

DEVELOPING IMPROVED PRACTICES FOR MANAGING CHARCOAL ROT IN STRAWBERRY

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The Disease

Charcoal rot is a lethal (deadly) disease, caused by the fungus *Macrophomina phaseolina*, with the potential to cause devastating losses in strawberry crops. The disease has recently emerged in strawberry fruit crops in Victoria, Queensland and Western Australia, following cessation of the practice of soil fumigation with methyl bromide. There are no registered products for the control of charcoal rot in strawberry production. In addition, of the strawberry varieties commonly grown in Australia, none are resistant to *M. phaseolina*, whilst several of the popular varieties show some level of tolerance.

Symptoms of charcoal rot consist of wilting and collapse of the plant leaves. Interior symptoms include dark brown or reddish-brown necrotic areas in the vascular tissue of the strawberry crown. Initial signs of disease development are similar to water stress. Infected plants eventually die and plant losses can be significant. Outbreaks of charcoal rot are easily confused with plant deaths from *Fusarium*, *Verticillium*, or *Phytophthora* because of the similarity of symptoms. Therefore, it is important that growers have affected plants diagnosed at an accredited laboratory to confirm which disease is involved. High soil temperatures (>27°C) and low soil moisture have been shown to favour disease development. Charcoal rot survives in soil and crop residues as microsclerotia, which serve as the primary source of inoculum for future infections. The fungus has a wide range of hosts, including many cultivated crops and weeds.

Planned Research

A collaborative research project (BS15005 Improved management of charcoal rot of strawberry) between Hort Innovation, Department of Agriculture and Fisheries (DAF), and Victorian Strawberry Industry Certification Authority (VSICA), has recently commenced and will run for three years to October 2020. The research

team of Apollo Gomez, Clinton McGrath and David Oag (DAF) will be focusing on sources of inoculum and its survival, whilst the team of Dylan McFarlane, Scott Mattner, and Frank Greenhalgh (VSICA) will concentrate on alternative soil fumigants and application techniques to improve the control of charcoal rot.

Over the next three years, this project aims to develop integrated chemical and cultural options for strawberry growers to manage charcoal rot. Research will evaluate better ways of applying existing and new soil fumigants to reduce the pathogen in soil. Other research in the project will identify alternative hosts of *M. phaseolina* within strawberry production systems, and establish the impact of major sources of inoculum on disease level in subsequent strawberry fruit crops. The project team will compile best practice information from the research into integrated management systems for the control of charcoal rot in strawberry crops.

So far the project team has reviewed published research and has identified better ways of applying soil fumigants to increase effectiveness against charcoal rot. One technique identified is the use of plastic films with greater impermeability (called 'totally impermeable films') with the potential to retain fumigant. The project team has also set up soil column experiments to screen new and existing fumigants, either alone or as mixtures, against charcoal rot. The soil column experiments will be used to prioritise the most effective fumigant treatments for testing in field trials. A field study has commenced on the survival of microsclerotia in infected strawberry crowns, and hence the importance of infected crop residue as an inoculum source for spread of the disease in a subsequent strawberry crop.

Benefits for Industry

The project has been designed to

deliver new information and practices that will benefit strawberry growers, including:

- Decreased plant deaths and increased productivity from control of *M. phaseolina* with effective alternative chemicals,
- An ability to reduce inoculum of *M. phaseolina* on strawberry farms with effective cultural practices to manage inoculum sources, and
- Guidelines for practices that minimise the risk of spreading *M. phaseolina*.

Information flow

As new information is generated from the research it will be disseminated at industry events and project seminars, as well as published in Simply Red, the Punnet e-news, HortLink and other platforms servicing the strawberry industry. Strawberry growers will be invited to contribute valuable information via surveys distributed online, interviews and questionnaires at industry events, throughout the duration of the project.

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