



CASE STUDY: PORTLAND STRAWBERRIES – A CHARCOAL ROT SUCCESS STORY

BOLWARRA, VICTORIA

*In 2017, the Victorian Strawberry Industry Development Committee (VSIDC) funded a project to survey all strawberry farms in Victoria for the soil borne disease Charcoal Rot, caused by the fungus *Macrophomina phaseolina*. The research was carried out by Dr Scott Mattner and his team at the Victorian Strawberry Industry Certification Authority (VSICA).*

Soil and plant samples were taken from the best and worst blocks on each property and analysed for the presence of *Macrophomina*. The incidence and severity of disease symptoms in the blocks was also recorded. The study found that around 80% of strawberry farms had *Macrophomina* in the soil, and the losses due to Charcoal Rot were costing the Victorian strawberry industry around \$20 million per year.

Fast forward to 2020, and VSIDC has again funded VSICA to conduct a follow-up survey to determine if recommendations put into place after the project in 2017 have had an effect on the incidence of Charcoal Rot on Victorian farms. The survey is still in progress, but preliminary results have shown that some growers have improved their management of Charcoal Rot by adopting the recommended practices.

One enterprise that has had a positive impact on the levels of disease in their strawberry crop is Portland Strawberries in Bolwarra, just north of Portland in Victoria, not far from the South Australian border. Peter and Pat Cutler have been growing strawberries on their property since 1991, and market their strawberries, and other products such as homemade strawberry ice-cream, through their Farm Shop, and from their vans which visit Mount Gambier, Hamilton, Port Fairy and Warrnambool on a regular basis during the season. They also have a small area of pick your own strawberries. During the off-season strawberries are grown under covers and sold through the Farm Shop. They have developed a loyal following among their customers, as according to Pat, they are picked one day and sold to the consumer the next day, ensuring they can be picked when perfectly ripe.



Pat and Peter Cutler (Photo credit: Portland Strawberries)



One of Portland Strawberries' vans servicing Western Victoria and South Australia (Photo credit: Portland Strawberries)



Victorian Strawberry Industry
Development Committee



In 2017, results from the Charcoal Rot survey showed that there were relatively high levels of *Macrophomina* in the soil at Portland Strawberries, similar to the state average, and a relatively high incidence of Charcoal Rot disease in plants.

Macrophomina is present in soils and can be moved between or within properties by machinery, vehicles, and on people's footwear. The fungus also remains inside old crowns of strawberry plants remaining in the soil. Strawberry plants become infected with the fungus when they are under stress, such as heat or water stress, and the disease often becomes more severe when plants are trimmed heavily in summer.

Several recommendations were made for managing Charcoal Rot as part of the Victorian project, including increasing on farm hygiene and biosecurity, removing diseased plants and old crowns from paddocks, and reducing stress, particularly in hot weather, by ensuring plants are well irrigated.

Peter and Pat have implemented these recommendations and have come up with innovative ways to improve their disease management. This has resulted in a 30% decrease in the level of *Macrophomina* in the soil, and a 20% decrease in the incidence of Charcoal Rot in the crop since 2017.

They have increased their emphasis on farm biosecurity, implementing processes such as paddock zoning, where workers and machinery move from areas of low disease to areas of higher disease, to reduce the risk of moving the fungus to clean areas. They have also placed more emphasis on crop rotation, aiming to rest paddocks for six months, although they are restricted by available land, and planting a green manure crop of barley, peas, vetch and ryegrass between crops. Peter also uses a lot of compost, manures, and fish emulsion, as well as beneficial micro-organisms, to increase the biological health of his soils.

The national Charcoal Rot project has shown that infected strawberry crowns left in the soil are a source of inoculum to infect new crops. In order to reduce the amount of the *Macrophomina* fungus in the soil, Peter has modified a garlic digger to lift the whole bed, plants and plastic, from the soil, which are then rolled up together for disposal. Peter's aim is to incorporate the roller onto the harvester so the whole process can be done in one pass with the tractor. The drop of 30% in the level of the fungus in the soil since 2017 suggests that this has been a worthwhile process. Peter says this method has also helped clean up the soil, removing fragments of old plastic left behind using previous methods.

Plastic mulch containing entire strawberry plants (Photo credit: Portland Strawberries)



Modified garlic digger lifting plastic and plants, including the crowns (Photo credit: Portland Strawberries)



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In order to reduce stress, plants are not trimmed heavily in summer, only dead and mature leaves around the base are removed. Peter also uses foliar sprays, including biostimulants, to reduce stress. Management of the inter rows has also been modified, with barley and ryegrass seed put out together after the plastic is laid and before the holes are punched for planting. The barley grows taller and allows the ryegrass to establish, then the barley goes down like a mulch while the ryegrass continues to grow. Peter uses Victorian ryegrass as it is not as tall as other varieties and it is left to grow. Having a well-established planting of ryegrass in the inter rows helps to reduce the soil temperature, reducing stress on the plants. Peter says the pickers get used to the longer grass in the inter rows and have also noticed that it is cooler in the field and they can pick longer into the day. He has also noticed that he is using less water. Research by VSICA has shown that the use of ryegrass in the inter rows is associated with lower disease, which may be due to reduced soil temperature, reduced soil splash, and

the fact that ryegrass is not a host of *Macrophomina*. The vast majority of Victorian growers fumigate their soil prior to planting, but current fumigants have not been as successful as Methyl Bromide in controlling Charcoal Rot. The 2017 survey showed that most farms in Victoria had *Macrophomina* in the soil and were affected by Charcoal Rot. The national Charcoal Rot project has shown that the use of TIF (totally impermeable film) with soil fumigants is more effective at controlling Charcoal Rot than the standard LDPE films.

However, the changes Peter and Pat have made on their property, where the soil has never been fumigated prior to planting, show that practices that decrease the risk of spreading the disease, decrease the level of inoculum in the soil and reduce plant stress over summer can lead to major improvements in the management and incidence of Charcoal Rot.



Strawberries in 2017, showing plant deaths caused by *Macrophomina*
(Photo credit: VSICA)



The same site in early 2020, showing healthy plants and inter row plantings of barley and ryegrass (Photo credit: VSICA)

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