Brown Marmorated Stink Bug Workshop:

An imminent threat to Australia and New Zealand

   

Plant Health AUSTRALIA

B3 Science Solutions for BETTER BORDER BIOSECURITY www.b3nz.org

Workshop Proceedings

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EXECUTIVE SUMMARY

Plant Health Australia (PHA) and Better Border Biosecurity (B3), New Zealand held the Brown Marmorated Stink Bug: An Imminent Threat to Australia and New Zealand Workshop in Brisbane on 25th September, 2017. The workshop aimed to inform participants of activities being carried out in Australia and New Zealand on brown marmorated stink bug (BMSB). Participants were invited from the Australian and New Zealand governments, research organisations, funding bodies and industries. Speakers included representatives from the Australian Department of Agriculture and Water Resources, AUSVEG, Bio-Protection Research Centre New Zealand, Horticulture New Zealand, New Zealand Winegrowers, New Zealand Ministry for Primary Industries, Plant and Food Research New Zealand, Plant Health Australia and Better Border Biosecurity New Zealand. The plenary was delivered by Tim Haye (Centre for Agriculture and Bioscience International), who spoke about the international situation, BMSB biology and the use of biocontrol. The workshop was split into sessions on risk assessment pathways, detection methods, industry perspectives and management and a workshopping session. From the proceedings of the day a series of recommendations were developed as outlined below.

Recommendations

1. A repository for information on BMSB was seen as important by the workshop participants. Plant Health Australia has created a page on the biosecurity portal (biosecurityportal.org.au/Pages/BMSB-Landing.aspx).
2. The lures available for BMSB are based on aggregation pheromones and a synergist. These lures are considered to be effective for pest management but not for border surveillance. Based on the large amount of research investigating lures it seems unlikely that more effective lures can be found in the near future.
3. A surveillance strategy should be developed for Australia in consultation with work being undertaken in New Zealand.
4. Australia and New Zealand should continue to work to pre-register chemical controls (emergency permits) for BMSB prior to an incursion.
5. New Zealand is undertaking research to investigate biocontrol agents. Part of this assessment has tested some Australian native stink bugs which have been identified as susceptible to the most promising agent (samurai wasp). Work should be initiated in Australia to investigate the use of biocontrol agents as a preparedness measure for BMSB.
6. There are various models for predicting regions in which BMSB will establish in Australia and New Zealand, however, they provide conflicting information. However, they are indicate the risk of establishment for large parts of Australia and New Zealand. Improved information on areas BMSB could establish may better target risk assessment.
7. A greater understanding of BMSB biology might be useful including triggers for long distance dispersal[1] and the biological differences between the tropical and temperate forms of BMSB.
8. A study to determine the effect of BMSB on Australian and New Zealand native plant species could be carried out in a country where BMSB is present. Such a study could include information in preferences of BMSB on native species over crop plants and weed species and could involve the International Plant Sentinel Network.

[1] Human mediated dispersal is the most important form of dispersal within and between countries.

CONTENTS

INTRODUCTION

Brown marmorated stink bug (BMSB) is an insect pest that originates from Asia that is currently spreading rapidly throughout the world. It is now widespread in North America and Europe but no established populations have been recorded in the southern hemisphere, however, there is a small population in urban Santiago, Chile which is being considered for eradication. BMSB has an extensive host range and is a major nuisance and plant pest of significant economic importance. Since 2014, raised awareness of BMSB's potential destructive impact to Australia and New Zealand's valued plant systems and increasing border interceptions have led to a greater focus on border operations and research required to prevent its establishment and to reduce its potential negative impact.

