

Red Leaf Disorder: knowledge through Field Surveys in South East Queensland

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- Key data about Red Leaf Disorder has been collected on farms across SEQ for the last 3 seasons
- There are significant differences in the incidence of RLD between varieties
- Further research is required to explore other potential contributing factors including soil types, fumigant usage and runner production systems

Farm surveys can play a crucial role in unravelling the factors contributing to the incidence of strawberry diseases or disorders, particularly the emerging Red Leaf Disorder (RLD) that poses significant challenges to strawberry production in Queensland. RLD manifests as reddish/maroon discoloration between veins on older leaves (Figure 1), leading to reduced plant vigour and diminished fruit productivity, particularly in popular grown commercial varieties. Since 2020, the Department of Agriculture and Fisheries (DAF) has been conducting field surveys in South East Queensland (SEQ) to monitor RLD in strawberries. The primary aim of these surveys is to identify patterns and potential factors contributing to the disorder.



Figure 1. Strawberry plant exhibiting Red Leaf Disorder. Photo credit: DAF

A crucial aspect investigated in these field surveys is variation in RLD incidence among different varieties grown across multiple farms. It is recognised that different varieties may exhibit varying levels of resistance or susceptibility to RLD. By evaluating multiple farms and comparing RLD incidence across different varieties, patterns can be identified.

Furthermore, the surveys aimed to determine if factors such as source grower, runner type, fumigant usage, nutritional regimes, and plastic type (new or used) have an impact on the level of RLD incidence.

In addition to variety selection and external factors, specific grower practices were also observed to determine their contribution to higher or lower RLD incidence. Factors such as bed size or plant densities may influence the soil environment and root system development, potentially affecting RLD levels.

The evaluations of the surveys aimed to provide insights into the effectiveness of different practices in managing RLD levels. By undertaking an analysis of data collated over consecutive years, patterns and changes can be detected, providing valuable insights into the emergence, spread, and long-term trends of RLD. This enhances our understanding of RLD dynamics, risk factors, and long-term trends.

Strawberry growers have actively contributed to this understanding by participating in on-farm surveys over the past three years, making their valuable insights an integral part of ongoing research.

This article aims to highlight important findings from the data collected during the period from 2020 to 2022 within the strawberry growing production times in SEQ. The insights gained from these surveys not only contribute to ongoing research efforts but may foster a collaborative approach to managing RLD and promote sustainable strawberry production practices in RLD management.

2020-2022 farm surveys

Over the course of three years (2020-2022), field surveys were conducted, involving a total of eleven farms, and resulting in 25 on-farm trials. The survey aimed to gather valuable insights into the agricultural practices and outcomes within these farms. Each participating farm had a unique evaluation period, with five farms involved consistently for all three years, two farms participating only in 2020, and the remaining farms taking part in consecutive years.

Throughout the three-year period, a diverse selection of 12 different varieties were observed, providing a

dataset for comprehensive analysis. The collected data encompassed various aspects, including the varieties grown, management practices (such as planting date, runner type, runner grower, fumigation type, and plastic status), bed layout information, and environmental factors (such as altitude and soil type) specific to each farm.

Results of 2020-2022 surveys

The field surveys yielded significant findings regarding RLD. Notably, *Parisiennne Kiss* consistently exhibited a higher incidence of RLD compared to other varieties, while *Scarlet Rose* showed minimal symptoms (Figure 2). The presence of RLD varied across different farms and varieties, with some farms experiencing minimal RLD while others faced severe symptoms. The expression of RLD also differed among farms and years, with the year 2021 showing particularly high RLD expression (Figure 3).

While this study primarily focused on post-planting aspects, it is evident that further research into runner production systems is required for a comprehensive understanding of plant origin and RLD. By conducting comprehensive investigations across the entire lifecycle, we could gain deeper insights into the factors influencing RLD.

Additionally, it was observed that bare runners displayed slightly lower median RLD incidence compared to plug runners as seen in *Parisiennne Kiss* and *Red Rhapsody* (Figure 4), although the variation is too large to conclusively determine a significant difference.

Figure 5 shows that there may also be some differences between fumigants, however further investigation is needed to understand the impact of fumigant treatments as well as soil types on RLD incidence.

It is worth noting that no significant difference was found between plant densities and bed height. Further research is required for plastic types (new or used).

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The Farm Survey conducted by the DAF RLD team has provided invaluable insights that the Australian Strawberry Breeding Program (ASBP) can effectively implement into their field trials. This implementation has led to the identification and release of RLD tolerant breeding lines, such as *Susie*-ASBP.

