Pest Management Regulatory Agency
Agence de réglementation de la lutte antiparasitaire

Regulatory Note

REG2002-03

Isomate-P Peach Tree Borer Pheromone for use in Orchards for Mating Disruption of the Peach Tree Borer

The active ingredient Peach Tree Borer Pheromone Technical and the associated end-use biopesticide product, Isomate-P Pheromone, containing (*Z*,*Z*)-3,13-Octadecadien-1-yl acetate and (E,Z)-3,13-Octadecadien-1-yl acetate, for the control of the peach tree borer, *Synanthedon exitiosa* (Say), in peach, nectarine, cherry, prune, plum, and apricot orchards have been granted temporary registrations under Section 17 of the Pest Control Product (PCP) Regulations.

This Regulatory Note provides a summary of data reviewed and the rationale for the regulatory decisions for these biopesticide products.

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Foreword

Health Canada's Pest Management Regulatory Agency (PMRA) has issued temporary registrations for the biopesticide, Peach Tree Borer Pheromone Technical, manufactured by Shin-Etsu Chemical Co., Ltd., Tokyo, Japan, and its end-use product Isomate-P Pheromone, manufactured by Pacific Biocontrol Corporation of Vancouver, Washington, for use against the peach tree borer, *Synanthedon exitiosa* (Say) in peach, nectarine, cherry, prune, plum, and apricot.

These submissions have been reviewed by Health Canada's 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. User support included British Columbia Fruit Growers Association, Similkameen Okanagan Organic Producers Association, and Organic Producers Association of Cawston/Kermeos.

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 reduces the need for conventional insecticides, making this pheromone an important addition to integrated pest management (IPM) strategies for dealing with pests in peach, nectarine, cherry, prune, plum, and apricot orchards.

Increasingly, biopesticides such as pheromones are 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, pheromone products are expected to pose low potential risk to human health and the environment compared with conventional pesticides.

Pacific Biocontrol Corporation will be carrying out additional efficacy studies as a condition of this temporary registration. Following the review of this information, the PMRA will publish a proposed regulatory decision document and request comments from interested parties before proceeding with a final regulatory decision.

Table of Contents

1.0 Introduction

Peach Tree Borer Pheromone Technical is manufactured by Shin-Etsu Chemical Co., Ltd., Tokyo, Japan, and its end-use product Isomate-P Pheromone is manufactured by Pacific Biocontrol Corporation of Vancouver, Washington. Both products contain (*Z*,*Z*)-3,13-Octadecadien-1-yl acetate and (*E*,*Z*)-3,13-Octadecadien-1-yl acetate.

The pheromone for the peach tree borer (PTB) has not been registered previously for pest control in Canada. Isomate-P Pheromone has been proposed for behavioural mating disruption of the PTB in peaches, nectarines, cherries, prunes, plums, and apricots.

Z,*Z*-3,13-Octadecadien-1-yl acetate and (*E*,*Z*)-3,13-Octadecadien-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.

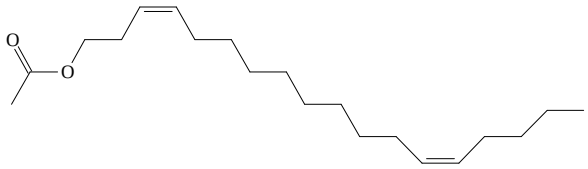
2.0 Product chemistry

2.1 Identity of products

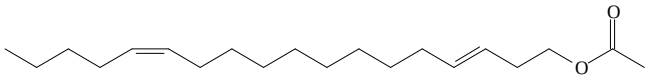
The common name for this product is Peach Tree Borer Pheromone; it functions as an insecticide through the disruption of the mating behaviour of the pest.

