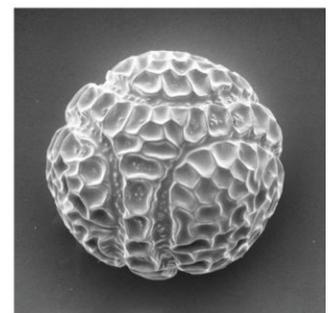
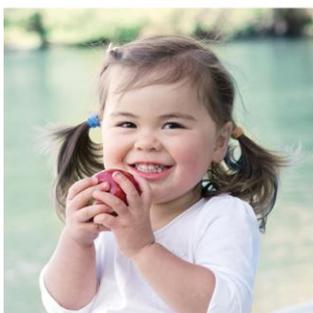
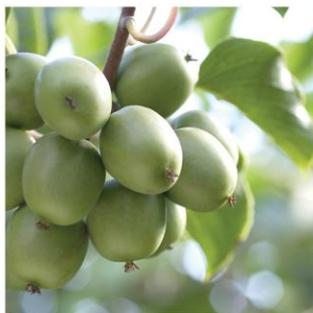
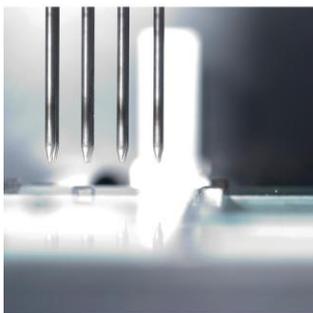
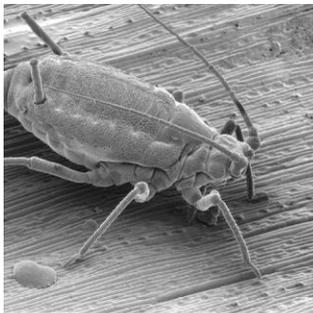


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A survey of pests and diseases on New Zealand covered crops

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A survey of pests and diseases on New Zealand covered crops

Chng S and Scott I

Executive summary

The New Zealand covered crops sector includes tomatoes, capsicums, chillies, lettuces, eggplants, cucumbers, sprouted beans and courgettes. Of these, tomatoes and capsicums are the two major crops grown in New Zealand supplying both local and overseas markets. Some of the principal export markets of NZ-grown tomatoes and capsicums include Australia, Japan and many other Pacific Rim and Pacific Island countries. The covered crop industry is continuing to seek improved access to countries including USA, Korea and China.

Insect pests and plant diseases affect covered crop production, causing significant losses to the growers and threatening access to export markets. Successful crop production requires that pests and diseases are managed, so that their negative effects on plant yields and fruit quality are minimised. As part of the core-funded Vegetables Sector programme, an informal survey was conducted to investigate pest and disease issues faced by the New Zealand covered crop growers, particularly of tomatoes and capsicums, across the country. The information gathered will provide insights into the current pests and diseases faced by the covered crop sector and help The New Zealand Institute for Plant & Food Research Limited to align future research plans, and maximise the impact of research upon industry.

The survey was carried out in May 2013 by phoning or visiting selected growers. Of the 11 growers contacted, eight agreed to participate in the survey. The survey included collecting background information on the types of growing systems to identify where pests and diseases are more likely to occur, and recent pests and diseases encountered. Where necessary, pathogens were identified using morphological and molecular techniques.

In general, tomato potato psyllids (TPP), sciarid flies, shore flies, thrips, aphids, whiteflies, spider mites and caterpillars were the common insect pests found on covered crops. TPP were the major insect pest in capsicum production, while whiteflies, thrips, mites and aphids were the major pests found on cucumbers. Thrips, whiteflies, TPP and caterpillars were the predominant pests in tomato production. Whiteflies were increasingly a problem for tomato growers because the effectiveness of biocontrol agents, such as *Encarsia* sp., were compromised since insecticides are the only control option available for management of TPP earlier in the season.

Plant diseases varied according to properties, types of production systems and cultivars grown. Properties using a closed system (i.e. re-circulating nutrient/water) and those re-using growth substrates (i.e. rockwool or coco slabs), had more disease problems. The major plant diseases on NZ covered crops were *Liberibacter*, powdery mildew, leaf mould, crazy roots, bacterial canker, stem, root and crown rots. While *F. oxysporum*, *Pythium* sp. and *Phytophthora* sp., were common root pathogens on covered crops, most growers were able to manage them.