ABOUT THE WORKSHOP

The Brown Marmorated Stink Bug: An Imminent Threat to Australia and New Zealand Workshop was held in Brisbane on Monday 25th September, 2017 and was coordinated by Better Border Biosecurity (B3) and Plant Health Australia (PHA). The workshop was attended by participants from Australian and New Zealand industries, governments and research agencies in order to review the potential impact of BMSB in Australia and New Zealand. The workshop also aimed to examine current and planned activities across the biosecurity spectrum to answer key questions about risk assessment, pathway risk management, diagnostics, surveillance and eradication, including pro-active consideration of BMSB biological control agents.

The workshop was split into six sessions, as outlined in the agenda below, including a workshop session which presented participants with one of four different scenarios.

PowerPoint presentations from the workshop and other BMSB materials are available on the Biosecurity Portal site: biosecurityportal.org.au/Pages/BMSB-Landing.aspx.

WORKSHOP AGENDA

TIME	ITEM	PRESENTER
Introduction Session		
1:00pm	Welcome	David Teulon – Better Border Biosecurity (B3), New Zealand
1:10pm	Keynote- A World View of BMSB	Tim Haye – Centre for Agriculture and Bioscience International
Session 1: Risk Assessment Pathways		
1:40pm	Risks to New Zealand	Ed Massey – New Zealand Winegrowers
	Risks to Australia	Brian Garms – Department of Agriculture and Water Resources
	A Generic Risk Assessment Tool	Lisa Jamieson – Plant and Food Research, New Zealand
Session 2: Detection Methods		
2:25pm	Detection in Confined Spaces	Laura Nixon – Bio-Protection Research Centre
	Fit for Purpose Trapping	Catherine Duthie – New Zealand Ministry for Primary Industries
Session 3: Industry Perspectives		
	New Zealand	Richard Palmer – Horticulture NZ
	Australia	Jessica Lye – AUSVEG
3:25 pm – Afternoon Tea		
Session 4: Management		
3:55pm	Treatments for Transit	Adriana Najar-Rodriguez – Plant and Food Research, New Zealand
	Insecticides for Incursion Responses	Catherine Duthie – New Zealand Ministry for Primary Industries

TIME	ITEM	PRESENTER
	Pre-emptive Biocontrol of BMSB	Gonzalo Avila – Plant and Food Research, New Zealand
Workshop Session		
4:30pm	Scenarios	Sharyn Taylor – Plant Health Australia Victoria Ludowici – Plant Health Australia
Summing Up		
5:20pm	New Zealand	David Teulon – Better Border Biosecurity (B3), New Zealand
	Australia	Sharyn Taylor – Plant Health Australia
5:30 pm – Close		

PROCEEDINGS

Introduction Session

Welcome

David Teulon, Better Border Biosecurity, New Zealand (B3 NZ), provided a brief overview of BMSB, its geographic range and outlined the structure, aims and objectives being sought from the workshop.

Keynote- A World View

Tim Haye, Centre for Agriculture and Bioscience, International (CABI), provided a summary the BMSB situation around the world, with a particular focus on Europe. BMSB is found in Europe, North America, the Near East (Georgia), and across Asia including China, Japan, Korea, Myanmar, Taiwan and Vietnam. The colouring of BMSB can vary greatly depending on the environment. Adult BMSB have distinctive spikes on the thorax. Eggs are laid in clusters of 28 there are five nymphal stages.

Figure 1: A typical specimen from invasive BMSB populations (Switzerland) (Photos: T. Haye, CABI).

BMSB has an incredibly broad host range of more than 100 host plants. European populations will feed on most plants that have unripe fruit but favour native European species such as holly, *Sorbus* and *Acer*, in addition to crop plants, such as pear, apple, bean and hazelnut. BMSB causes more damage in warmer regions as they can have more than one generation per year. For example, populations in Switzerland generally have one generation per year, whereas populations in Mediterranean regions (such as Italy or Georgia) have two generations per year. Because of the cold climate in Switzerland, BMSB is mainly an urban pest, causing little damage in agricultural systems, however, in 2017 BMSB caused more damage than expected in areas north of the Alps due to warmer than usual weather conditions.

