Environmental Protection Authority
Te Mana Rauhī Taiao

Information for Submitters – APP201955

Have your say on an application submitted under section 34 of the HSNO Act (1996)

Introduction

Horticulture New Zealand Inc. have submitted an application to the Environmental Protection Authority (EPA) seeking approval under the Hazardous Substances and New Organisms Act (HSNO Act) to release a new organism (*Tamarixia triozae*). The application will be processed by the EPA through a publicly notified pathway.

This document provides information to help you understand the application, the HSNO Act process for considering the application, and how you can participate in that process.

What is the application for?

The application seeks approval to release *Tamarixia triozae* as a biological control agent for the tomato potato psyllid (*Bactericera cockerelli*; TPP).

This application was submitted by Horticulture New Zealand Inc. on behalf of the potato, tomato (greenhouse and field tomatoes), capsicum and tamarillo industries represented by Potatoes New Zealand Inc., Tomatoes NZ Inc., Heinz-Wattie's NZ Ltd, Vegetables NZ Inc., and NZ Tamarillo Growers Association Inc.

TPP is a serious pest of solanaceous crops (plants in the nightshade family, which include potato, eggplant, tomato and capsicum) in New Zealand. It not only causes damage to the crops it feeds on but is also the carrier of a newly characterised bacterial pathogen, *Candidatus Liberibacter solanacearum* (Lso), which causes foliar wilting of susceptible crops, and in potatoes causes browning of the vascular tissue - commonly referred to as Zebra Chip. This pathogen has caused significant economic losses to the New Zealand potato, tomato, and tamarillo industries.

Tamarixia triozae is a psyllid parasitoid, therefore it has an immature life stage that develops on a single host (TPP), ultimately killing the host. It is intended that the parasitoid will be mass reared by commercial operators for release. The parasitoid will be put into the New Zealand environment in a series of co-ordinated releases into potato, outdoor tomato and tamarillo growing areas, where it will establish self-sustaining populations that will parasitise TPP. Greenhouse tomato and capsicum industries might consider releasing *T. triozae* into greenhouses, but most benefits will be derived from a reduction in TPP levels outside of greenhouses.

Where can I find the application?

The full application can be found on the EPA website (www.epa.govt.nz).

You can also contact the applicant representative directly if you have questions about the technical information in the application. The applicant representative is Stephen Ogden, who can be contacted by email (Stephen@solutionz.co.nz) or by phone (04 473 6040).

You can contact the EPA if you have any questions about the application process, making submissions, or the hearing process. The application leader is Clark Ehlers, who can be contacted by email (clark.ehlers@epa.govt.nz) or phone (04 474 5495)

What is the application process?

The application process is set out in the HSNO Act, including timeframes within which steps of the process must occur. The main steps are set out below.

Stage of process	Date
Application formally submitted to EPA	27 January 2016
Public submission period	11 February 2016 – 24 March 2016
EPA Staff Assessment Report release	10 days before the hearing commences
Public Hearing (open to the public, applicant and submitters can present)	Tentatively on or before 10 May 2016
Consideration of application (not open to the public)	At close of the public hearing
Decision released	Within 30 working days of the close of the hearing

Who considers the application?

The application is considered by a sub-committee of the EPA's HSNO Committee. The HSNO Committee consists of eight members, appointed by the EPA Board, with delegated decision-making powers to consider certain applications made under the HSNO Act.

The Decision-making Committee for this application has not yet been appointed.

What is the role of the EPA staff?

EPA staff support the Decision-making Committee, and administer the consideration process including the submissions and hearing.

EPA staff also provide advice to the Decision-making Committee. Following the close of submissions, EPA staff will complete a full assessment of the matters to be considered, using the information in the application, from submitters, and other readily available sources. This Staff Assessment Report will be published on the EPA website and will assist the Decision-making Committee with the consideration of the application.

What information is available to the Decision-making Committee?

