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Thrips management in the green beans industry

HAL R&D project no.: VG07017

Establishing the threat levels of thrips and how to combat them.

Vegetable soil health systems for overcoming limitations causing soilborne diseases

HAL R&D project number: VG09038

Recognising the links between healthy soils and healthy crops.

Thrips management in the green beans industry

Grower paddock at flowering stage

*The chemical dimethoate has recently been reviewed in a 2011 Dietary Risk Assessment and some restrictions for the use of the chemical have been implemented. **Currently there is no suspension placed on the use of dimethoate for beans, as illustrated in project VG07017**. For more information on what restrictions are in place for dimethoate please visit: http://www.apvma.gov.au/products/review/current/dimethoate_a_z.php

Introduction

Green beans attract a range of insect pests from the moment they germinate. During the flowering stage, it is thrips which are by far the greatest challenge for growers from Tasmania to north Queensland. These very small insects, usually 1-2mm in length, can cause anything from light scarring to severely twisted and scarred pods which are rejected at harvest. A lot of this damage begins within the flower when the pods are being fertilised and where the thrips are protected, making them extremely difficult to control.

Identifying species

Identifying thrips species will allow growers and consultants to determine if the thrips are responsible for the damage seen on the bean pods. Thrips numbers can be assessed by placing yellow sticky traps throughout the crop and examining them regularly, while the identification of the thrips species needs to be carried out using a microscope. To date, 13 different thrips have been identified from both leaves and flowers of green beans.developed to provide options for integrated weed management using three key steps:

About the project

This project, which was facilitated by Agri-Science Queensland, featured two key components."We investigated alternative chemical control options and application methods at sites in Queensland and Tasmania, and we also examined whether there is any link between thrips and 'wind scorch' under Tasmanian growing conditions," explained project leader John Duff.

Queensland Component

The trial work in Queensland concentrated on finding suitable insecticide control options in addition to those currently registered. The following product formulations were used:

Insecticide Products	Active Ingredients	Chemical Group	Chemical Company
Actara	thiamethoxam	4A	Synagenta Crop Protection
Confidor	imidacloprid	4A	Bayer Crop Science
Dimethoate	dimethoate	1B	Nufarm
Durivo	thiamethoxam+ chlorantraniliprole	4A/28	Syngenta Crop Protection
HGW86 (Czay-pyr)	cyantraniliprole		DuPont Australia
Lannate	methomyl	1A	Crop Care Australasia
Movento	spirotetramat	23	Bayer Crop Science
Success 2	spinosad	5	Dow AgroSciences
Samurai	clothianidin	4A	Sumitomo Chemical

Different application methods, such as ground application at planting and foliar application at flower bud formation, were also investigated.

Queensland Research Findings

The Success™ treatment during the autumn 2008 trial appeared to give the best return on healthy pods, however this was not the case when applied as a mix with *dimethoate during the 2010 autumn trial. No other treatment performed significantly better than the unsprayed control treatment with regards to pod damage. Movento and those treatments with Success™ significantly reduced the larval populations, especially during the autumn trials.

There was a distinct difference in population numbers during the season. Although there were high populations of thrips in spring (up to 5 thrips per flower in the unsprayed control) nearly 90% of the pods were still marketable. This was regardless of the treatment being applied and including the unsprayed control. In spring *Frankliniella occidentalis* was the most prevalent thrips (2.8-27.6 thrips per 10 flowers) and *Megalurothrips usitatus* numbers were very low (0-0.25 thrips per 10 flowers). In contrast, the autumn plants suffered severe pod damage, and on average, only half the pods were marketable. This period corresponded with higher numbers of *M. usitatus* in the flowers, while *F.occidentalis* numbers were variable, suggesting that *M. usitatus* might be more responsible for pod damage than *F. occidentalis.*

Tasmanian Component

The work in Tasmania centred around determining whether scarring on green beans is due primarily to 'wind scorch' from the strong westerlies experienced each year across Tasmania, thrips damage at flowering or a combination of both. Wind exclusion trials were carried out during the 2008/09 and the 2010/11 growing seasons in order to compare 'wind scorch' with known thrips damage and the interaction of the two. This was accomplished by trying to exclude thrips from plots by repeat applications of an appropriate insecticide. Alternative insecticides were also examined for use under Tasmanian growing conditions.

Tasmanian Research Findings

The results confirmed that the major cause of wind-scorch is indeed wind. Nevertheless, thrips do damage pods and wind may intensify the symptoms of damage. The installation of wind-breaks may reduce the incidence of these symptoms and increase the yield of marketable pods, however there are concerns that they may also increase the incidence of disease. Since there are many variables involved, the disease severity will be unpredictable. and Karate® gave the best control of thrips, both in the wind exclusion trials and the insecticide trials, while the majority of other insecticides tested were not much different from the untreated control.

