MASTERCLASSES FACILITATE THE ADOPTION OF FARM BIOSECUIRTY FOR SOIL-BORNE PATHOGENS OF STRAWBERRY

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Introduction

Soil-borne diseases of strawberry, including charcoal rot and Fusarium wilt, have increased in importance since the withdrawal of the pre-plant fumigant methyl bromide, and are threatening the viability of the Australian industry. In 2017, a comprehensive survey of the strawberry fruit industry in Victoria showed that 80% of growers' properties had soil that was infested with *Macrophomina phaseolina* and that 20% of plants died due to charcoal rot. This resulted in a loss in revenue from fruit worth $20M AUD.

The survey also found that the concentration of *M. phaseolina* DNA in soil was highly variable across each growers' farm. *M. phaseolina* and many other soil-borne pathogens are transmitted in infested soil. Farm biosecurity practices can decrease the risk of spreading infested soil between and within farms, and are an important component of integrated approaches to manage soil-borne diseases. We conducted a series of Masterclasses for strawberry growers across Australia with the aim of improving the understanding and adoption of farm biosecurity practices.

National Masterclass Series

We conducted a series of twelve workshops with small groups of growers (10-30 participants) in regional areas that produce strawberry fruit (Figure 1). The workshops took an educational and participatory approach to facilitate grower empowerment. They included aspects of participatory learning (e.g. microscope demonstrations of pathogens) and encouraged exchanges between growers (i.e. facilitated discussions). Local chemical resellers, fumigant contractors, extension workers and agronomists also attended the workshops.

We asked growers to consider the layout of their farms at the workshops, and critical control points for managing the spread of infested soil and soil-borne pathogens. We discussed a range of individual biosecurity practices, including: property access, biosecurity signs, property zoning, cleaning vehicles and equipment, the use of foot baths and foot covers, and training staff in farm biosecurity, etc. (see Figure 2). Growers discussed the practicalities and ease of adopting individual biosecurity measures, and we recorded their responses at the workshops using response cards (TurningTechnologies) and in telephone interviews 3-months later.

Grower Participation

There were high rates of attendance by growers at the workshops (e.g. over 65% of Victorian fruit growers). Conducting the workshops at centers close to growers was an important factor in achieving high attendance rates. In some locations, where English was a second language, the use of translators assisted in attracting and encouraging participation by growers. Most growers (>90%) attending the workshops contributed to the discussions, and many commented that this was due to the small size of the groups and the informal environment it created. Results from surveys showed that most growers preferred receiving extension information in small group forums and in emails compared with other formats (Figure 3). Results also showed that growers (68% of those surveyed) seek information on management of soil-borne diseases from chemical resellers and agronomists, and their participation proved important in maintaining momentum of the key messages after the workshops.

Grower Responses and Adoption of Farm Biosecurity Practices

Growers considered most of the farm biosecurity practices discussed at the workshop as ‘easy’ to adopt, particularly those that were not costly or time consuming to implement (Figure 2). Growers considered practices that were costly and labor intensive as ‘difficult’ to adopt, such as the removal of dead strawberry plants and weeds. After the workshops, however, some growers began to experiment on-farm with the use of potato and carrot harvesters to remove old strawberry plants, and the use of crop termination.

Three months after the workshops, survey results showed that 75% of participants had adopted one or more biosecurity practices on their farms (Figure 4). There was good adoption of educating staff about farm biosecurity and cleaning equipment to minimize the spread of infested soil. Growers identified that utilities providers (e.g. electricity workers) and labor force contractors need greater education about farm biosecurity, and this warrants further extension and communication work in the future.

Use and Effectiveness of Participatory Learning

Several participatory learning methods proved popular and effective with growers attending the workshops. Anonymous quizzes with growers on ‘what soil-borne disease is this?’ highlighted the importance of having diseased plants and soils properly diagnosed. An outdoor experiment using columns filled with soil that was previously fumigated, and the surface sealed with low density polyethylene or totally impermeable film (TIF) was particularly effective. Growers participated in measuring the amount of fumigant in the soil using Gastec detection tubes or a MiniRae device. This provided a clear demonstration of the effectiveness of TIFs for retaining fumigants in soil and reducing emissions to the environment. Survey results showed that the use of TIFs in the Victorian strawberry industry has increased from 0% in 2017 (before the workshops) to 50% of the production area in 2019.

