

Red leaf disorder 2020 farm survey update

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- Less RLD observed in the 2020 season, than seen in the 2019 season
- RLD affects yield and size of fruit (average weight & yield decreased as RLD increased)
- Purpling in leaves was noted throughout the season
- There was a peak in RLD occurrence in August 2020
- Parisienne Kiss was worst affected cultivar in the 2020 season of surveyed fruit farms

Red leaf Disorder (RLD) of strawberry plants, the cause of which is currently unknown, is characterised by a reddish/maroon discolouration of the mature leaves.

Plants exhibiting RLD are usually undersized with reduced vigour and reduction in yield. To better understand the threat RLD poses for the strawberry industry, the Department of Agriculture and Fisheries (DAF) undertook a survey of plants showing RLD during the 2020 fruiting season, as part of a DAF-funded project investigating the disorder.

We surveyed 15% of plants in a field per cultivar across 14 farms, with over 220,000 plants viewed over the course of the season. We looked at a diverse range of farm types, cultivars, and planting material to compare with the 2019 DAF RLD survey and hope to continue surveying into the 2021 season.

RLD field survey — South East Queensland

Eight strawberry fruiting farms in the South East Queensland (SEQ) region were selected to collect data on RLD incidence and severity, and we checked for RLD every 4 weeks from May to September. Cultivars sampled included: Red Rhapsody, Scarlet Rose, Rubygem, Parisienne Kiss, Aussiegem, Florida Radiance (Fortuna) and Florida Festival. A substrate production farm was included in the survey, to compare the incidence of RLD on Red Rhapsody plants from both bare-root and plug style plants.

From the eight farms surveyed, cultivars Parisienne Kiss, Sundrench and Festival displayed the highest incidence of RLD with maximum percentages of 17.2%, 10.0% and 8.0% respectively.



Red Leaf Disorder symptoms on strawberry leaf.

Photo credit: Joanna Kristoffersen



Counter used in field to count plant numbers affected by RLD. Photo credit: Madeline Betts

Cultivars Aussiegem (3.8%) and Scarlet Rose (2.3%) had fewer RLD incidence, while Red Rhapsody (1.6%) and Fortuna (0.9%) had very little RLD incidence (Figure 1). All farms surveyed had RLD present on their properties, with observations of RLD in plants received both as runners and plug plants. A limited number of Red Rhapsody plants in substrate showed RLD, and were identified only on water stressed plants and, later disappearing when water supply issues were corrected. Overall, in the SEQ region, there was a lower incidence of RLD in the 2020 fruiting season compared to 2019. There was also a delay in RLD symptoms appearing on plant leaves, with a low level of symptoms observed in May, peaking in August and then a decline in September. This delay in visual symptoms could possibly be due to the late plantings of 2020. There was, however, a higher occurrence of other reddening and purpling leaf issues observed (not RLD). These were attributed to nutritional and/or other factors. (Figure 1)

RLD field survey - Bundaberg

We also looked at six farms in Bundaberg as a single time measurement. The cultivars sampled included: Scarlet Rose, Red Rhapsody, Petaluma, and Rubygem. RLD was apparent in all the farms we visited, and occurrence varied between cultivars. For example, Scarlet Rose ranged from 0.2% to 1.8% incidence of RLD, Red Rhapsody 0.4% to 1.4%, Petaluma 3.6% to 6.8%, and Rubygem the highest at 14%. This was our first survey of Bundaberg and we hope to return in the 2021 season. Again, there was a high occurrence of other reddening and purpling leaf issues that were not RLD.

RLD yield trial

In 2020 we also undertook a field survey from a RLD affected field in Nambour, rating 46 Red Rhapsody plants for RLD and root observations. The plant leaves were scored on a symptom severity scale from 1-6, where rating 1 = healthy plant with no RLD symptoms, ratings 2 to 5 = progressively increasing of reddening and on more leaves and, rating 6 = plant death (Figure 2).