Trade Name	Peach Tree Borer Pheromone Technical
Other Names	Isomate-P Technical
Common Name	Peach Tree Borer Pheromone
English	(*Z*,*Z*)-3,13-octadecadienyl acetate (*E*,*Z*)-3,13-octadecadienyl acetate
Chemical Name:	
International Union of Pure and Applied Chemistry	(*Z*,*Z*)-3,13-Octadecadien-1-yl acetate (*E*,*Z*)-3,13-Octadecadien-1-yl acetate
Chemical Abstract Services	(*Z*,*Z*)-3,13-Octadecadienyl acetate (*E*,*Z*)-3,13-Octadecadienyl acetate
CAS Number	53120-27-7 53120-26-6

Structural Formula



(Z,Z)-3,13-Octadecadienyl acetate



(E,Z)-3,13-Octadecadienyl acetate

Molecular Formula $C_{20}H_{36}O_2$

Molecular Weight 308.5

2.2 Physical and chemical properties of active substance

Table 2.2 Technical product: Peach Tree Borer Pheromone

Properties	Value	Comments
Colour	colourless or light yellow transparent	
Physical state	liquid	
Odour	mild waxy and sweet	
Melting point/range	N/A	Product is a liquid.
Boiling point/range	178–180°C at 2 mm Hg	
Specific gravity	0.889 at 20°C	
Water solubility (mg/L)	not soluble in water	
Solvent solubility (mg/L)	soluble in all common organic solvents	
Vapour pressure	1.795×10^{-5} mm Hg at 20°C	
Henry's Law constant at 20 °C	cannot be calculated, as value for solubility in water not reported	Based on vapour pressure and insolubility in water, this compound will be volatile under field conditions.

Properties	Value	Comments
Dissociation constant (pK_a)	N/A	Active ingredients do not contain dissociable moiety.
n-Octanol/water partition coefficient (K_{ow})	more than 1000	
UV/visible absorption spectrum	No absorbance above λ >400 nm	
Stability (temperature, metals)	stable against sunlight and hydrolysis when exposed to water	

Table 2.3 End-use product: Isomate-P Peach Tree Borer Pheromone

Property	Value	Comment
Colour	colourless or light yellow transparent	
Physical State	liquid	
Odour	mild waxy and sweet	
Formulation Type	slow-release generator	
Container Material and Description	high density polyethylene tubes in foil packet (500 tubes in 1 packet)	
Specific Gravity	0.889 at 20°C	
pH	3.57	
Oxidizing or Reducing Action	N/A	Product does not contain redox agents.
Viscosity	8.03 c.s. at 20°C	
Storage Stability Data	Data showed that, when stored for 18 months at room temperature and 5°C, losses of 2.7% and 1.0% active ingredient occur, respectively.	

Property	Value	Comment
Flammability	flash point, 1348°C	closed cup method
Explodability	N/A	Product is not potentially explosive.
Miscibility	miscible in all common organic solvents; i.e., *n*-hexane, cyclohexane, benzene, toluene, etc. (except DMSO, ethylene, glycol)	
Corrosion Characteristics	not corrosive	
Dielectric Breakdown Voltage	N/A	This formulation is not designed for use around electrical equipment.

2.3 Method for analysis of the active substance as manufactured

A single gas chromatographic method was provided for determination of the active ingredients and all major impurities. The validation data are shown in Table 2.4.

Table 2.4 Method validation

Method validation data				
Component	**Method type / ID**	**Retention time (min)**	**RSD (%)[2]**	**MA[1]**
Active ingredients (*Z*,*Z*)-3,13-octadecadien-1-yl acetate (*E*,*Z*)-3,13-octadecadien-1-yl acetate	GC*/FID*	35.55 34.04	0.16 1.3	Y
(Z,E)-3,13-octatecadien-1-yl acetate	GC/FID	33.48	3.5	Y
n-octadecyl acetate	GC/FID	30.79	2.3	Y
13-octadecen-3-yn-1-ol	GC/FID	46.40		Y
(*Z*,*Z*)-5,11-hexadecadiene	GC/FID	8.51	9.3	Y
2,13-octadecadien-1-yl acetate	GC/FID	34.54	4.2	Y