Wind barriers used on individual plots in Tasmania

Conclusion

Correct identification of the thrips is vital for effective management. So, too, is an understanding of the damage caused by the different species. The number of known pest thrips found within the flowers or on the plant can help in developing thresholds that can then be used when deciding whether to spray a crop and allow the grower to better tailor insecticide sprays.

Life table studies for all the thrips species during the growing season needs to be undertaken to investigate when the different thrips species appear, peak and decline in numbers. Ideally this should be carried out in each major growing region to determine what thrips are present and causing the damage commonly seen on green beans. Knowing just where the adults lay their eggs will help growers better target their limited insecticides to the site where the larvae are due to emerge, potentially getting better control of this pest in the green beans.

The Bottom Line: VG07017

- Correct identification of thrips is vital in order to implement an effective management Program.
- Certain species of thrips are more damaging than others.
- The Success™/dimethoate treatment offers the most effective control for adult thrips, while the Success™ and the Movento treatments used individually are the best at controlling larvae in the flowers.

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Vegetable soil health systems for overcoming limitations causing soilborne diseases

Thrips in flowers

Introduction

Reliance on off-farm inputs has increasingly become a substitute for good farming knowledge by lessening the focus on the interaction between soil function and crop growth. But growers' mindsets are gradually changing due to the loss of agri-chemicals, increasing input costs, tighter regulations, and a desire to improve the land and environment for the next generation. Soil health research is also playing an important part by increasing our understanding of the role played by soil biology and soil organisms when it comes to supporting crop production and suppressing disease.

The need for research

On many vegetable farms, the inputs needed to sustain productivity levels can come at the expense of soil health, resulting in reduced "workability" of the soil and increases in pests and diseases. A research project currently underway at the QLD Department of Employment, Economic Development and Innovation in collaboration with the NSW Department of Primary Industries is aiming to increase our understanding of the underlying constraints of soil, how best to manage these limitations, and the important role of soil biology.

"The understanding of soil biology has long been neglected due to the difficulty in measuring the organism, the diversity of the organisms and their dynamic behaviour," explained project leader Tony Pattison. "The improvement in soil biological measurements and understanding of the role of soil organisms has meant that we can apply this knowledge to improve our farming systems and make them less reliant on off-farm inputs."

Project components

A number of innovative vegetable producers have already recognised the importance of soils and soil biology to their farming operations and are allowing their systems to be validated and monitored as "test cases" to develop soil health indicators. However, other growers are interested in improving soil health but not willing to risk possible losses in production while new systems take effect. In order to remove some of this risk, field trials investigating different farming systems with in-depth analysis of crop and soil components are being conducted in vegetable production areas at Bowen, south-east Queensland and in the Sydney basin. Physical, chemical and biological components of the soils are being measured in order to increase the understanding of what is happening in the soil under different systems. The relationship between soil borne diseases (suppression or increase) and other soil biological indicators is a particular focus, with soil biology being the most susceptible component to changes imposed by management practices.

"A large, active and diverse soil biology relies on the physical and chemical components of the soil, which is directly affect by soil management. For example, tillage, nutrient applications, organic matter inputs, the types of crops and cropping sequence will all impact on the soil biology in some way, either negatively or positively," Dr Pattison said.

Thrips damage

Findings to date

• The healthier the soil, the bigger the plant protection buffer. e.g. no tillage systems with increased organic C and a well developed soil food web structure have developed a soil biology to suppress plant-parasitic nematodes, which can be maintained after soil disturbance.

• Growers who identify soil constraints and limitations before changing farming systems can plan and apply appropriate management to overcome the limitations and monitor soil changes in the new system.

• Current farm management practices cannot be directly transferred to a new cropping system without some production losses. For example, a minimum tillage system using organic instead of plastic mulch would require "priming" of the system to ensure good cover crop growth to provide adequate mulch, adaptation of machinery for planting, careful irrigation scheduling and close monitoring of nutrient applications.

• Soils from farms with large, active and diverse soil biology tend to provide greater suppression of disease organisms, even after soil disturbance.

• The system that is most suitable for improving vegetable soil health may not be the same for each crop or region. For example, application of compost may be more cost effective in the Sydney region due to the close proximity of suppliers and continuous cropping. In north Queensland, minimum tillage and summer mulch systems may be more effective due to heavy summer rains and the large scale of production.

Conclusion

Multiple benefits are obtained from healthy soils. These can be tangible (reduced input costs, reduced fuel costs, timeliness of planting and harvesting) and non tangible (disease suppression, nutrient recycling, and reduced erosion).

To ensure that the soil health research meets the needs of Australian vegetable producers, strong links are needed between on farm practices, field trials and laboratory measurements and studies. The benefits for soil systems may not be immediately obvious, but should become apparent in subsequent years.

The Bottom Line: VG09038

- Healthy crops cannot be achieved without healthy soils.
- Soil biology is the most important component of disease suppression in soils.
- Resilient soil will buffer plants and rebound quickly from imposed stresses.

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