Pinworm, which may include an insecticide spray (if registered for this purpose) if initial populations in the infested area are high, the use of light traps to attract and kill the adult moths, screening the greenhouse air vents to exclude the adults, the removal and proper disposal of infested plants, plant parts and containers, and the use of biological control agents. Treated areas should be thoroughly monitored for the presence of other pests and treated if necessary.
Pest managed	Tomato pinworm (*Keiferia lycopersicella*),

8.0 Regulatory Decision

The PMRA has carried out an assessment of available information in accordance with Section 9 of the PCPR and has found it sufficient pursuant to Section 18(*b*) to allow a determination of the safety, merit and value of the active ingredient 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm. The PMRA has concluded that the use of the active ingredient 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, in accordance with the label has merit and value consistent with Section 18(*c*) of the PCPR and does not entail an unacceptable risk of harm pursuant to Section 18(*d*). Therefore, based on the considerations outlined above, the use of the active ingredient 3M TPW Technical Pheromone, containing (E)-4-tridecen-1-yl acetate and (Z)-4-tridecen-1-yl acetate, and its end-use product, 3M Sprayable Pheromone for Mating Disruption of Tomato Pinworm, for use against the tomato pinworm is proposed for full registration, pursuant to Section 13 of the PCPR.

The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document to allow interested parties an opportunity to provide input into the proposed registration decision for this product.

List of abbreviations

ADI	acceptable daily intake
ARfD	acute reference dose
CAS	Chemical Abstract Services
FID	flame ionization detector
FQPA	*Food Quality Protection Act*
GC	gas chromatography
HDPE	high-density polyethylene
IPM	integrated pest management
IUPAC	International Union of Pure and Applied Chemistry
K_{ow}	n-octanol/water partitioning coefficient
LD_{50}	median lethal dose
MS	mass spectroscopy
MSDS	Material Safety Data Sheet
PMRA	Pest Management Regulatory Agency
RSD	relative standard deviation
SCLP	straight-chained lepidopteran pheromone
TPW	tomato pinworm
TSMP	Toxic Substances Management Policy
U.S. EPA	U.S. Environmental Protection Agency
UV	ultraviolet

References

1. PMRA Regulatory Proposal, PRO2002-02, September 25, 2002, *Guidelines for the Research and Registration of Pest Control Products Containing Pheromones and Other Semiochemicals*