Mitigate heat stress with Parka®

Understanding heat stress

Heat stress can negatively impact all crops by adversely affecting growth, development, and productivity. Heat stress is a widespread problem due to the continuous rise in atmospheric temperature and its potential to impact the crop at multiple stages.

High temperature stress disrupts biochemical reactions fundamental to normal cell functioning and it primarily affects the photosynthetic functions of plants. Reproductive processes are also affected by heat stress in most plants. High temperature causes morphological, anatomically, physiological, and biochemical changes in the plants, which affect growth and development. Heat stress may cause either direct or indirect injury to plants. Direct injury includes aggregation and denaturation of proteins and fluidity of membrane lipids. Indirect injury includes enzymes inactivation, inhibition of protein synthesis, and degradation and loss of membrane integrity. These alterations result in cell injury or even death (Shah et al., 2017).

Heat stress on cherry trees

Parka's MOA to help with heat stress

Parka is a phospholipid and polysaccharide-based product that was originally designed to supplement the plant's cuticle. This additional layer of protection reduces both fruit microfractures and cracking, and increases water repellency. Additionally, Parka's novel mode of action (MOA) allows plants to use solar radiation for photosynthesis instead of promoting the development oxidative compounds. It is based in two major processes:

1. Parka applications increase the production of antioxidants (e.g., anthocyanins) which reduces the content of oxidative compounds such as reactive oxygen species (ROS) and lipoxygenase (LOX). Cell membrane stability is improved by reducing the content of oxidative compounds and therefore fatty acids are preserved (IRTA, 2020).

2. Parka also enhances the plant's photosynthetic activity by increasing stomatal conductance and net CO_2 exchange (IRTA, 2020).

Parka's MOA and functions are summarized in Figure 1. As a result, plants treated with Parka are better equipped to sustain growth under environmental stress conditions to deliver high fruit quality and marketable yields.

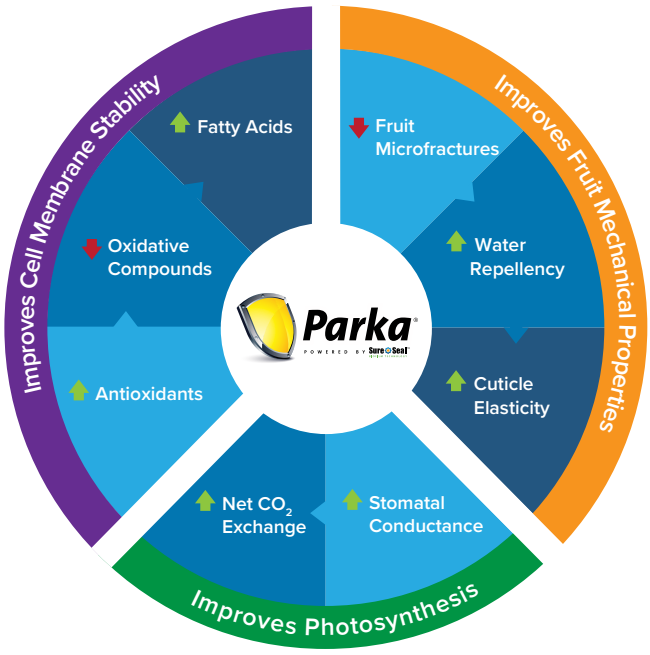

Figure 1. Parka's MOA and function to improve fruit quality and markable yields.

Heat stress on cherries

High temperatures during the flower developing stages can cause abnormal pistil development, resulting on fruit doubling the following season (Beppu et al., 2001). On average doubling can range between 5% and 15%, depending on location and cultivar. However, it can reach 50% on susceptible cultivars in hot growing areas. (Whiting and Martin, 2021).

Parka applications post-harvest reduced the amount of doubled fruit and spurs by an average of 64% (Figure 2). Parka was applied at 1 gal/ac rate 2 weeks post-harvest and reapplied 14—21 days after.

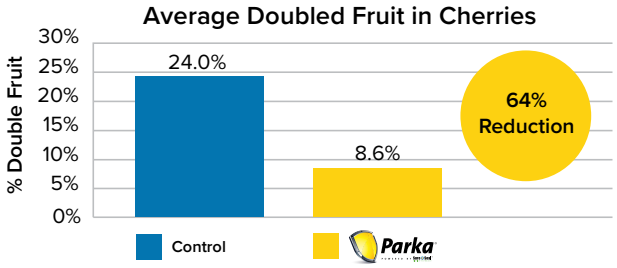

Figure 2. Average results of post-harvest applications of Parka® for cherry doubling reduction (Source: Internal data compiled from 3 trials between 2017 and 2020).

Heat stress on citrus

Temperature plays an important role for productivity and fruit quality. While high temperatures during the summer period can cause yield losses, it can also decrease overall fruit quality by affecting fruit maturity, skin quality and color, and by increasing fruit cracking and creasing (Abobatta, 2019).

In a study conducted in California, Parka applications increased the percentage of fruits in the higher fruit quality category (Figure 3). Parka applications were done at 1 gal/ac rate applied before first fruit drop and repeated every 21-30 days.

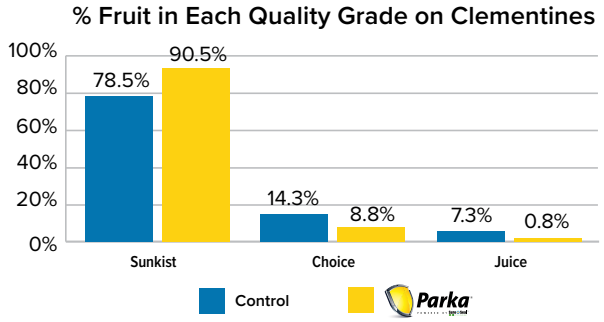

Figure 3. Citrus quality improvement as a result of Parka application compared to the control (Source: Research for hire, CA, 2020).

Heat stress on almonds

Research has shown that during periods of elevated temperatures, trees begin to shut down their transpiration potential by closing the stomata to preserve water. This can reduces photosynthesis which means that energy is not being stored and nutrients are not being allocated to the nuts (Kreps, 2007; Suleuman et al., 2007).

Parka has shown to help mitigate heat stress on Californian almonds and increase nut yield by an average of 10% compared to the control (Figure 4). Parka was applied at 1 gal/ac rate, starting at nut set and repeating every 21-30 days.

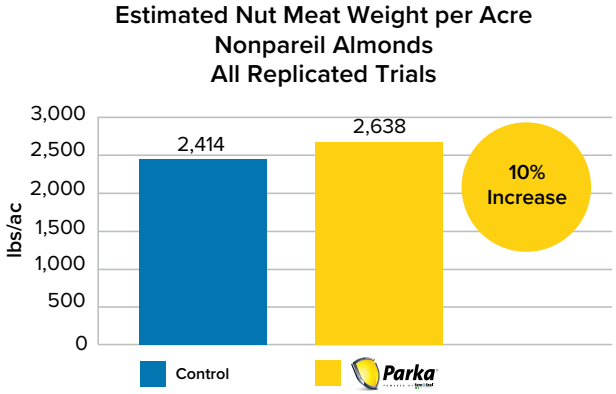

Figure 4. Average results of Parka application to reduce heat stress on almonds (Source: Internal data compiled from 7 trials in California between 2015 to 2020).

References

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