Rhizoctonia sp. and *Plectosphaerella cucumerina* were common pathogens that caused wilts and rots on cucumbers. Because growers reused the coco slabs over a number of growing seasons, diseases persisted and became worse over time.

Crazy roots caused by *Agrobacterium rhizogenes* is a new disease in New Zealand tomatoes. There is very limited information on the spread and control of the bacterium. Crazy roots may be more widespread than reported here as growers are unfamiliar with this disease.

Stem rot (*Botrytis cinerea*), stem and leaf mould (*Fulvia fulva* or *Cladosporium fulvum*), powdery mildew (*Oidium neolycopersici*) and bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*), were commonly reported during the survey. There is a possibility that these diseases are becoming less sensitive to the fungicides applied, or they are likely to play a role in 'symptom/disease complexes' with other diseases, such as crazy roots.

Based on the findings gathered from the survey, it is recommended that future research be focused on:

- Evaluating the production systems and operating procedures, so as to identify and propose possible improvements at critical control points, where pests and diseases are likely to be introduced into the greenhouses.
- Developing and implementing a better way of managing both TPP and whiteflies on covered crops. This will require the development of biocontrol options for TPP as this appears to be the greatest impediment to a return to IPM for both capsicum and tomato growers.
- Conducting a survey to gauge the extent of crazy roots in New Zealand covered crops and implementing diagnostic tools for the identification of *A. rhizogenes*.
- Investigating the symptom/disease complexities among *A. rhizogenes*, *F. fulva*, *Cladosporium fulvum*, and *B. cinerea*, so that effective control strategies can be applied.
- Investigating the genetic diversity of *B. cinerea* and *C. fulvum* and their sensitivity to major fungicides (e.g. carbendazim).

The key findings from the survey were:

1. Insect pests

- a. In general, TPP, sciarid flies, shore flies, thrips, aphids, whiteflies, spider mites and caterpillars were the common insect pests of covered crops.
- b. TPP was the major insect pest to the capsicum growers.
- c. Whiteflies, thrips, mites and aphids were the major pests found on cucumbers.
- d. Thrips, whiteflies, TPP and caterpillars were the most common insect pests on tomatoes.
- e. Whiteflies were an apparent problem for tomatoes because biocontrol agents, such as *Encarsia* sp., are relatively ineffective because insecticides are the only control option presently available for TPP.

2. Plant diseases

- a. Major diseases on New Zealand covered crops included Liberibacter, powdery mildew, leaf mould, crazy roots, bacterial canker, stem, root and crown rots.
- b. While *Fusarium oxysporum*, *Pythium* sp. and *Phytophthora* sp., were common root pathogens on covered crops, most growers were able to manage them.
- c. *Rhizoctonia* sp. and *Plectosphaerella cucumerina* were common pathogens that cause wilts and rots on cucumbers, possibly because the growers were reusing the coco slabs for several consecutive growing seasons.
- d. Crazy roots (*Agrobacterium rhizogenes*) may be more widespread than found so far as growers lack information and diagnostics on this disease.

- e. Stem rot (*Botrytis cinerea*), stem and leaf mould (*Fulvia fulva* or *Cladosporium fulvum*), powdery mildew (*Oidium neolycopersici*) and bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*), were common in 2013. There is a possibility that these diseases are becoming less sensitive to the fungicides applied, or they are likely to play a role in 'symptom/disease complexes' with other diseases, such as crazy roots.

Recommendations for future work

Based on the findings gathered from the survey, we recommend that future research be focused on:

- Non-chemical options for the control of tomato potato psyllid. All growers of tomatoes and capsicums have a limited range of chemical options for the management of this pest and this raises concerns about the development of insecticide resistance. In addition, the necessary use of chemicals to control TPP in these production systems has compromised the utility of those biological products used for the control of other insect pests and is a major impediment to the reintroduction of IPM practices in tomatoes and capsicums.
- Auditing greenhouses to evaluate production systems and operating procedures. This is to identify and propose possible improvements at critical control points, where insect pests or plant pathogens are likely to be introduced into the greenhouse during crop production.
- Establishing diagnostic tools and conducting a survey to determine the distribution of crazy roots in New Zealand; and exploring/trialling various control measures reported overseas.
- Investigating the symptom/disease complexities among *A. rhizogenes*, leaf mould and stem rot so that effective control strategies can be applied.
- Investigating the relationship between genetic diversity of *B. cinerea* and *C. fulvum* from covered crops and their resistance to major fungicides (e.g. carbendazim), so that the changes in the genetic populations from one covered crop and the scale of fungicide resistance within each population can be determined.



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