Higher marketable yields seen in Sunshine Coast strawberries under tunnels

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- The effect of plastic high tunnels on the performance of four strawberry cultivars was studied on the Sunshine Coast over two years
- Marketable yields were 38% higher under the tunnels in year one, and 24% higher in year two compared with strawberries grown outdoors
- Rain damage was the primary cause of lower yields outside of the tunnels
- Returns were about $1.50/plant higher under the tunnels than outdoors

Strawberry production in south-east Queensland is affected by rain most seasons. Direct rain damage on strawberries presents as water soaking, surface etching, and surface cracking on the fruit. Cultivars vary in their sensitivity to rain damage, however nearly all are affected when the fruit are mature. Pollination is disrupted by rain and the impact of this is evident in distorted berries following periods of wet weather.

Grey mould, stem-end rot and black spot are also common in plants exposed to rainfall. Some of the fungicides used to control these diseases are ineffective in wet weather, and their overuse to compensate for this can lead to the development of resistance in the fungi.

This article reports on the effect of tunnels on the performance of four strawberry cultivars on the Sunshine Coast over two years. Plants were grown under tunnels or outdoors and information was collected on yield and fruit losses due to rain, disease and other defects.

Experimental design

Bare-rooted transplants of '*Festival*', '*Rubygem*', and two breeding lines were planted in late March over two years at Palmwoods in Queensland. There were four replicates of each cultivar in each treatment (tunnel or outdoors).

The plants were grown under plastic high tunnels (8m wide and 5m high) or in open, outdoor plots. The tunnels were covered in mid-May in the first year and mid-April in the second year. The sides were raised during warm weather to moderate temperatures close to the plants.

Plants in both environments received similar pest and disease management sprays. The only exception was the application of 2 or 3 additional powdery mildew sprays to the plants under the tunnels.

Fruit were harvested every week from May to October in the first year and from May to September in the second year. Marketable yield and fruit weight were recorded at each harvest, with mature fruit classified as at least three-quarter coloured. The number of fruit that were affected by rain or grey mould, or that were small (less than 12 g), deformed (misshaped) or had other defects (other diseases, surface bronzing or bird damage) were also recorded.

Figure 1. Experimental strawberries planted under the tunnels at Palmwoods. The open-field strawberries can be seen off to the right in the image. Photo credit: Christopher Menzel

Figure 2. Fruit with grey mould (*Botrytis cinerea*). Photo credit: Christopher Menzel

Figure 3. Examples of the cracking caused by rain damage (note: powdery mildew can also be seen on the sample on the left). Photo credits: Helen Newman (L) and Mark Herrington (R)

Figure 4. Example of small misshapen and deformed fruit. Photo credit: Onyeka Nzie

Rainfall during the experiments

Total rainfall during harvest was 357mm in the first year (May to October) and 329mm in the second year (May to September), about 30% and 20% below the long-term average for the area. The distribution of this rainfall is shown in Figure 5.

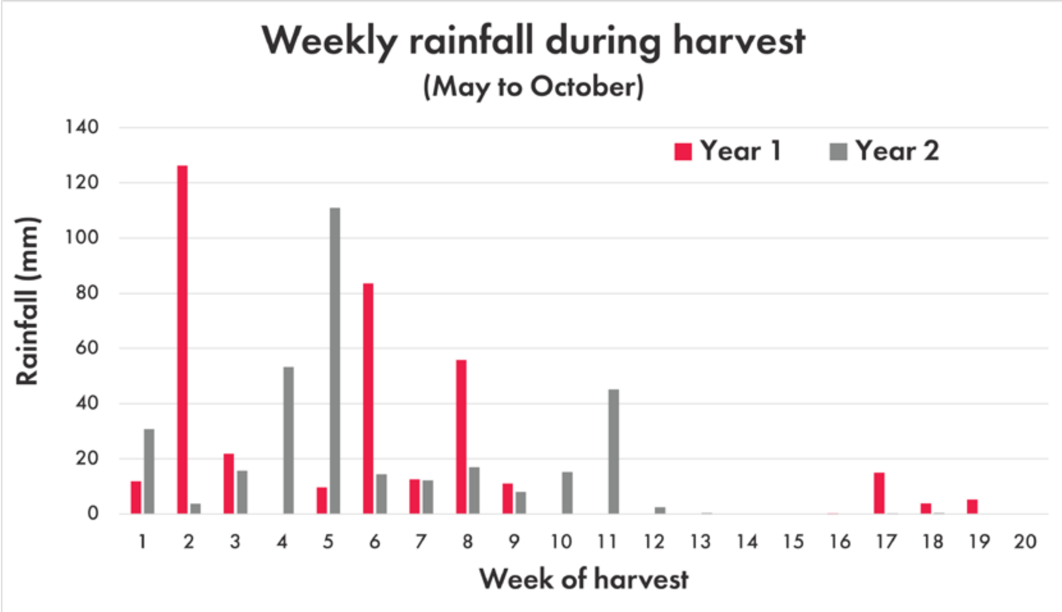

Figure 5. Weekly rainfall totals for each week of the harvests at Palmwoods in Queensland. Note: There were only small differences in temperature and relative humidity between the two environments over both years.