BMSB have been intercepted at the Australian and New Zealand borders on multiple pathways such as machinery, shipping containers and cars particularly during September to April. This is because BMSB aggregate during overwintering periods at their Northern Hemisphere source. January is considered a particular risky time for a Southern Hemisphere BMSB incursion as aggregated populations are ready to oviposit about two weeks after they are introduced to a warmer climate, such as at a port in Australia or New Zealand. BMSB also has a high survival rate after overwintering of up to approximately 28 per cent.

Modelling suggests that areas in Australia and New Zealand are suitable for BMSB establishment. The east coast of Australia, south west Western Australia and the North Island of New Zealand have been predicted to be suitable for the establishment of BMSB. However, different models vary with some suggesting that Queensland and the South Island of New Zealand would also be suitable for BMSB populations. The populations in topical areas of southern China are geographically isolated and genetically different to populations in central and northern China which are the source of the worldwide invasive populations. Since in tropical regions populations do not aggregate for overwintering, they are less likely to be moved with goods to other parts of the world.

There are a number of lures and traps commercially available in the US for BMSB. These are all based on the BMSB aggregation pheromone and a synergist and have been used in attract and kill traps. The effectiveness of these traps has been well studied, but they are not especially useful for border surveillance. Biological controls are currently being investigated in Europe and the US.

Session 1: Risk Assessment Pathways

Risks to New Zealand

Ed Massey, New Zealand Winegrowers, presented on the risks BMSB poses to New Zealand's agricultural industries. BMSB is considered a 'pan horticulture problem' due to its very broad host range and it is estimated that losses could reach 4.2 billion NZD if BMSB established in New Zealand.

In addition to direct damage to fruit, BMSB injury can lead to secondary infection by bacterial and fungal pathogens, in particular powdery mildew which is a serious problem in New Zealand's horticultural industries. It was also noted that integrated pest management systems that are currently in place to control established pests and diseases may be disrupted by the introduction of BMSB, due to the need to spray. A BMSB incursion may also affect market access, not only due to the presence of BMSB but also the potential need to exceed maximum residue limits to control the pest. This is especially true for premium markets. In some products, such as red wine, BMSB may lead to taint due to the production of defensive volatiles.

BMSB is also an urban problem overseas with the bug aggregating in very large numbers in or on any suitable structure including houses.

Given the risks posed by this pest and others, New Zealand Winegrowers signed the Government Industry Agreement for Biosecurity Readiness and Response Deed. New Zealand Winegrowers has also signed the BMSB Operational Agreement. This agreement covers a response strategy, research into new control measures and an awareness campaign to improve preparedness for BMSB.

Risks to Australia

Brian Garms, Australian Department of Agriculture and Water Resources, outlined the level of BMSB interceptions at the Australian border and activities the government is taking to mitigate that risk. In 2010–11 and 2012–13, machinery imported from USA were carrying more BMSB than in previous years and since then there have been many consignments recorded as having live or dead BMSB present (Figure 2). When the numbers of BMSB intercepted are mapped over the year, it was found that the BMSB season starts in September and drops off in April. This matches the times when BMSB are aggregating to overwinter in the northern hemisphere.

Figure 2: BMSB found in machinery at the Australian border (circled) (Photo: Department of Agriculture and Water Resources).

The increased number of BMSB interceptions triggered a change in import conditions in 2014 for machinery from the US, including all vehicles, vessels, large machinery and parts transported as break bulk or containerised cargo. During BMSB season all machinery, vehicles, parts etc must be treated before export from USA. There are three approved treatments, sulfuryl fluoride, methyl bromide and heat treatment that must be used in accordance with the following treatment windows:

- Break bulk goods treated before 1 December 2017 must undergo treatment within 96 hours of loading.
- Break bulk goods treated on or after 1 December 2017 are not considered likely to become re-infested, so are not subject to a treatment window.
- Containerised goods sealed in the container immediately after treatment and arriving seals intact are not subject to a treatment window.