We also measured fresh fruit weights, leaf length, and fruit gradings. Measurements of leaf length, root health and length were sampled between two groups, a control group (no RLD), and the treatment group (showing RLD). Root ratings were determined on a scale from 1-5, where 1 = unhealthy, shorter roots, progressively increasing to a rating of 6 = maximum root health and length.

In this trial, we noticed RLD rating (severity) increased progressively over the subsequent weeks (Figure 2), however towards the end of the season some plants recovered to some extent. This coincided with what we observed on the eight farms from SEQ region. All plants showed some degree of reddening, with six mortalities. This data is currently being statistically analysed; however, we can report that there was an obvious progressive decline in yield and fruit quality as reddening developed. (Figure 3)

Figure 3 shows the average weight per fruit for each RLD rating, illustrating how the average size of fruit decreases as RLD rating (RLD severity) increases. Differences in root length and browning was also apparent between the treatment groups (Figures 4a and 4b).

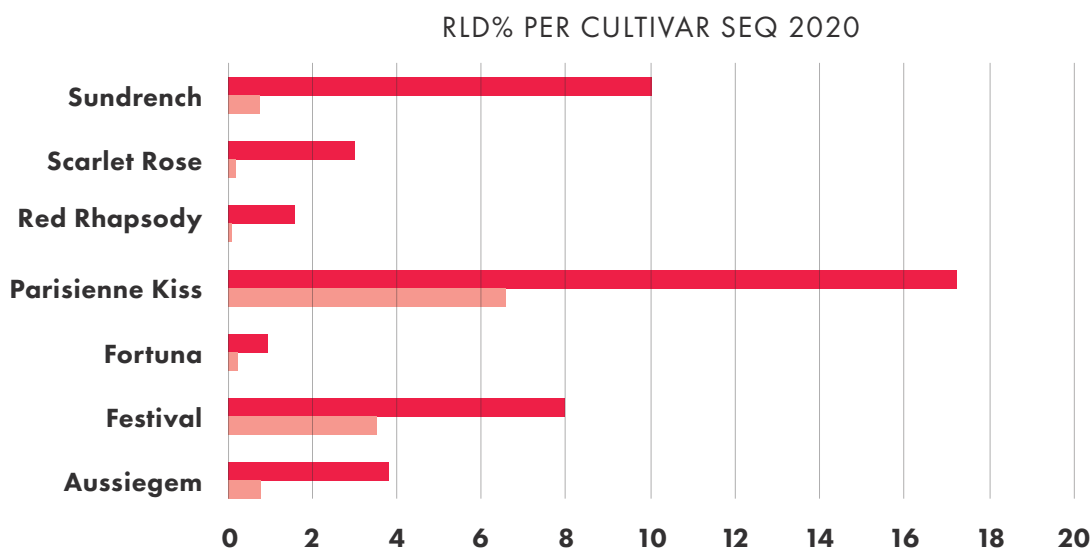


Figure 1. Mean and max % for cultivars surveyed in SEQ region 2020

Plant	Rating																	
	30/06/20	7/07/20	14/07/20	21/07/20	28/07/20	3/08/20	11/08/20	18/08/20	25/08/20	2/09/20	9/09/20	15/09/20	22/09/20	29/09/20	6/10/20	13/10/20	21/10/20	27/10/20
1	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2	4	4	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4
3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	1	1	1	1	1	1	3	2	3	3	4	4	4	4	5	5	5	5
5	1	1	1	2	2	2	2	1	3	4	3	3	4	5	5	3	3	3
7	2	2	2	2	3	3	4	4	4	4	4	3	4	4	2	3	3	2
8	1	1	1	2	2	2	2	2	2	3	3	4	4	4	5	5	5	4
9	1	2	3	3	3	3	4	3	4	4	4	4	4	4	3	3	4	4