Our future work will comprehensively survey the strawberry industry in Victoria in 2020 to measure the adoption of farm biosecurity and other management practices on farms, and the impact this has had on charcoal rot and other soil-borne diseases.

Figure 1. Location of biosecurity workshops across Australia.

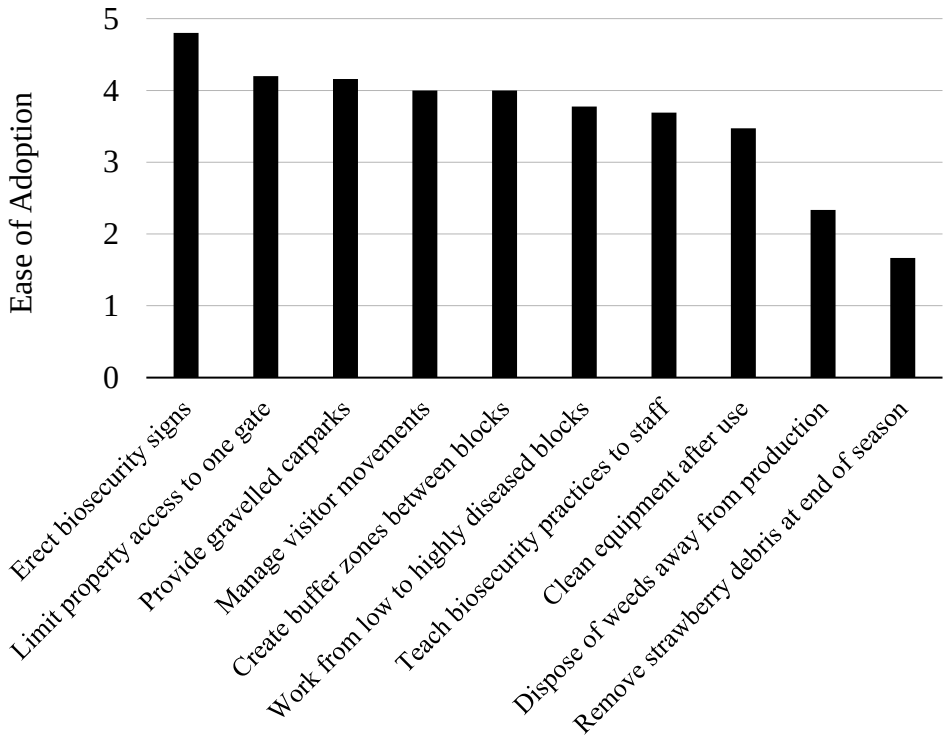

Figure 2. Average response of strawberry growers to the ease of adopting specific biosecurity practices. Growers rated each practice as either (1) very difficult, (2) difficult, (3) moderate, (4) easy or (5) very easy to adopt.