There have been no interceptions of BMSB on fruit and there are currently few interceptions on goods coming from Europe. However, due to the large numbers of interceptions coming from Italy to New Zealand the Australian Government has been carrying out targeted inspections of goods arriving from other countries of BMSB concern, particularly Italy.

Although the Australian Government has been placing pheromone traps at some ports, they are not considered to be a fully effective detection measure, as any live BMSB adults that might come off transported goods are unlikely to respond to the trap pheromone until they feed and become sexually mature. Therefore there is likely to be a delay between any adults becoming active and detection in the trap.

A draft pest risk analysis for brown marmorated stink bug can be found at:

www.agriculture.gov.au/biosecurity/risk-analysis/plant/brown-marmorated-stink-bug.

A Generic Risk Assessment Tool

Lisa Jamieson, Plant and Food Research New Zealand and B3, provided an update on a project being carried out to assess which entry pathways present the greatest risk for BMSB entry into New Zealand and will help determine if treatments are needed for cargo from BMSB countries. Given the current data on interceptions, a Generic Risk Assessment Model has confirmed that new and used vehicles represented the main pathway of entry into New Zealand from BMSB countries and that new cars from North America represent the greatest risk at the time of analysis. The model was also used to ascertain which port in New Zealand represented the greatest risk. Auckland was identified as receiving the greatest number of BMSB adults by entering import trade patterns of new and used vehicles and the ports of entry into the model. The model confirmed that September to April was considered to be the time where the greatest numbers of adult BMSB arrive at ports in New Zealand.

The model is being used to inform the economic, environmental, human health and social and cultural costs (or impacts) associated with an establishment and spread event occurring at an infection point. This model is also being applied to other pest species that are exotic to New Zealand.

More information on the preliminary model is available in Jamieson LE, Woodberry O, McDonald CM and Ormsby M (2016) Developing a generic biosecurity risk assessment model for imports. *New Zealand Plant Protection* 69:186-199.

Session 2: Detection Methods

Detection in Confined Spaces

Laura Nixon, Bio-Protection Research Centre and B3, outlined research underway to improve the detection of BMSB in shipping containers using volatile organic compounds released by BMSB. Currently the detection of BMSB is based on visual inspection. Using this method, it can be difficult to detect BMSB as they can hide inside machinery and vehicles. A method to detect BMSB using volatile organic compounds released during passage is being investigated. Initial results show that tridecane, (E)-2-decenal, 4-oxo-(E)-2-hexenal and dodecane are all released by BMSB during diapause and in BMSB which had diapause disrupted. Tridecane made up the greatest proportion of volatile organic compounds detected, however, it was not considered to be a good candidate to detect BMSB as it is released by many insects.

The study also simulated the journey from Baltimore, USA to Auckland, NZ by ship and examined if the changes in temperature and movement of populations of BMSB affected the mortality of BMSB. It was found that 90 per cent of BMSB populations were dead by the last day of the trial (simulated arrival in Auckland). On this same day 26 per cent of the surviving BMSB were mobile. A related study also looked at BMSB communication (vibrations), however, the signals were not consistent. More work needs to be done to determine the feasibility of using volatiles and/or vibrations as signals for the detection of BMSB in confined spaces.

Fit for Purpose Trapping

Catherine Duthie, New Zealand Ministry for Primary Industries (MPI), presented on work commissioned by NZ MPI and being carried out in USA by Tracy Leskey, Agricultural Research Service, US Department of Agriculture. The study aims to find the most cost-effective trap design and lure formulation and to determine if nymphs as well as adults can be detected using trapping. Currently in the US there are BMSB lures commercially available from two companies, Trece and AgBio. These lures are both based on BMSB aggregation pheromones in combination with a synergist. A high loading of the lure produced was found to be more effective at attracting BMSB overall. Both lures were found to be less effective early in the season, when BMSB is actively feeding.