10	1	2	1	2	1	2	2	2	2	2	3	3	3	2	3	2	2	3
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	4
12	2	3	2	2	2	2	2	2	3	4	3	4	4	4	4	4	4	5
13	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4
14	1	1	1	1	1	1	2	1	1	2	2	4	4	4	4	5	5	5
15	1	1	2	2	3	3	4	3	3	4	4	4	4	4	4	4	4	4
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	3	4
17	2	2	1	2	2	2	2	2	2	2	2	3	3	2	2	4	6	6
18	1	2	2	3	3	3	3	2	3	3	3	4	4	4	4	4	4	4
20	1	1	1	2	2	3	3	3	3	4	4	3	3	3	3	2	3	4
21	2	2	2	1	3	3	4	4	4	4	4	5	4	5	5	2	5	5
22	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4
23	1	2	3	3	4	4	5	4	4	5	5	4	4	3	3	2	3	2
24	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3
25	1	1	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	3
26	2	2	2	2	2	3	3	3	1	4	4	4	4	4	4	4	4	5
28	1	1	1	2	2	2	2	2	3	4	4	4	4	4	4	4	2	3
29	1	1	1	1	1	1	1	2	2	2	2	3	4	4	4	4	5	5
30	2	2	2	2	2	2	2	2	3	3	3	4	4	4	4	4	4	4
31	1	1	1	1	1	1	1	1	1	2	2	3	3	3	3	3	3	3
32	3	3	3	4	4	5	5	4	4	4	5	5	6	6	6	6	6	6
33	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
34	3	3	2	3	3	5	5	5	5	6	6	6	6	6	6	6	6	6
35	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	5	5
36	4	4	4	4	5	5	5	5	5	5	5	4	3	4	2	2	2	3
37	2	3	3	3	3	3	3	3	3	3	4	4	4	5	4	4	4	3
38	2	2	1	4	4	4	4	4	4	4	5	4	3	3	2	2	2	2
39	2	4	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6
40	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
41	1	1	1	1	1	1	2	3	3	4	3	4	4	4	4	4	4	4
42	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
43	1	1	1	2	2	3	4	3	3	4	4	3	3	3	3	3	3	3
44	2	1	1	1	1	1	2	3	3	1	1	2	3	4	4	4	4	4
45	1	1	2	2	2	2	3	2	2	3	2	3	3	3	4	4	4	4
46	1	1	1	1	1	1	2	2	2	4	3	4	4	4	4	4	4	4
48	2	2	1	2	2	2	3	4	4	5	5	4	5	5	4	4	4	3
49	2	1	3	3	3	2	3	1	3	3	3	3	2	2	2	2	2	2

Figure 2. RLD ratings for plants of the cv. Red Rhapsody over the 2020 fruiting season. 1= healthy plant (bright green), 3 = plant with several leaves with RLD, 6 = dead plant (bright red).