Sources of information for the Decision-making Committee include, but are not limited to:

- The application (by Horticulture New Zealand Inc.)
- Submissions
- EPA Staff Assessment Report
- Information presented at the public hearing

All written reports, submissions, the application, and decision will be available on the EPA website as they become available.

What are the statutory criteria for considering this application?

In considering the application, the Decision-making Committee must take into account a range of matters set out in the HSNO Act.

Undesirable self-sustaining populations

The Decision-making Committee is required to consider the potential for *T. triozae* to establish an undesirable self-sustaining population, and the potential for eradication of an undesirable population of *T. triozae*.

The Decision-making Committee is interested in any information about a situation where a population of *T. triozae* might be considered undesirable.

Minimum standards

The HSNO Act sets out minimum standards that must be met in order for a new organism to be released. This means that *T. triozae* cannot be approved for release if it is likely to:

- cause any significant displacement of any native species within its natural habitat
- cause any significant deterioration of natural habitats
- cause any significant adverse effects on human health and safety
- cause any significant adverse effect to New Zealand's inherent genetic diversity
- cause disease, be parasitic, or become a vector for human, animal, or plant disease, unless the purpose of that importation or release is to import or release an organism to cause disease, be parasitic, or a vector for disease.

The Decision-making Committee is interested in any information about whether *T. triozae* meets the minimum standards.

Adverse and beneficial effects

The Decision-making Committee is required to weigh the potential beneficial (positive) effects against the potential adverse effects of releasing *T. triozae* into the New Zealand environment.

If the adverse effects outweigh the beneficial effects, the organism cannot be released.

The Decision-making Committee is interested in any information about benefits or adverse effects that could result from the release of *T. triozae*, in particular, any effects on the environment, human health and safety, the market economy, Māori culture and traditions, and society and communities.

We have provided a brief summary of the potential risks and benefits of this application based on the information we currently have available. This can be found in Appendix 1 of this document.

How can I have my say?

Make a submission

Any person can make a submission on this application, provided it is submitted within the submission period (11 February 2016 to 24 March 2016). In a submission you can provide information, make comments and raise issues. In this way, you contribute to the EPA decision making process on this application.

Further information on the purpose of submissions is available from the EPA website using the link below: www.epa.govt.nz/about-us/have-your-say.

In your submission, you can also request a hearing if you would like to speak to your views in person before the Decision-making Committee. Further information on submissions for an application is available from the EPA website using the link below:
http://www.epa.govt.nz/about-us/have-your-say/Pages/what-is-submission.aspx

The EPA website provides guidance and steps on how to make a submission. This is preferably done via the EPA submission form online, but may be sent as a letter or e-mail to the EPA. This information and the submission form can be accessed from the EPA website using the link below:
http://www.epa.govt.nz/about-us/have-your-say/Pages/make-submission.aspx

Participate in the public hearing

A hearing may be held to enable submitters to speak to the Decision-making Committee about their submissions.

You are entitled to bring witnesses who may speak to your submission at a hearing. If you choose this option, you should provide the EPA with a list of the witnesses, their areas of expertise, and the elements of the submission or application they will talk to.

If you choose to speak at a hearing, you are entitled to speak in one of the three official languages of New Zealand: English, Māori, or New Zealand Sign Language. Please advise the application lead **at least two weeks prior to the hearing start date if you wish to speak to your submission in Māori or New Zealand Sign Language** in order for the EPA to organise for an interpreter. The application lead, Clark Ehlers, can be contacted by e-mail (**Clark.Ehlers@epa.govt.nz**) or by phone (**04 474 5495**).

Both the applicant and submitter(s) need to provide the EPA with copies of any information they intend to present at the hearing at least two weeks prior to the hearing.

Appendix1: Summary of the risks and benefits of this application

To guide and inform submitters, EPA staff have summarised the potential risks and benefits identified in the application, and through a preliminary literature review.