The lures were incorporated into two trap types, a pyramid trap and a sticky trap (Figure 3). Staked sticky traps were shown to be the best trap type for attracting adult BMSB when compared with standard pyramid and sticky traps hanging in tree canopies. There were no differences across the different trap types in attracting BMSB nymphs. Clear sticky traps have been shown to be better for use to attract BMSB than yellow sticky traps, as there is lower by-catch. Clear sticky traps are also more cost effective than pyramid traps. Further work needs to be carried out on other potential deployment methods for the lures and the most cost effective lure loading for traps that could be used during surveillance.

Figure 3: Pyramid BMSB trap (left) and clear sticky trap (right) (photo: Tracy Leskey, US Department of Agriculture)

Session 3: Industry Perspectives

New Zealand

Richard Palmer, Horticulture New Zealand, summarised the activities being carried out by industry in partnership with the New Zealand Government around BMSB. New Zealand industries and MPI have worked together to form a BMSB Council under the auspices of the New Zealand Government Industry Agreement (GIA) for Biosecurity Readiness and Response. This council has been set up to lead the development of an operational agreement to prepare for, and respond to, an incursion of BMSB. Membership of this council includes representatives from the GIA Secretariat, MPI, Horticulture NZ and a number of representatives from New Zealand's agricultural industries. The Council is focusing on raising public awareness, developing response plans and helping secure funding arrangements for strategic BMSB RD&E.

In March 2017, a workshop was held at the end of the Horticulture Industry Forum in Wellington. This workshop was attended by numerous stakeholders and included a simulation exercise testing the basis for an emergency response, with a focus on the ways industry can support a BMSB emergency response.

New Zealand's plant industries are also working on international collaboration opportunities and a research visit to Chile to pre-emptively test the developed response measures.

Australia

Jessica Lye, AUSVEG, provided an update of a study tour of the US which she undertook earlier in the year. On this trip she visited research labs that are currently working on BMSB including labs in California, Oregon, Washington State, Florida, North Carolina, Maryland, Delaware, Pennsylvania and New Jersey. The tour aimed to raise industry awareness of BMSB, help guide implementation of new biosecurity preparedness activities and development of international relationships with researchers working on BMSB. The US has a Stop BMSB Program (stopbmsb.org) which aims to increase understanding of environmental factors affecting damage to crops and implementing biological control. This program is currently in its second phase and the research being carried out broadly falls into six areas:

- urban IPM
- understanding phenology
- innovative trapping
- practical techniques
- biological control
- area wide management

Some of the highlights raised during the presentation were the design of a BMSB trap that can be made using a 3D printer, the study of BMSB hosts in the US (including the invasive species tree of heaven (*Ailanthus altissima*)) and the introduction of biocontrol agents. From this trip a series of recommendations were developed:

- invest in development of innovative trapping technologies
- learn from currently used effective practices overseas
- conduct BMSB host range testing on Australian native species in countries with BMSB
- focus on education and awareness for urban dwellers and port workers
- develop a first detector system at high risk areas to expand on Commonwealth inspections
- determine economic impact down to regional level
- gain pre-agreement on interstate phytosanitary protocols and proof of freedom requirements

Session 4: Management

Treatments for Transit

Adriana Najar-Rodriguez, New Zealand Plant and Food Research and B3, summarised research on optimising BMSB treatments for trade. Since 2015, New Zealand MPI has imposed a mandatory pre-export treatment of vehicles, machinery and other cargo from the USA with methyl bromide, sulfuryl fluoride or heat treatment. The current prescribed rates for treatment are at 10–15°C a rate of 48 g/m^3 for 24 h for methyl bromide and 16 g/m^3 for 12 h for sulfuryl fluoride; at 15°C or above the rates for both chemicals are 16 g/m^3 for 12 h.