Overall results

Marketable yields were 38% higher under the tunnels than outdoors in the first year, and 24% higher in year two (Figure 6). There were no differences in average fruit weight across the two growing systems.

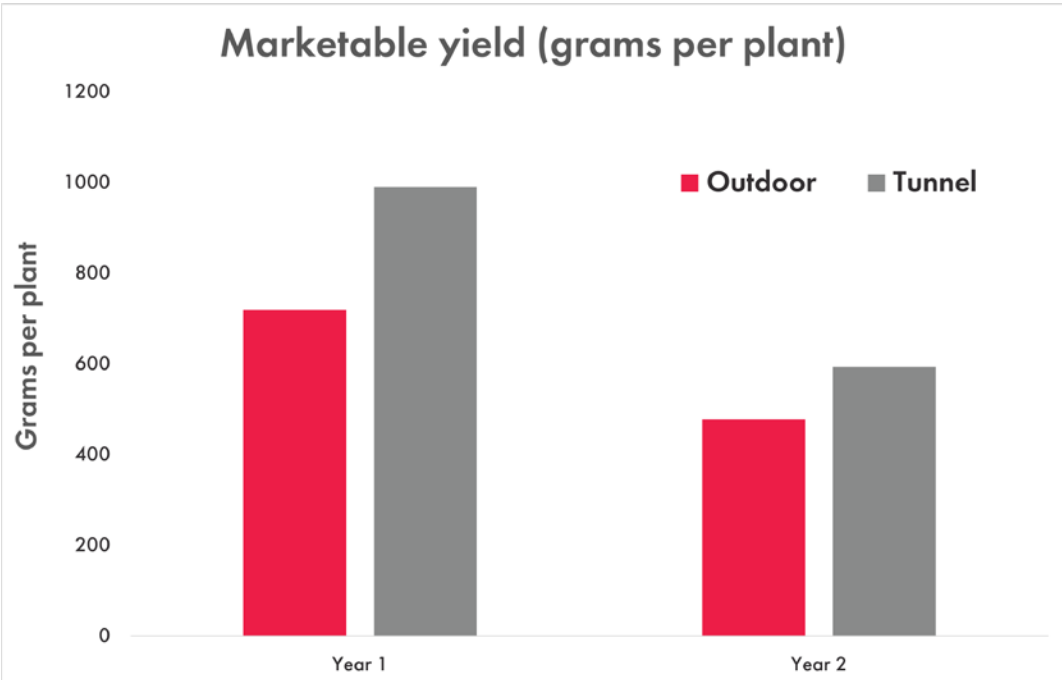

Figure 6. Effect of growing system on marketable yield (grams per plant). The data presented is the average of 16 replicates per treatment, pooled across four cultivars.

Table 1. Effect of the growing system on the incidence of fruit with defects

		Rain damage (%)	Grey mould (%)	Small fruit (%)	Misshaped fruit (%)	Other defects (%)	Total defects (%)
Year 1	**Outdoor**	13.5	2.8	16.0	5.4	2.9	40.6
	Tunnel	4.2	1.4	16.6	4.0	1.1	27.3
Year 2	**Outdoor**	14.1	1.8	24.4	6.0	0.8	47.1
	Tunnel	1.4	0.8	29.5	3.2	0.8	35.7

The values presented in this table are the averages of 16 replicates per treatment, pooled across four cultivars.

Average yield losses due to fruit defects were greater outdoors than under the tunnels (Table 1). Rain damage on fruit grown outdoors was the leading cause of this.

The incidence of misshaped fruit under the tunnels was lower than that in the open field, but only by a small amount. Differences in the incidence of grey mould between the two growing environments were also small, but in favour of the tunnels. The incidence of other fruit diseases during the study, including stem-end rot, powdery mildew and black spot was small.

In the first year, the plants in the two environments had similar numbers of small fruit. In year two, losses due to small fruit were higher under the tunnels.

During the experiments, the growing system did not affect the post-harvest quality of the fruit or the fruit-soluble solids. There was a mixed effect on fruit acidity, with no effect in the first year, and higher acidity under the tunnels in year two.

Implications for commercial production

Returns were $1.50 per plant higher under the tunnels than outdoors. This was equivalent to an increase in return of 38%. The average difference in yield between the two groups of plants was 31%, mainly due to the lower rates of rain damage under the tunnels. Plants under the tunnels benefited by having more marketable fruit in May and June when the crop is more valuable.

High plastic tunnels may increase the productivity and returns of strawberry fields even further during years of average or above-average rainfall.

Acknowledgements

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