

# Farm biosecurity to improve the management of soil-borne diseases of strawberry in Australia & China

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- Results from a recent disease survey in Australia showed a strong association between the number of farm biosecurity practices adopted by strawberry growers and decreasing charcoal rot incidence in crops and *M. phaseolina* in soil.
- This result reinforces the importance of farm biosecurity practices for the management of soil-borne diseases of strawberry.
- There is great interest in the adoption of farm biosecurity practices to manage soil-borne diseases in China's strawberry industry, the largest strawberry industry in the world.
- Researchers and growers from both countries are working together to improve farm biosecurity for strawberry and increase opportunities for trade.

## Importance of soil borne diseases in strawberry

Soil-borne pathogens cause diseases that stunt and/or kill strawberry plants. They are widespread across the globe and cause severe economic losses each year.

In Australia, charcoal rot, Fusarium wilt and Phytophthora crown rot are some of the most devastating soil-borne diseases of strawberry and have increased in importance since the phase-out of the fumigant methyl bromide. Based on a survey of the Victorian strawberry industry in 2020, charcoal rot killed 15% of plants and cost the industry \$15 million.

The Chinese strawberry industry is now the largest in the world and is heavily impacted by soil-borne diseases. The most common disease is anthracnose caused by *Colletotrichum* spp., though recent evidence suggests that Fusarium wilt may also be present.

Unlike Australia, Chinese strawberry growers rely solely on 'good' cultural practices and healthy runners to reduce disease risk, since chemical fumigants are not commercially available. In 2020, surveys estimated that the average incidence of soil-borne diseases in strawberry in China was >30% on individual farms.

## Farm biosecurity

Farm biosecurity practices are a set of measures designed to protect a property from the entry and spread of pathogens, pests and weeds. Farm biosecurity is the responsibility of the grower and every person visiting or working on their property.

The pathogens that cause soil-borne diseases of strawberry survive in infested soil and plant debris. Therefore, growers can use farm biosecurity practices that reduce the movement of infested soil and plant debris within and between farms as one component of their management systems for these diseases.

Strawberry growers can adopt the following farm biosecurity practices to reduce the risk of spreading soil-borne diseases within and between properties:

- *Plant Certified strawberry runners*: Certified runners give strawberry plants the healthiest start possible because they are inspected for pests and diseases before they arrive at your property.
- *Erect biosecurity signs*: Biosecurity signs indicate to the public and staff that growers are serious about maintaining high standards of hygiene. Be sure to include a phone number on these signs so that visitors can contact you before they enter your property.

- *Minimised property entry:* Minimising entry points onto a strawberry property gives growers greater control over who is coming onto their property. Limit the number of access points to your property (e.g. lock unused gates and construct fences).
- *Use designated car parks:* Limiting vehicles to designated areas on your property helps to contain any infested soil they may carry. Car parks can also help to control the movement of visitors and staff on your property.
- *Washdown your vehicles:* All vehicles should be cleaned before they enter your property. It is important to routinely washdown your work vehicles (e.g. tractors) between paddocks especially when they move from a paddock with high disease into a paddock with low disease. Pay attention to car tyres, grills and wheel rims when cleaning vehicles.
- *Staff and visitor hygiene:* Provide appropriate hand and shoe washing facilities for employees and visitors to use while they are on your farm to remove soil.
- *Zone your property:* Dividing your farm into production, packing and visitor areas will allow you to define where individuals may or may not go.
- *Paddock zoning:* Conduct your farm operations (e.g. spraying, picking, etc.) from paddocks with low disease towards paddocks with high disease. This minimises the risk of workers and farm vehicles carrying infested soil to areas of low disease. You can determine which paddocks have high or low disease from your farm records or by getting the soil analysed for pathogens that cause disease. Paddock zoning will enable you to reduce the spread of disease across your property.
- *Remove old and/or dead planting material:* Infested strawberry crowns in soil (dead plants from the previous season) can harbour pathogens. Therefore, if feasible, you should remove dead and/or old strawberry plants from your production sites and destroy them elsewhere.
- *Clean your equipment:* Farm equipment (e.g. picking trays) may collect and spread infested soil and plant debris. All farm equipment should be cleaned regularly, especially those moving between paddocks.
- *Train your staff:* Induct your staff and visitors in farm biosecurity. Give clear directions regarding the biosecurity practices you require them to perform on your property.