This research has found that a related pentatomid, the green vegetable bug (*Nezara viridula*), has a similar response to BMSB to the methyl bromide, but sulfuryl fluoride is yet to be tested. The two bug species are anticipated to have a similar response due to the mode of action of the two fumigants tested. Because of the similarities, it is possible that the green vegetable bug could be used as a surrogate species for testing new treatment regimens. This is dependent on the sulfuryl fluoride results. Having a surrogate species for BMSB is important as it is not yet in New Zealand, making research on BMSB and chemical treatments to control it difficult. Preliminary results suggest that the overwintering populations of BMSB are more resistant to treatment than the summer forms of BMSB and possibly green vegetable bug. Consequently further testing needs to be carried out on overwintering BMSB to test optimal application rates. Further work is also planned to test heat treatments and ethyl formate.

Insecticides for Incursion Responses

Catherine Duthie, New Zealand MPI, outlined the work that MPI is doing to pre-register insecticides for BMSB in the event of an incursion. Currently Talstar (active ingredient Bifenthrin) is approved for emergency use on BMSB, however, this is a stop gap measure and the application rate is very high and treated crops cannot enter the food chain. A literature review was carried out and over 200 chemical products were reviewed. Most of the research was aimed at economic control of BMSB in broadacre agriculture and not at eradication. There was little research on the effect of chemical treatments on BMSB nymphs and eggs. There was also little research which took BMSB behaviour into account, such as dispersal and avoidance of treated surfaces.

The results of the literature review were passed onto a Technical Advisory Group, which included representatives from research institutions, NZ government departments and consultants. Three chemical treatments, Permethrin, Bifenthrin and Dinotefuran, were recommended for further investigation. Currently Dinotefuran and Permethrin are not registered for use on crops in New Zealand. There is a registration for Bifenthrin but at much lower rates than is used to control BMSB in USA. Further work needs to be done with New Zealand's Environmental Protection Authority (EPA) to ensure that any desired treatments for emergency use are registered in New Zealand and are workable within any EPA imposed controls. A public health risk assessment needs to be carried out and suitable agricultural aviation operators identified for any aerial application of the insecticide deemed necessary. Research also needs to be carried out to understand BSMB behaviour in response to exposure to key insecticides over short intervals and evaluate the efficacy of a range of insecticides and insecticide mixes against different BMSB life stages.

Pre-emptive Biocontrol of BMSB

David Teulon, Plant and Food Research and B3 NZ, spoke on behalf of Gonzalo Avila and provided a summary of the programme to investigate the use of the samurai wasp, *Trissolcus japonicas*, as a biocontrol for BMSB in New Zealand prior to a BMSB incursion. The samurai wasp is a solitary egg endoparasitoid and good candidate for a biocontrol agent as the adults are long lived and there are more generations per year than BMSB. The wasp is an effective natural enemy of BMSB overseas. Generally, countries wait until a pest is present to approve a new biocontrol introduction. However, this project aims to assess the impact of the samurai wasp on native New Zealand and introduced stink bugs species prior to a BMSB incursion. Of the species tested only the green vegetable bug, *Nezara viridula*, was not a host to the samurai wasp. All other species tested were hosts, to some degree. It should be noted that these tests were in the laboratory and further testing to establish preferred hosts would provide additional information. There is a New Zealand native alpine bug species that wasn't tested as it was unable to be found at the time of testing. It was also noted that this biocontrol agent (the samurai wasp) might not be suitable for Australia as there are a many native stink bugs in Australia which may be hosts for the samurai wasp.

Workshop Session

The participants of the workshop were asked to split into four separate groups. A series of hypothetical situations with a series of questions were distributed to the groups and participants were asked to summarise the key issues for each scenario. The key issues are summarised below.

Scenario 1: Eradication response

Hypothetical situation

BMSB has been found in two warehouses at a port in an urban area. The information has been reviewed by the appropriate authority and it has been decided that an eradication response will go ahead.