Method validation data				
Component	**Method type / ID**	**Retention time (min)**	**RSD (%)[2]**	**MA[1]**
3,13-octadecadien-1-ol	GC/FID	41.05	3.4	Y
Z-9-tetradecen-1-yl bromide	GC/FID	13.12	10.7	Y
(*E*,*Z*)-2,13-octadecadien-1-yl acetate	GC/FID	37.02		Y
(E,E)-3,13-octadecadien-1-yl acetate	GC/FID	33.06		Y
3,11-tetradecadiyn-1,14-yl diacetate	GC/FID	19.15		Y
Z-13-octadecen-1-yl acetate	GC/FID	33.25		Y

[1] MA = Method acceptability; Y = acceptable; N = not acceptable (see deficiency)
[2] Calculated by the reviewer based on the area percentages provided by the applicant

* see section 2.4 below

2.4 Method for analysis of formulation

The same gas chromatography (GC) method with flame ionization detection (FID) that was used to analyse the technical product was also provided for the analysis of the formulated product. The method was assessed to be specific and precise for use as an enforcement analytical method.

2.5 Product chemistry conclusions

The product chemistry data for Peach Tree Borer Pheromone Technical used in the end-use product Isomate-P Peach Tree Borer 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 Toxic Substances Management Policy (TSMP) Track-1 substances as identified in Appendix II of DIR99-03, The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy. The required physical and chemical properties of the technical material and of the end-use product were provided. A 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 product, Isomate-P Pheromone, is contained within a passive, retrievable dispenser, and so the potential for direct human exposure to the formulation ingredients is considered to be negligible.

A detailed review of the toxicity data base available for Peach Tree Borer Pheromone Technical and its formulation, Isomate-P Pheromone, 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

Peach Tree Borer Technical was considered to be of low acute toxicity by the oral (LD_{50} > 5000 mg/kg bw), dermal (LD_{50} > 2000 mg/kg bw), and inhalation (LD_{50} > 5.32 mg/L) routes to Sprague-Dawley rats. 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 albino Hartley guinea pigs were negative.

Based on the results of acute toxicity testing, it is recommended that the signal words “CAUTION SKIN IRRITANT” be displayed on the primary panel of the label.

Isomate-P Pheromone, containing ~80.6% (*Z,Z*)-3,13-octadecadienyl acetate and ~3.3% (*E,Z*)-3,13-octadecadienyl acetate was considered to be of low acute toxicity by the oral, dermal, and inhalation routes, mildly irritating to the skin, and minimally irritating to the eyes. There is no report of human dermal sensitization resulting from exposure to this product. Since this product is contained within a passive, retrievable dispenser, exposure potential is minimal.

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1 Refer to “The White Paper - A Review Of The Current Bases For The United States Environmental Protection Agency’s Policy For The Regulation Of Pheromones And Other Semiochemicals, Together With A Review Of The Available Relevant Data Which May Impact The Assessment Of Risk For These Classes Of Chemicals”, Compiled by James E. Touhey, Senior Agricultural Advisor, Field Operations Division.

Results of acute toxicity testing, and examination of the MSDSs, trigger the recommendation to include the signal words "CAUTION SKIN IRRITANT" on the primary panel of the label. However, since Isomate-P Pheromone is contained within a passive, retrievable dispenser, exposure potential is minimal. In addition, the statement "Avoid inhalation of vapors or contact with liquid ingredients" is included under the PRECAUTIONS section. Hence, the signal words "CAUTION SKIN IRRITANT" are not required on the primary panel of the label. However, it is recommended that the statement "Avoid contact with skin, eyes and clothing" be displayed on the secondary display panel under the "PRECAUTIONS" section (i.e., to replace the statement "Avoid contact with eyes.").