**Figure 1. Staff from the Victorian Strawberry Industry Certification Authority (VSICA) inspecting strawberry runners for pests and diseases.** Photo credit: VSICA



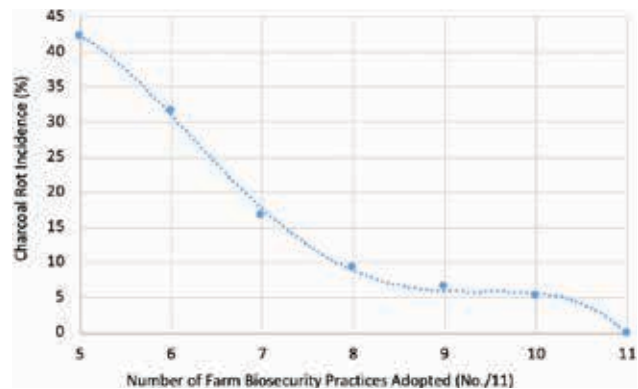
**Figure 2. Growers cleaning a tractor with high pressure water to remove soil, in a designated washdown location.**  
Photo credit: VSICA

## Do farm biosecurity practices really help manage disease?

In 2020/21, we surveyed 77 strawberry growers in Victoria about their adoption of the farm biosecurity practices listed above, and then measured the incidence of charcoal rot disease and the amount of the fungus (*Macrophomina phaseolina*) that causes the disease on their properties.

Results showed there was a strong association between the number of farm biosecurity practices adopted by growers and charcoal rot in their crops (Figure 3). Growers who adopted more farm biosecurity practices had less *Macrophomina* and charcoal rot on their properties.

Furthermore, the incidence of charcoal rot across Victorian strawberry farms had decreased by 20% in 2020/21, compared with 2017, due to the industry's adoption of improved farm practices, including farm biosecurity. The continued adoption of these farm biosecurity practices by Australian strawberry growers is expected to reduce the spread of diseases, pests and weeds across the industry.



**Figure 3. Association between the number biosecurity practices (out of eleven) adopted by strawberry growers on their farms in Victoria in 2020/21 and the incidence of charcoal rot in their crop. Note: no growers had adopted fewer than five of the eleven farm biosecurity practices.**



**Figure 4. A typical strawberry farm in north-eastern Yunnan, China. Growers cover the laneways (inter-rows) with plastic to prevent the movement of soil.**

Photo credit: YunNan LuFeng QuinPan Agri-Dev. Co

## Farm biosecurity in China

The Chinese strawberry industry accounts for 40% of the world's production at 3.72 million tonnes/year (Figure 4). The strawberry varieties: Benihoppe, Sweet Charlie and Akihime accounted for 70% of the production in China in 2018. The largest strawberry cultivation provinces in China are Shandong, Liaoning, Anhui, Jiangsu, Hubei, Hebei, Henan, Sichuan, Zhejiang, Hunan, Shanxi and Shanghai.

Earlier this year, YunNan LuFeng QuinPan Agri-Dev. Co., a strawberry runner producer in China, surveyed strawberry plants on fruit farms in the south of the country for soil-borne diseases. The survey showed that some unidentified *Fusarium* species were present inside sick strawberry plants, though anthracnose caused by *Colletotrichum* spp. had also been recorded in the area. Based on these results, YunNan LuFeng QuinPan Agri-Dev. Co. has adopted several of the farm biosecurity practices listed above to help manage disease on their properties and the farms that purchase their runners.

Moreover, YunNan LuFeng QuinPan Agri-Dev. Co. is currently working with VSICA Research to have these farm biosecurity practices translated into Mandarin to disseminate the information as a manual to strawberry growers in China. This work is considered an important step in building future opportunities for trade of strawberry from Australia to China.

**If you would like to learn more about these projects, please contact: Dr Dylan McFarlane | 0408 374 233**

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