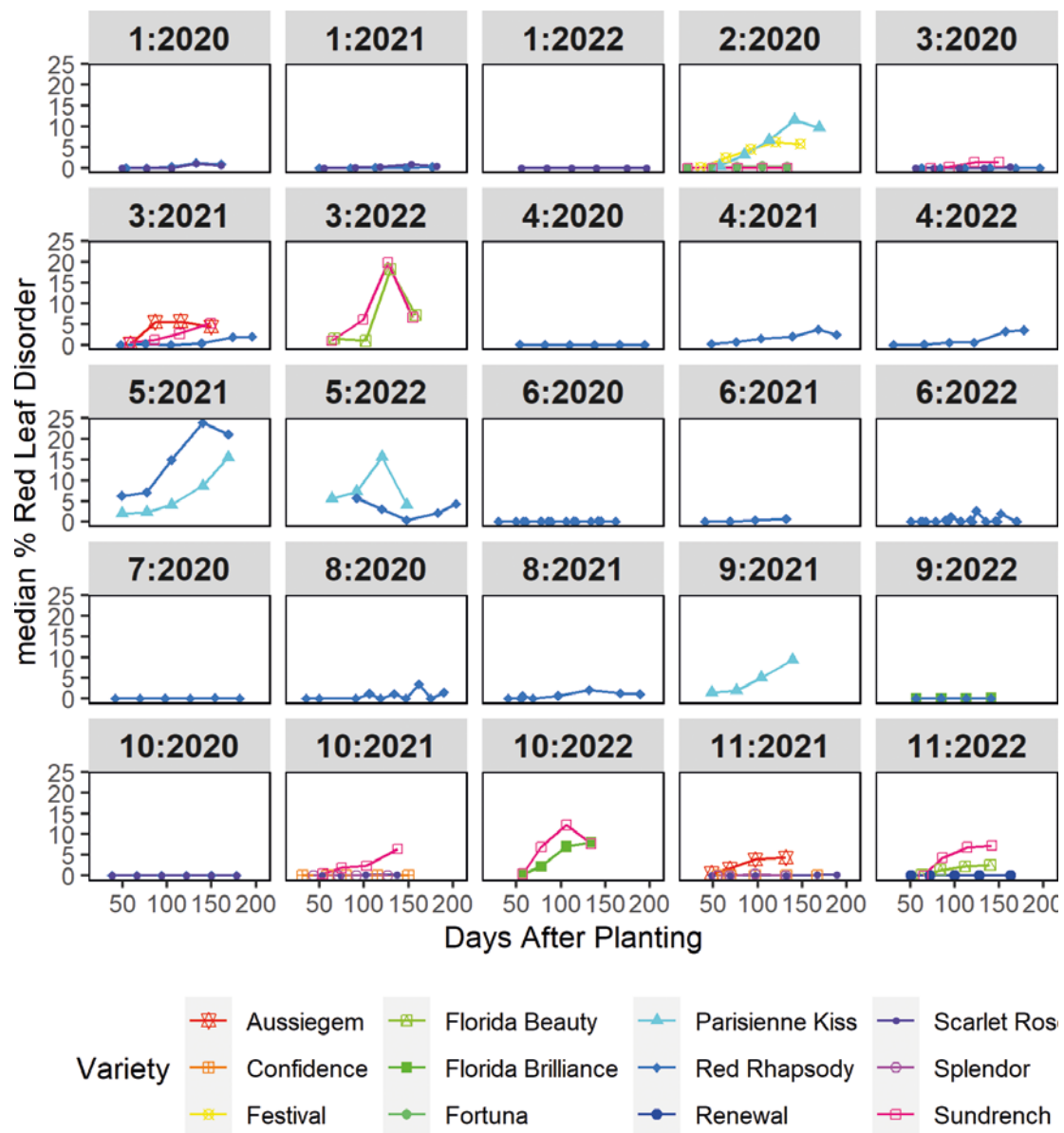


Figure 2. Days after planting versus the median percentage of plants with RLD for variety by trial (Year by Farm) in Red Leaf farm survey 2020-2022