3.3 Mutagenicity — technical

Data provided by the applicant indicated that Peach Tree Borer Pheromone Technical was not a mutagenic agent.

3.4 Acceptable daily intake and acute reference dose 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 or 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 acceptable daily intake (ADI) or an acute reference dose (ARfD) for Peach Tree Borer Pheromone Technical 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* 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 to adults that 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

The proposed end product is formulated as retrievably sized twist-tie rope dispensers to be attached to orchard tree branches in spring prior to moth emergence. The active ingredient (a.i.) is impregnated into a polyethylene tube which slowly releases into the atmosphere at a rate of 9.45–23.63 g a.i./ha. A repeat application may be made during the season.

Based on the toxicological profile of the active ingredient, a quantitative estimate of exposure was not required for this product. Exposure is anticipated to be primarily dermal and could occur during handling and placement of the dispensers. Bystander and re-entry 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 it is used according to label directions. The precautions statements should be amended to read "When handling dispensers, wear chemical resistant gloves and eye protection."

5.0 Food residue exposure

With respect to Isomate-P Peach Tree Borer Pheromone, neither the technical grade active ingredient nor the end-use product is considered to pose any significant residue concern. Furthermore, no ADI or ARfD was established for Peach Tree Borer Pheromone Technical due to inherent lack of toxicity of this compound. Therefore, it is unlikely that this pheromone will pose any dietary concern to any segment of the population.

6.0 Environmental assessment

The method of application of Isomate-P Peach Tree Borer Pheromone is described under Value assessment in section 7.1.1 (Intended Uses). The active ingredients in the subject product are SCLPs.

Exposure of the environment to the end-use product will be very limited because the dispensers containing Isomate-P Pheromone are to be manually attached to fruit trees for control of the pest.

7.0 Value assessment

7.1 Effectiveness

7.1.1 Intended uses

Pacific Biocontrol Corporation has applied for registration of an end-use product, Isomate-P Pheromone, for control of the PTB, *Synanthedon exitiosa* (Say) on peach, almond, nectarine, cherry, prune, plum, and apricot under the PMRA's URMUR. Isomate-P Pheromone is a synthetic sex pheromone of the PTB, and is currently registered for use in the U.S. by the U.S. EPA.

The product is formulated as discrete hand-applied dispensers, each containing 37.8 mg of the Peach Tree Borer Pheromone Technical, of which (*Z,Z*)-3,13-Octadecadien-1-yl acetate and (*E,Z*)-3,13-Octadecadien-1-yl acetate are the major components. The applicant proposes that a minimum of 250 and a maximum of 625 dispensers per hectare be attached to trees prior to moth emergence in the spring.

7.1.2 Mode of action

Isomate-P Pheromone acts through mating disruption (i.e., through disruption of pheromone communication between male and female moths for mating activities) rather than by killing the pest. This nontoxic mode of action differs from that of traditional chemical insecticides.

(*Z,Z*)-3,13-Octadecadien-1-yl acetate and (*E,Z*)-3,13-Octadecadien-1-yl acetate are the major synthetic components of the sex pheromone blend for the PTB. In nature, the sex pheromone is produced and released into the air by the female moth and is used to attract a mate. “Mating disruption” refers to the process of releasing synthetic pheromone into the air at concentrations that 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 season, and an ambient level of pheromone sufficient to disrupt communication must last throughout the entire mating period of the insect.

7.1.3 Nature of the pest problem

The PTB, *Synanthedon exitiosa* (Say), is an important pest of peach trees in Ontario and British Columbia. Plum, cherry and apricot trees are also occasionally attacked by this insect. The larvae tunnel into the bark and outer wood to feed. The main roots near the ground surface may also be attacked. Gum oozing from injured areas usually contains sawdust and borer excrement. Trees older than 8 years are more resistant to injury. Younger trees, especially those under 3 years, may be seriously damaged or killed.