Key issues

In order for an eradication to be successful, information on optimal disinfestation techniques for different materials (eg plant material, buildings etc) is required. It was also noted that an early detection of BMSB is unlikely to occur at a warehouse near a port, as any surviving BMSB that enter Australia or New Zealand are most likely to go in search of food rather than aggregate in a warehouse. Due to this, and the current lures being based on aggregation pheromones, information on the potential lag-time between BMSB entering the country and being responsive to such lures is required. Further research into chemical controls is needed as BMSB has not been eradicated anywhere to date and the effective ones are broad spectrum.

Methods for delimiting surveillance are required if an eradication is to be carried out successfully. Information about native plant host preference would be useful to inform a delimiting surveillance plan and an eradication response. Study of sentinel plants overseas could provide this information.

Scenario 2: Regional containment

Hypothetical situation

BMSB has been found in agricultural, urban and peri-urban areas on an island. The information has been reviewed by the appropriate authority and it has been decided that eradication is not technically feasible. As there have been no detections in other areas, it has been decided that a regional containment program should be implemented to restrict the potential movement of BMSB to other production areas.

Key issues

If BMSB were found in Australia or New Zealand and regional containment was attempted a greater understanding of surveillance would be required. The sensitivity of trapping is not well understood and BMSB lures are considered to be effective, with the potential exception of the period after adult BMSB exit diapause and before they become sexually mature. A model to help target surveillance efforts was seen as a RD&E gap. However, information on native hosts is required to aid in both prediction of BMSB spread and surveillance efforts.

Australia has many stink bugs which could be easily confused with BMSB. A factsheet comparing BMSB with stink bug species from Australia would be useful in this scenario and as a preparedness resource. A factsheet like this would also be useful for preparedness prior to a BMSB incursion.

In the event of regional containment, regional controls would need to be established. Guidelines around this could be formed, however, this may be difficult as the guidelines would need to be specific to different regions.

Scenario 3: Management

Hypothetical situation

Two years ago BMSB was detected in a peri-urban region and a second agricultural area. Due to the wide spread detections, no eradication or regional containment program remains in place and it is left to growers to manage the pest as part of their ongoing operations.

Key issues

In order to be able to manage BMSB, if it were to establish in Australia or New Zealand, control regimes will need to be developed that are compatible with existing IPM systems. This includes more options for chemical control, chemical registration, cultural controls (e.g. netting) and biocontrols. It was noted that New Zealand is currently working to pre-register chemical controls and biocontrol agents before an incursion of BMSB. Currently the control measures overseas involve chemical controls therefore an understanding of residues would be useful. Understanding the movement of BMSB between native vegetation and urban areas into production areas would be useful in the event of BMSB establishing, but also in predicting potential spread prior to and during an outbreak.

A greater understanding of BMSB biology is required including triggers for long distance dispersal by flight and the differences between the tropical and temperate forms of BMSB. Information about the biology could then be used to predict the severity of outbreaks. This includes the potential for BMSB to survive Australian and New Zealand winters. Such information could be useful in the current situation for better targeting surveillance.

Scenario 4: BMSB not present

Hypothetical situation

BMSB is not known to occur in Australia or New Zealand. The pest has never been picked up in any post border targeted or general surveillance activities. Both countries are able to trade under a declaration of pest freedom. This aligns to the real current situation.

Key issues

An assessment of effectiveness in pre- and post-border surveillance was seen as a potential area of study. The workshopping group highlighted the need to ascertain if both countries are confident that the surveillance being carried out will detect BMSB early enough to eradicate. The workshop group raised the importance of having a response plan prior to incursion and linking this to current surveillance arrangements. In Australia, pre-agreement between the states on arrangements in the event of an incursion was also seen as important. An understanding of BMSB preference for native hosts was called for and this information should feed into the response plan. The International Plant Sentinel Network was raised as a potential source for this information.