Potential benefits of releasing *T. triozae*

The applicant identified the following potential effects from the release of *T. triozae* to be used for the control of TPP:

- reduction in tomato potato psyllid (TPP) in New Zealand
- improved integrated pest management (IPM) programmes for the affected horticulture crops (increased use of natural enemies for a range of pests)
- reduced reliance on broad-spectrum insecticides to control TPP in the horticulture industry
- economic benefits to the horticultural industry through reducing the cost of chemical control, savings in vegetable yields and quality losses due to TPP damage and Zebra Chip disease, and better returns to growers overall
- reduction in the transmission of the bacterium *Candidatus Liberibacter solanacearum,* the causal agent of Zebra Chip disease
- reduced TPP impact on taewa, kūmara and poroporo grown for amenity and cultural reasons, allowing a return to traditional and/or organic cultivation methods

The applicant has provided reasons why they believe that those benefits will occur and contend that the benefits will be significant.

An important factor in whether the proposed benefits will eventuate, and the level of benefit that will eventuate, is the efficacy of *T. triozae* in parasitizing TPP.

We have reviewed the literature, and note that there is limited published data on the efficacy of *T. triozae* available. *Tamarixia triozae* is not currently used in formal biological control programmes anywhere and most information on parasitism levels are obtained from observations in its native habitat and from laboratory studies.

In the past, *T. triozae* has demonstrated effective control of TPP in capsicum greenhouse crops in Canada in augmentative releases (*T*. *triozae* was released often in large numbers over a growing season in 2001-2002), however data on TPP mortality due to *T. triozae* parasitism is not available.

In its native range, parasitism levels of TPP in tomato, capsicum and potato crops in Southern California and Texas were less than 20% in 2009/2010, whilst parasitism rates varied between 70 and 80% in horticultural crops in Mexico where insecticides were not extensively used (Butler and Trumble 2012, Liu, Zhang et al. 2012, Rojas, Rodríguez-Leyva et al. 2014).

Laboratory-based testing performed in New Zealand showed that predicted mortality of immature TPP insects from attack by *T. triozae* varied between 26 and 35%, compared to mortality rates of up to 7% due to other causes (Gardner-Gee 2012).

Tamarixia triozae has shorter generation times (the average time span between two consecutive generations) than TPP, suggesting that it will be able to build large self-sustaining populations on TPP. This is an important factor in being an effective biocontrol agent.

A range of factors can influence levels of parasitism, for example:

- use of broad-spectrum insecticides in fields
- lack of coordination between TPP invading crops and *T. triozae* searching to lay its eggs on immature TPP insects
- predation of the parasitoid
- large field sizes potentially limiting parasitoid dispersal (Liu, Zhang et al. 2012).

The benefits *of T. triozae* may also be increased by parasitism of TPP residing on non-crops plants that border horticulture crops in the winter season, which, in turn, reduces the migration of TPP to crops in spring and summer.

Tamarixia triozae will curb the transmission of the bacterium *Candidatus Liberibacter solanacearum* (Lso), by parasitizing immature TPP insects that may have acquired the disease via transmission from the TPP parent to its offspring. This will reduce the number of Lso-infected TPP adults that will be searching for new host plants.

Based on the information currently available, *T. triozae* is a viable biocontrol agent for TPP, and the release of this parasitoid has the potential to result in significant benefits to the horticulture industry, as well as reducing the impact of TPP on traditional crops and non-crop foods harvested for traditional uses.

As proposed by the applicant, the release of *T. triozae* will result in direct and indirect economic benefits to the horticultural industry and the local and regional economies that support the horticulture industry.

The potential for the horticultural industry to reduce the use of pesticides to control TPP, which would enable them to introduce cost-effective 'soft chemicals' and natural enemies into their pest management programmes, is one cost benefit proposed by the applicant. The use of natural enemies is currently curtailed by the need to control TPP using broad-spectrum insecticides, and the limited options for doing so.