The adult PTB, unlike most other moths, is active in the daytime. The moths emerge from mid-July to early September, with peak emergence occurring around the first of August. The females lay their eggs on the trunk or foliage, or in the soil close to the peach tree. These eggs hatch in about 12 days and the young larvae bore into the bark of the trunk near ground level. In the spring, after wintering in their feeding tunnels or in the soil, larvae resume feeding, in either their old tunnels or new ones. The larvae mature in late June or in July and pupate in their tunnels or near the surface of the soil within 3 inches (8 cm) of the trunk before emerging as moths. Some borers complete their life cycle in one year; others require two. Regardless of the life cycle, all borers overwinter in the larval stage.

Current control strategies involve application of chemical insecticides to tree trunks from ground level to lower scaffold limbs when first moths are captured in pheromone traps. The treatment threshold is an average of one moth captured per trap per week in a block of young trees and two moths per trap per week in a mature block. For effective control it is essential to treat for two or more consecutive years.

7.1.4 Effectiveness against the pest

Three field trials using the proposed PTB sex pheromone (3,13-Octadecadien-1-yl acetate) to disrupt the mating of PTB were reviewed. Efficacy was assessed by comparing the number of male PTB caught in traps placed in orchards treated with the pheromone to the number caught in traps placed into orchards treated with a standard insecticide. One study also assessed the effect of pheromone disruption on female reproductive output. The following is a summary of the efficacy trial results.

Biglerville, Pennsylvania, 1998
A field trial was conducted in four orchards (all blocks were 2–3 ha in size). An insecticide was applied to all blocks before the trial started and only to the control blocks afterwards. Mating disruption blocks received 247 dispensers/ha of Isomate-P Pheromone. The dispensers were placed on trees by hand in early June before the flight of PTB. The control blocks were either adjacent to, or within 400 m of, the mating disruption blocks. Information on details of experimental protocol and statistical analysis was limited. Efficacy was assessed by monitoring male moth catches in treated and untreated blocks. Trap catches in the blocks treated with Isomate-P Pheromone were zero throughout the trial while substantially more male moths were captured in the untreated blocks. However, neither direct nor indirect assessment of mating disruption was carried out (e.g., measuring percentage of mated females, larval population, level of tree damage). The submitted data did not indicate the period of time for which the dispensers would be effective.

Cream Ridge, New Jersey, 1996
Very similar to the trial in Pennsylvania, this field trial was conducted in four orchards. Mating disruption blocks received 247 dispensers/ha of Isomate-P Pheromone. Information on details of experimental protocol and statistical analysis was limited. Efficacy was assessed by monitoring male moth catches in treated and untreated blocks. Trap catches in the blocks treated with Isomate-P Pheromone were zero throughout the trial while substantially more male moths were caught in the untreated blocks. However, neither direct nor indirect assessment of mating disruption was carried out (e.g., measuring percentage of mated females, larval population, level of tree damage). The submitted data did not indicate the period of time for which the dispensers would be effective.

Byron, Georgia, 1984 and 1985
Field trials were carried out over two summers (1984, 1985) in several blocks of peach orchards. Wild hosts around the orchards were sometimes treated with dispensers. Both pheromone trap catches and percentage of mated females were assessed in the field trials. Trap catches in four blocks treated with Isomate-P Pheromone showed significant reduction (compared with control blocks) in number of males caught per pheromone trap. Only one percent of 200 females dissected were found mated in treated blocks while 84% of 42 females were mated in untreated blocks. However, there is a difference in impregnation rate of the pheromone in the dispensers between the tested material (68 mg) and the proposed product (37.8 mg). Furthermore, the pheromone blend used to assess mating status of females was 100% (*Z,Z*)-3,13-Octadecadien-1-yl acetate isomer instead of the proposed product blend which contains (*Z,Z*)-3,13-Octadecadien-1-yl acetate and (*E,Z*)-3,13-Octadecadien-1-yl acetate at a ratio of 90:10, even though trap catches in the same trial using different ratio of pheromone blend suggested that the 90:10 blend should be more attractive to males. The submitted data did not indicate the period of time for which the dispensers would be effective.