Summary

Summaries from Australian and New Zealand perspectives were provided by Sharyn Taylor, Plant Health Australia and David Teulon B3 NZ, respectively. New Zealand is currently doing focussed research efforts on BMSB and Australia is focussing on other pests. Although the two countries are working together, it was felt that there should be more effort on sharing information and holding events where research efforts could be shared.

It was seen as important for B3 and PHA to work closely with the Plant Biosecurity Research Initiative[2], especially as the Plant Biosecurity Cooperative Research Centre will be winding up in June 2018. PHA agreed to set up a BMSB site on the Biosecurity Portal to act as a repository for the presentations from the workshop and other useful BMSB information[3].

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[2] More information about the PBRI can be found at http://horticulture.com.au/wp-content/uploads/2017/08/PBRI-QAs-080817.pdf

[3] The BMSB workshop site can be found at biosecurityportal.org.au/Pages/BMSB-Landing.aspx

RECOMMENDATIONS

1. A repository for information on BMSB was seen as important by the workshop participants. Plant Health Australia has created a page on the biosecurity portal (biosecurityportal.org.au/Pages/BMSB-Landing.aspx).
2. The lures available for BMSB are based on aggregation pheromones and a synergist. These lures are considered to be effective for pest management but not for border surveillance. Based on the large amount of research investigating lures it seems unlikely that more effective lures can be found in the near future.
3. A surveillance strategy should be developed for Australia in consultation with work being undertaken in New Zealand.
4. Australia and New Zealand should continue to work to pre-register chemical controls (emergency permits) for BMSB prior to an incursion.
5. New Zealand is undertaking research to investigate biocontrol agents. Part of this assessment has tested some Australian native stink bugs which have been identified as susceptible to the most promising agent (samurai wasp). Work should be initiated in Australia to investigate the use of biocontrol agents as a preparedness measure for BMSB.
6. There are various models for predicting regions in which BMSB will establish in Australia and New Zealand, however, they provide conflicting information. However, they are indicate the risk of establishment for large parts of Australia and New Zealand. Improved information on areas BMSB could establish may better target risk assessment.
7. A greater understanding of BMSB biology might be useful including triggers for long distance dispersal[4] and the biological differences between the tropical and temperate forms of BMSB.
8. A study to determine the effect of BMSB on Australian and New Zealand native plant species could be carried out in a country where BMSB is present. Such a study could include information in preferences of BMSB on native species over crop plants and weed species and could involve the International Plant Sentinel Network.

[4] Human mediated dispersal is the most important form of dispersal within and between countries.

APPENDIX 1: ADDITIONAL INFORMATION

Australian Department of Agriculture and Water Resources sites

Draft pest risk analysis report for brown marmorated stink bug

agriculture.gov.au/biosecurity/risk-analysis/plant/brown-marmorated-stink-bug

Factsheet

agriculture.gov.au/pests-diseases-weeds/plant/brown-marmorated-stink-bug

99-2017 – Brown Marmorated Stink Bug (BMSB) Risk Season 2017-18 – Extension of treatment window for some break bulk cargo ex-Italy

agriculture.gov.au/import/industry-advice/2017/99-2017

91-2017 – Brown Marmorated Stink Bug risk season 2017-18

agriculture.gov.au/import/industry-advice/2017/91-2017

76-2017 - Brown Marmorated Stink Bug Season 2017-18

agriculture.gov.au/import/industry-advice/2017/76-2017

BMSB workshop site

biosecurityportal.org.au/Pages/BMSB-Landing.aspx

New Zealand Ministry for Primary Industries sites

BMSB Alert

mpi.govt.nz/protection-and-response/responding/alerts/brown-marmorated-stink-bug/

Factsheet

mpi.govt.nz/dmsdocument/10784-brown-marmorated-stink-bug-fact-sheet

Plant Health Australia BMSB factsheet

planthealthaustralia.com.au/pests/brown-marmorated-stink-bug/

United States Department of Agriculture

Stop BMSB programme

stopbmsb.org