# Can Microbes Help Strawberries Beat the Heat?

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- Beneficial microbes increased sugar content and dry matter percent in fruits after a period of high temperatures
- Microbial products appear to be making plants more resistant to accelerated ripening caused by hot weather
- Growers involved suggest these initial findings may provide valuable economic benefit
- More research is needed to confirm this hypothesis and investigate impacts on shelf life

## Cool climate industry challenge

Australians expect high-quality strawberries year-round, but the hottest months of summer can present challenges for fruit quality.

When strawberries ripen under elevated temperatures (typically above ~28–30 °C), fruit tends to be softer and more prone to postharvest breakdown, leading to increased rejection both in the field and along the supply chain.

With the Bureau of Meteorology confirming El Niño conditions for the coming season, the risk of heat events this summer is high, compounding these challenges.

## Research into the potential of beneficial microbes

Beneficial microbes are increasingly being explored as a tool to improve plant resilience to environmental stressors. While beneficial microbes have been shown to enhance nutrient uptake, growth, and yield in strawberries, their potential role in improving heat tolerance—and maintaining fruit quality under high temperatures—remains largely unexplored.

The Tasmanian Institute of Agriculture (TIA), supported by regional berry industry partners, has been undertaking research to evaluate whether commercially available microbial products could improve strawberry fruit quality during periods of hot weather.

The project is being led by Dr Pippa French (Figure 1) as a component of broader research being undertaken by TIA to sustainably grow the value of cool climate horticulture in Australia (AS20004), funded by Hort Innovation's Hort Frontiers program.

### The trial set-up and methods

The one-year trial was established using the heat-sensitive cultivar '*Arabella*', grown in substrate under high tunnels. Five commercially available microbial products were evaluated against a control treatment which received only water. These products ranged from simple formulations containing a single beneficial bacterium, to more diverse microbial formulations comprising multiple bacterial and fungal species.

The five treatments were applied to the substrate fortnightly from late October to early December. Irrigation, nutrition and pest management were carried out according to standard grower practices across all treatments.

**Figure 1. Tasmanian Institute of Agriculture researcher, Dr Pippa French, is exploring the use of beneficial microbes as a strategy for reducing the impact of heat on strawberry crops** Photo credit: TIA

From early to late December, the plants were exposed to heat stress in a greenhouse, where daytime temperatures reached 30–39°C and nighttime temperatures remained above 19°C. During this period, the microbial products were applied weekly as foliar sprays.

Fruit yield and quality were assessed throughout the three-week heat period and during the recovery phase that followed. Measurements included fruit size, weight, firmness, total soluble solids (sugars) and dry matter content. Plant physiological responses to heat were also monitored through measurements of photosynthetic efficiency and stomatal conductance.

## These first findings

Microbially treated plants produced slightly less dry matter yield (the fruit components excluding water) than the control during the heat-stress period, although the differences were not statistically significant.

Following the heat event, this pattern reversed, with microbially treated plants tending to produce more dry matter than the control. Overall, however, cumulative dry matter yield was similar across treatments when the heat and recovery periods were combined (Figure 2).

Additionally, after the heat event, fruit from microbially treated plants had higher sugar content and dry matter levels than fruit from untreated plants (Figure 3). These responses were observed across all microbial treatments.

## What could the findings mean scientifically?

While the second year of the project will build understanding of the effects of beneficial microbes, researchers have a hypothesis they have been discussing with local growers that may explain the trial responses.

It is generally accepted that fruit quality is impacted by the acceleration of ripening caused by hot weather, but it is possible that the microbial treatments in this trial helped moderate this response to heat. While the control plants produced more fruit early in the assessment period, their production tapered off after the first two weeks.

By contrast plants that received the microbial treatments continued to ripen fruit at a steady rate and, by the end of the study, had achieved similar total yields. A slower ripening rate could also explain the sweeter berries with higher dry matter content because a longer ripening period would have allowed more time for sugar and dry matter accumulation in the fruit.