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

No adverse effect to the treated crop was reported in the efficacy field trials conducted with Isomate-P Pheromone**.**

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

Due to its nontoxic mode of action, Isomate-P Pheromone is not expected to negatively impact beneficial and other nontarget organisms.

7.3.1 Impact on succeeding crops

Isomate-P Pheromone is not expected to impact on succeeding crops.

7.3.2 Impact on adjacent crops

Isomate-P Pheromone is not expected to impact on adjacent crops.

7.4 Economics

Not assessed.

7.5 Sustainability

7.5.1 Survey of alternatives

The major alternative insecticide active ingredients currently registered for control of the PTB include, but are not necessarily limited to, endosulfan, deltamethrin, azinphos-methyl, diazinon, and carbaryl.

7.5.2 Compatibility with current management practices including IPM

Pheromone products are generally more target-specific than conventional pesticides. The mode of action of these products is through disruption of pheromone communication rather than directly killing the target pest. Isomate-P Pheromone has potential as a tool in the management of resistance of PTB to conventional chemical insecticides and as an integral part of an IPM strategy to control this pest. Due to specificity and the nontoxic nature of its mode of action, Isomate-P Pheromone is compatible with current orchard management practices, particularly with those of organic orchard producers.

7.5.3 Contribution to risk reduction

Due to the nontoxic mode of action of Isomate-P Pheromone, 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

Although trap catch data for pheromone-baited traps suggest that Isomate-P Pheromone is effective in disrupting pheromone communication, the data do not unequivocally demonstrate that mating has been disrupted. In the trial carried out in Byron, Georgia, data did show that successful mating disruption was achieved by using Isomate-P Pheromone. However, there was a difference in pheromone blend and rate of impregnation between the tested material and the proposed Isomate-P Pheromone. Furthermore, this trial was carried out in a U.S. state where pest problems and control practices are likely to be different from those in peach-growing areas in Canada.

Sufficient efficacy data have been submitted to support the temporary registration of Isomate-P Pheromone.

8.0 Overall conclusions

The Agency has assessed the safety, merit, and value of the proposed use of Isomate-P Peach Tree Borer Pheromone. In terms of human exposure, bystander and re-entry exposure to workers is considered negligible. Further, it is unlikely that this pheromone will pose any dietary concern to any segment of the population. Exposure to the environment will be very limited because the product is contained in dispensers. No TSMP issue is associated with this product. Sufficient efficacy data have been submitted to support the temporary registration of Isomate-P Peach Tree Borer Pheromone.

9.0 Regulatory decision

Peach Tree Borer Pheromone Technical and the associated end-use product Isomate-P Peach Tree Borer Pheromone have been granted temporary registrations for use on the peach tree borer in peach, nectarine, cherry, prune, plum, and apricot orchards pursuant to Section 17 of the Pest Control Products (PCP) Regulations, subject to the provision of additional data on the efficacy of the end-use product Isomate-P Peach Tree Borer Pheromone.

List of abbreviations

a.i.	active ingredient
ADI	acceptable daily intake
ARfD	acute reference dose
CAS	Chemical Abstract Services
FID	flame ionization detector
GC	gas chromatography
IPM	integrated pest management
IUPAC	International Union of Pure and Applied Chemistry
K_{ow}	n-octanol/water partitioning coefficient
LD_{50}	median lethal dose
MSDS	Material Safety Data Sheet
PCP	Pest Control Products
PTB	peach tree borer
PMRA	Pest Management Regulatory Agency
SCLP	straight-chained lepidopteran pheromone
TSMP	Toxic Substances Management Policy
U.S. or U.S.A.	United States of America
U.S. EPA	U.S. Environmental Protection Agency
URMUR	User Requested Minor Use Registration Program
UV	ultraviolet