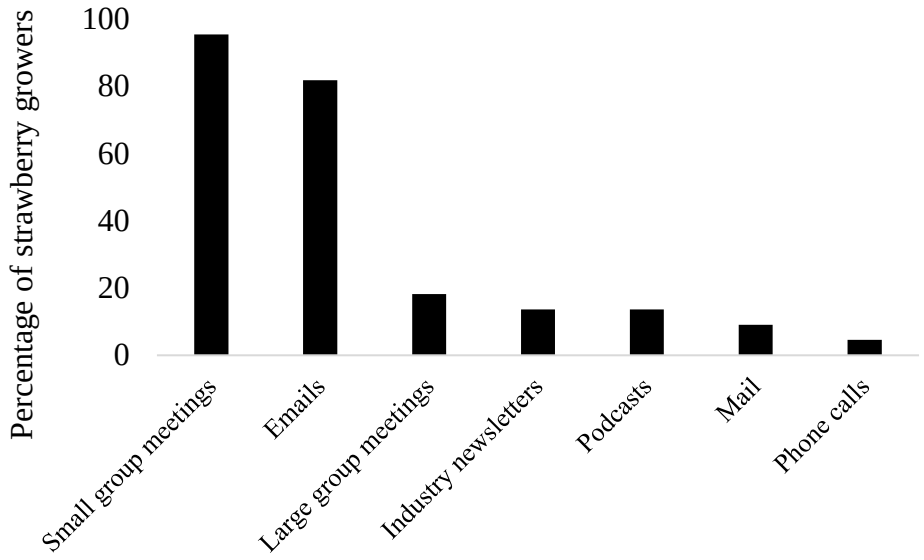

Figure 3. Strawberry growers' preference for the method of receiving extension material.

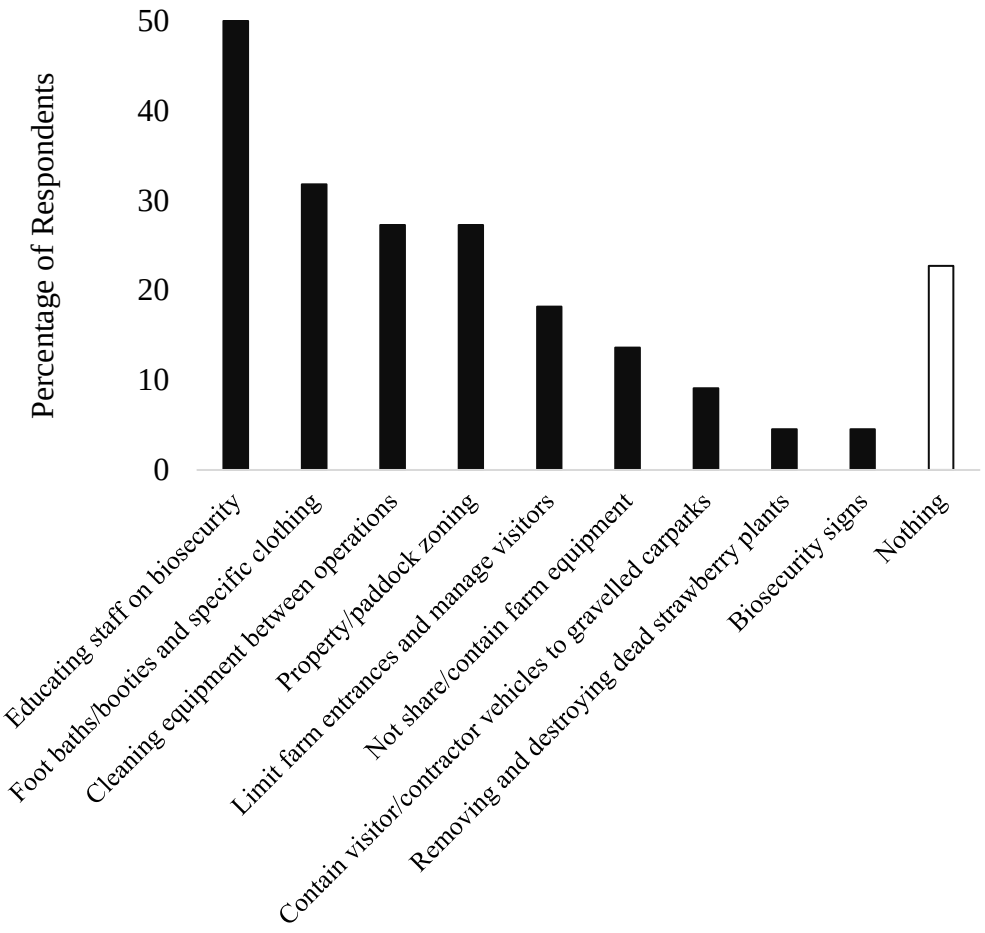

Figure 4. Adoption of specific biosecurity practices by strawberry growers in Australia, three months after national workshops.