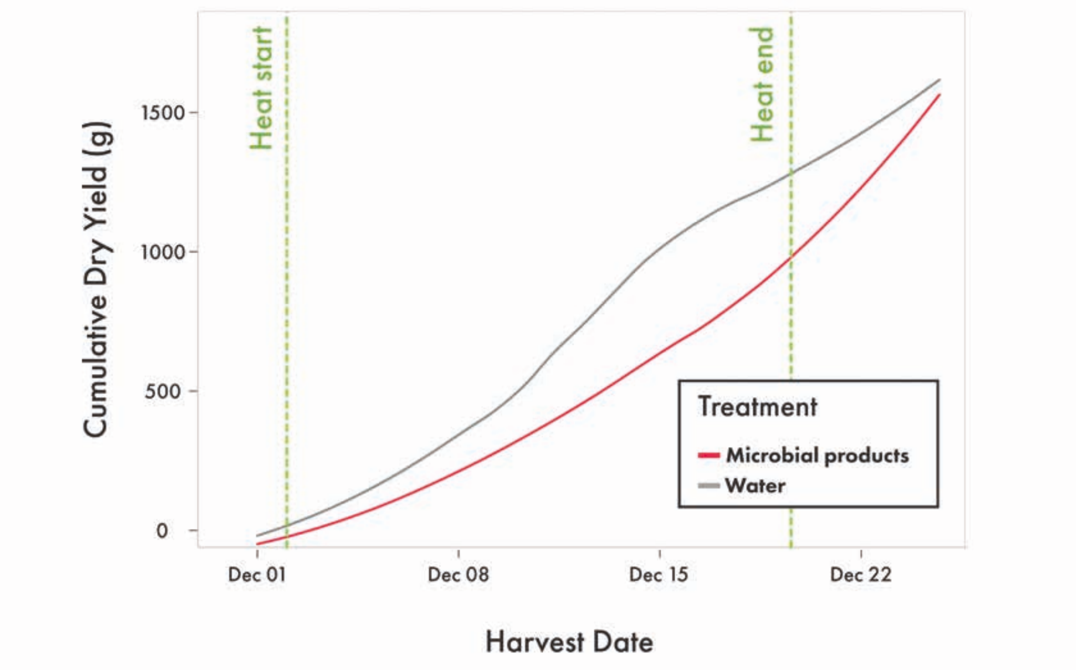


**Figure 2. Cumulative dry yield by treatment over time**

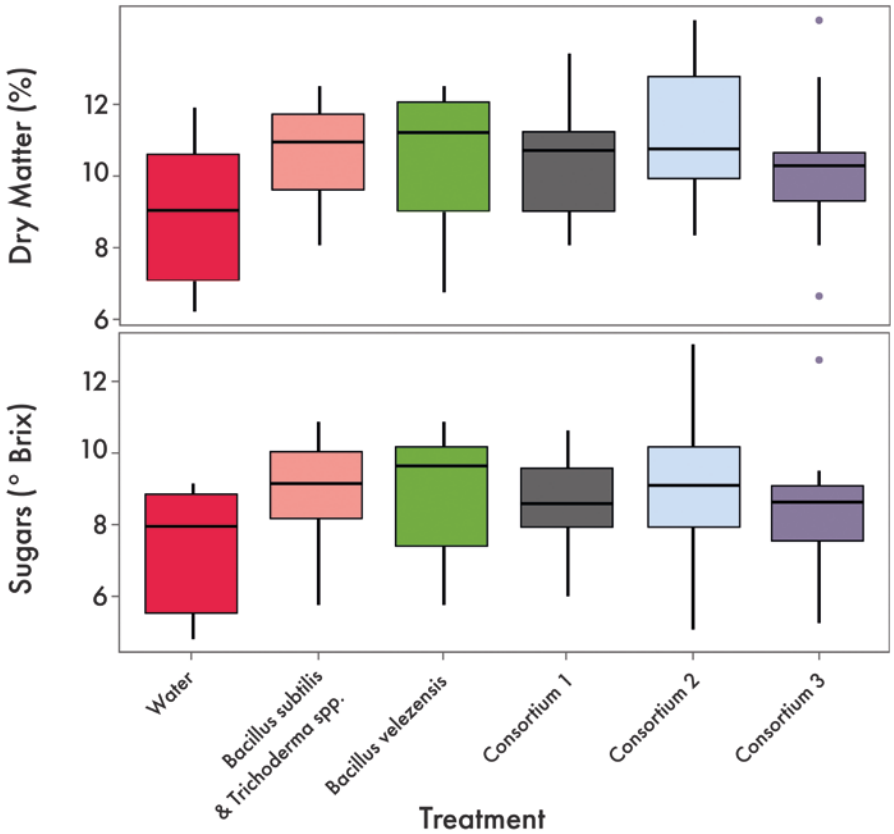


**Figure 3. Effects of microbial treatments on strawberry fruit dry matter and sugar content following heat stress**

## What could the findings mean in economic terms?

Fruits that ripen more slowly and have a higher dry matter content typically develop stronger cell walls, making them less susceptible to bruising and mould during handling and storage. As a result, microbial treatments may help increase marketable yield by reducing fruit rejections at a time of year when losses can be high.

Higher dry matter content can also deliver logistical benefits. According to Berried in Tas Head Agronomist Sumit Bhandari, fruit with lower water content experiences less weight loss during transport.

"When the berry has more water, we have to put more fruit in the punnet to account for water loss in transit," he explains.

By arriving on retail shelves with stabilised weight, berries with higher dry matter content could reduce the need for overpacking, potentially improving pack-out efficiency and reducing costs along the supply chain.

## Second year investigations

There are several physiological mechanisms that will be researched in the second year to help explain why the microbially treated plants appeared less susceptible to accelerated ripening, with changes in hormonal signalling being one of these.

The accelerated ripening hypothesis will be investigated by measuring fruit ripening rates and hormone profiles in microbially treated and untreated plants. Importantly, it will also determine whether the treatments affect shelf life, measuring mould incidence and quality decline during storage.

**Further information**

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