Independent economic assessment

The New Zealand Institute of Economic Research (NZIER) performed an assessment of the economic benefits and costs of *T. triozae* to the affected industries (Nixon 2014). The NZIER determined that the total quantifiable benefits to the potato, tomato, capsicum and tamarillo industries to be between $7.8m and $24.9m per annum over 20 years to reflect the long term impacts of introducing *T. triozae*. This was considered to be an estimate based on a 5 and 20% (for both potatoes and tamarillos) and 20 and 50% (for both tomatoes and capsicums) likelihood of the benefits occurring. These benefits were reductions in insecticide spray applications and in crop impacts with resulting improvements in crop yield and quality. The NZIER did not quote any dollar estimates to express the beneficial impacts on amenity gardeners, Māori-grown crops, export growth and regional development but noted that the release of *T. triozae* may contribute towards achieving these unquantified benefits.

The costs associated with the release of *Tamarixia* and potential adverse effects it may cause were expressed in terms of the funds that New Zealand are willing to invest to curb biodiversity loss. The NZIER adopted this approach since *T. triozae* may be able to parasitise native psyllid species as was shown in host range testing performed in containment (Gardner-Gee 2012) and discussed below. The costs reflect the dollar amount society is willing to pay to prevent the loss of a native psyllid by eradicating *T. triozae* from New Zealand if it is shown to heavily parasitise a native organism. The NZIER estimated the costs to curb biodiversity loss to be $3.4m based on the amount spent by the Department of Conservation and Vegetables New Zealand to eradicate the pest great white butterfly that first arrived in New Zealand in 2010. The incursion of the butterfly threatened a number of native brassica species and had the potential to harm commercial brassica crops as well.

The benefits to cost ratio of releasing *T. triozae* was determined to be 2.1 at the lower end and 6.8 at the higher end. The authors noted that their economic assessment relied on a number of assumptions that were derived from international studies, a limited number of New Zealand studies, opinion from scientists, and interviews with industry. Therefore, their report should be considered a conservative estimate of the economic benefits and costs of introducing *T. triozae* since there are a number of uncertainties that needed to be taken into consideration, including establishment and efficacy of the parasitoid against TPP in New Zealand, and the potential adverse effects and the degree of those effects to New Zealand's biodiversity.

Potential costs of releasing *T. triozae*

The applicant identified the main potential risk associated with the release of *T. triozae* as being the potential for *T. triozae* to parasitise and kill native or valued introduced psyllids. As noted in the application, *T. triozae* was selected as a potential biocontrol agent because it has been recorded parasitizing a number of psyllids, including TPP, in its native habitat. The intended method of using *T. triozae* in most cases will be to introduce the parasitoid to cropping locations, with the intention of establishing a self-sustaining population, which will result in a reduced TPP burden on the cropping environment and nearby. This means that *T. triozae* will not be limited in its range through its intended use, but will be able to move freely throughout New Zealand and interact with other species present in New Zealand.

In order to better understand the potential risks that *T. triozae* poses to native and valued introduced psyllids (for example, the broom psyllid introduced to control the weed Scotch broom), the applicant commissioned host range testing to be undertaken. This was carried out by Dr Robin Gardner-Gee at The New Zealand Institute for Plant and Food Research (Gardner-Gee 2012) and is fully described in section 3.7 of the application. It is important to note that host range testing of *T. triozae* is limited by availability of potential hosts – not all native New Zealand psyllids are known, some psyllids are rare and others may be difficult to rear to sufficient numbers in captivity to conduct host range testing on. It is also important to note that host range testing does not represent actual environmental conditions, for instance parasitoids may not always be presented with a choice of hosts in the natural environment and in such close physical proximity like they might be in containment. Therefore, the results from laboratory based testing may not reflect actual behaviour in the wild.