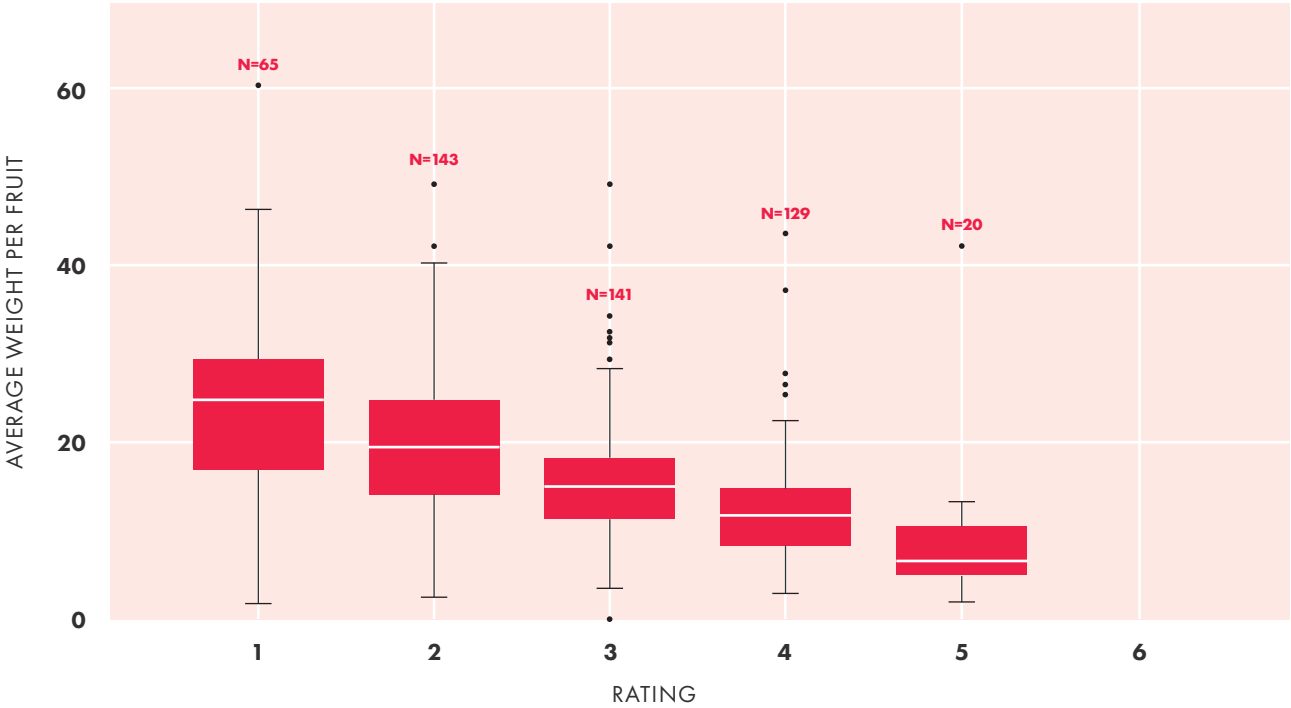


Figure 3. Average fruit weight per RLD rating, where 1= no RLD and 6= plant dead.

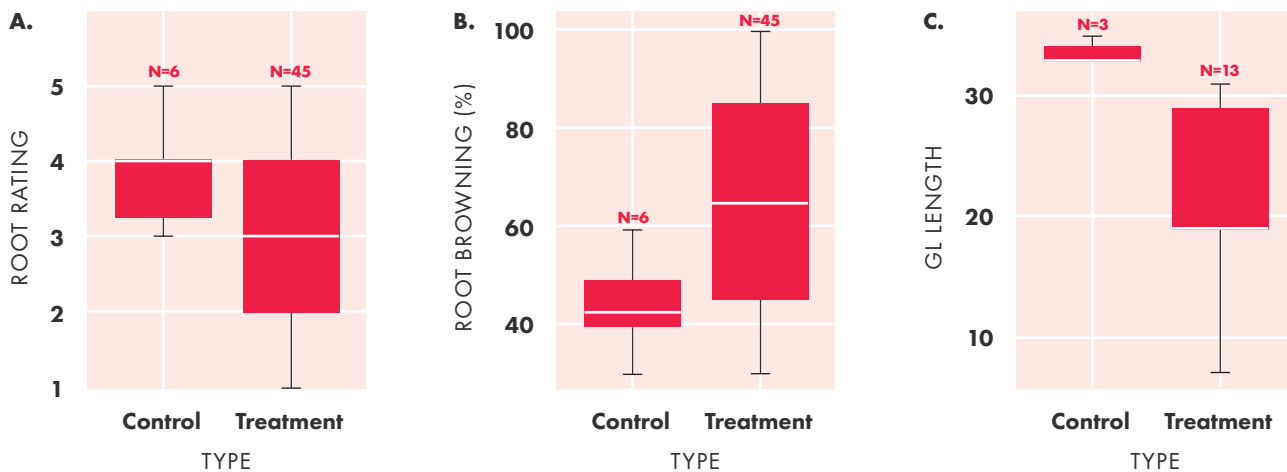


Figure 4. A) Root rating (1-5, where 1 = unhealthy, short roots, 6 = maximum root health & length), B) root browning % and C) green leaf (GL) length, for control group (plants without RLD) & treatment group (plants with RLD).