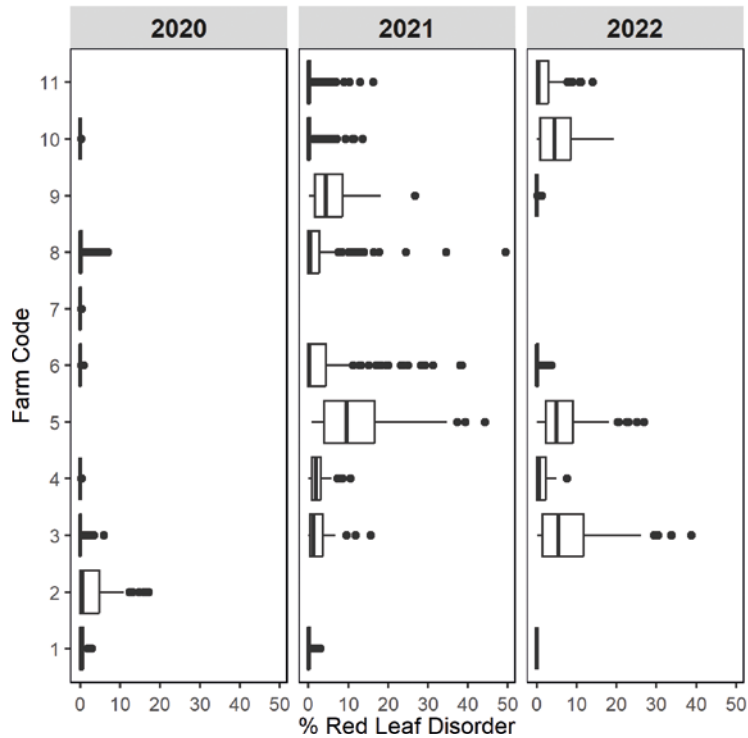


Figure 3. Box and whisker plot of Number of plants with RLD by Farm and by year

Farms are represented by numbers 1 to 11. A box and whisker plot shows the centre and spread of a dataset. The middle half of the data are represented by the box – the vertical line in the box represents the median (or middle value). The whiskers (horizontal lines from the box) represent a reasonable distance from the box and the points represents values far from the middle point.

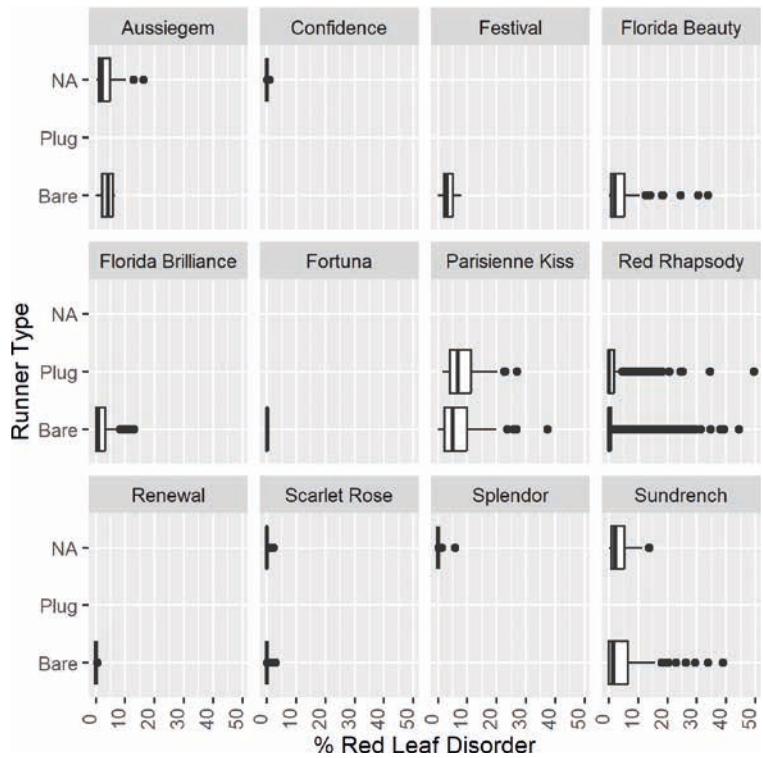


Figure 4. Percentage of plants with RLD by variety and Runner type in the RLD farm survey 2020-2022

A box and whisker plot shows the centre and spread of a dataset. The middle half of the data are represented by the box – the vertical line in the box represents the median (or middle value). The whiskers (horizontal lines from the box) represent a reasonable distance from the box and the points represents values far from the middle point.