Eight potential psyllid hosts were identified and tested to determine if they could be parasitised by *T. triozae*, and whether *T. triozae* could complete its lifecycle (thus emerge as an adult) with only the test species available as a host. The selection of potential hosts for testing was based on a range of information, including knowledge of the native range of *T. triozae* in North America, current knowledge of the distribution and ecology of New Zealand psyllids and their phylogenetic relatedness to TPP.

The eight psyllids tested were: *Trioza panacis* (houpara psyllid); *Trioza vitreoradiata* (pittosporum psyllid); *Trioza curta* (pōhutukawa psyllid); *Trioza* “Ohumata”; *Ctenarytaina clavata* (manuka psyllid); *Acizzia dodonaeae* (akeake psyllid); *Psylla apicalis* (kowhai psyllid); and the exotic beneficial *Arytainilla spartiophila* (broom psyllid).

Tamarixia triozae was able to parasitise two of the eight psyllids in the laboratory: *Trioza panacis* (houpara psyllid) and *Trioza curta* (pōhutakawa psyllid).

The results revealed that *Trioza panacis* is within the physiological host range of *T. triozae*, as it can support development of the parasitoid, which means that it may be attacked in the field. However, tests that determined the ability of the non-target psyllid to support healthy parasitoid offspring that can subsequently grow into mating adults showed that offspring fitness is compromised by using *T*. *panacis* as a host. The tests indicate that *T*. *panacis* is a low rank host which will not support successive generations of *T. triozae*. The tests also showed that mortality of *T*. *panacis* in the presence of *T. triozae* was not significantly different from mortality in the absence of the parasitoid, suggesting that *T. triozae* did not contribute to the death of the psyllid

The host range tests predicted that up to 21% of *Trioza curta* may die when *T. triozae* is given a choice between this non-target psyllid and TPP. Twelve percent of *Trioza curta* died due to other causes. We consider that mortality at this level should be viewed in light of the test conditions and the field conditions that *T. triozae* will encounter, as well as population dynamics of the native psyllid in its natural environment. No juvenile parasitoids emerged from any parasitised *T. curta* suggesting that this psyllid will not act as a field host for *T. triozae*.

Biological control researchers frequently note the difficulty in predicting population level effects on non-target species of an agent before release, and assessing population level effects (if any) post release. This is due to limited environmental monitoring data (e.g. the absence of life table analysis) and funding constraints. Thus, there is uncertainty regarding the magnitude of adverse effects on native species, should they occur, and the likelihood of any effects. Notwithstanding this uncertainty, it is important to take into consideration the results of host range testing that deliver important guidance to determine *T. triozae*-host acceptance, and other factors that support a parasitoid’s behaviour to first locate and then parasitise hosts in the natural environment. They include chemical cues that *T. triozae* employs to search for TPP and the potential for refuges created for native psyllids by their food plant preferences and geographic separation from cropping systems. These as well as other factors raised during the public consultation process will be discussed in the EPA Staff Assessment Report.

References

Butler, C. D. and J. T. Trumble (2012). "Identification and impact of natural enemies of *Bactericera cockerelli* (Hemiptera: Triozidae) in Southern California." Journal of Economic Entomology 105(5): 1509-1519.

Gardner-Gee, R. (2012). Risks to non-target species from the potential biological control agent *Tamarixia triozae*, proposed for use against *Bactericera cockerelli* in New Zealand: A summary of host-range testing, The New Zealand Institute for Plant and Food Research Limited: 22.

Liu, T.-X., Y.-M. Zhang, L.-N. Peng, P. Rojas and J. T. Trumble (2012). "Risk assessment of selected insecticides on *Tamarixia triozae* (Hymenoptera: Eulophidae), a parasitoid of *Bactericera cockerelli* (Hemiptera: Trizoidae)." Journal of Economic Entomology 105(2): 490-496.

Nixon, C. (2014). New Zealand Institute of Economic Research Report to *Tamarixia* Working Group: Economic assessment of *Tamarixia triozae*, NZIER: 24.

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