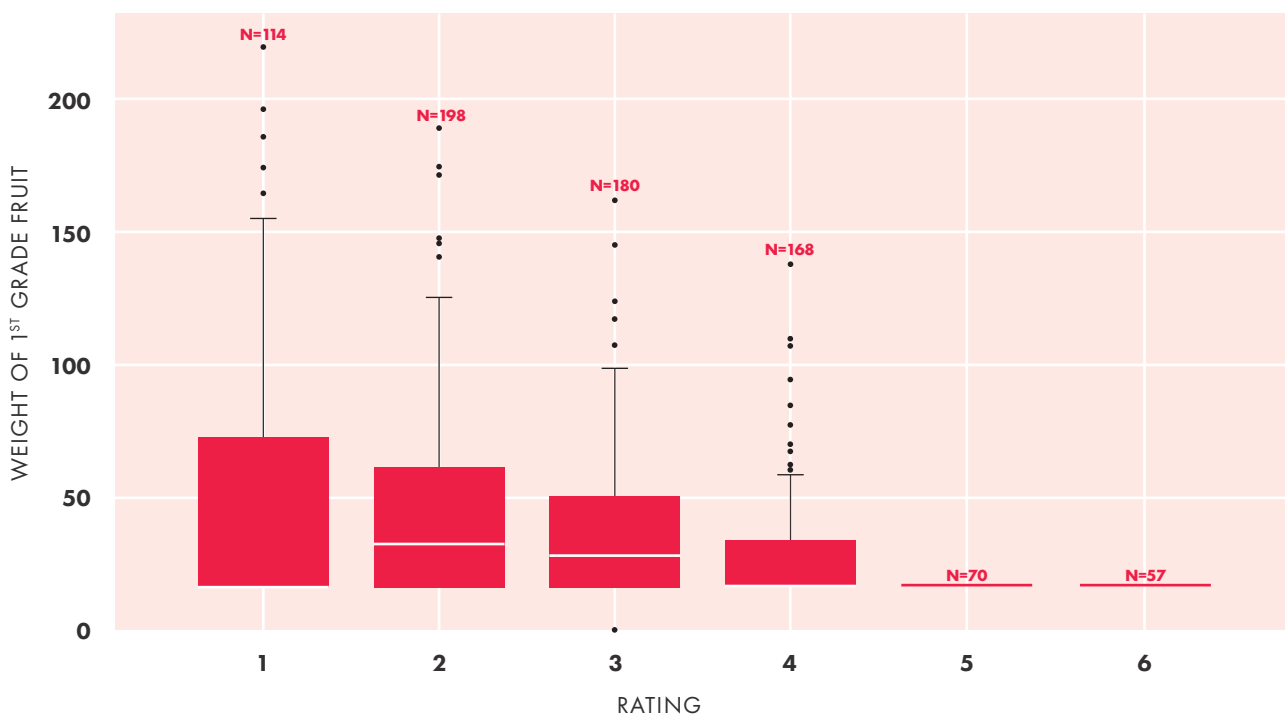


Figure 5. RLD Yield trial of total weight of 1st grade fruit per plant vs rating of RLD, where 1= healthy, 6 = plant dead.

We identified more variation in the treatment group (with RLD) for root length, more root browning, and shorter roots. Plants from the control group had longer roots and less browning. Figure 4(c) shows the differences between the length of green leaves on plants with and without red leaf. The control group plants (no RLD) had longer and more uniform length leaves, all over 30 cm, compared to those of the treatment group which ranged from 18–28 cm. The number, weight and quality of 1st grade fruit progressively decreased as RLD severity increased. Figure 5 shows the yield weight per plant of the 1st grade fruit for each rating. (Figure 5)

Overall, there was less RLD observed in 2020 than in 2019. It will be interesting to observe how the RLD trend develops over the 2021 strawberry season will. Cultivars exhibiting RLD have differed each year,

however most cultivars sampled have shown RLD at some stage. We hope to continue investigating this disorder and its cause. Any information growers can provide regarding the occurrence of RLD in other region of Queensland or Australia will be appreciated. Please email Joanna: joanna.kristoffersen@daf.qld.gov.au or or Michelle: michelle.paynter@daf.qld.gov.au

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