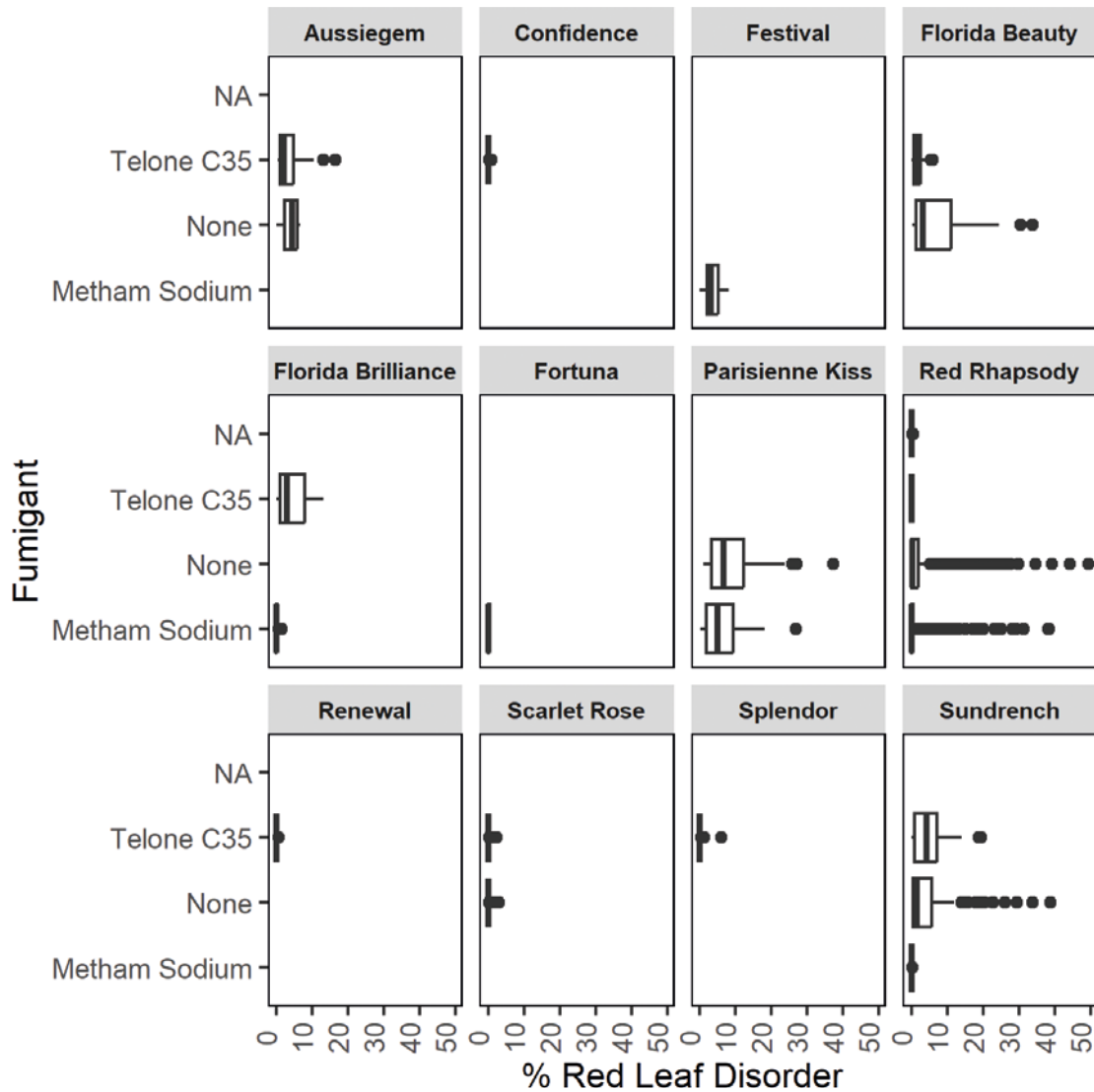


Figure 5. Percentage of plants with Red Leaf by variety and fumigant in the RLD farm survey 2020-2022

A box and whisker plot shows the centre and spread of a dataset. The middle half of the data are represented by the box – the vertical line in the box represents the median (or middle value). The whiskers (horizontal lines from the box) represent a reasonable distance from the box and the points represents values far from the middle point.

Acknowledgements

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Disclaimer

The above information is sourced from trials conducted on strawberry farms in Australia. This is the best available information on Queensland local conditions at these sites. The information provided here may not be applicable for all regions and varieties. The Queensland Department of Agriculture and Fisheries, and Hort Innovation provide the above information as a guide only and take no responsibility for data accuracy.



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