The clear choice for premium quality

Impact of abiotic stress on citrus yield and quality

Citrus yield can be impacted by high temperature and drought. These stresses cause biochemical, anatomical, physiological, and genetic changes that result in yield loss due to reduced fruit set, decreased fruit growth and size, increase in fruit acidity, reduced fruit peel thickness, and pre-harvest fruit drop (Shafqat et al., 2021).

One of the main symptoms of heat stress on citrus is the “June-drop” of fruits (Jifon and Syversten, 2001). However, fruit drop can happen at three different times: 1. At post-bloom drop where flowers and fruitlets abscise because of pollination or in response to nutrient shortages and/or inadequate environmental conditions; 2. At June drop where the typical natural drop due to excessive fruit set in May-June is aggravated by water deficit and high temperatures; 3. At pre-harvest drop that occurs in mature fruit a few months before harvest (Vashisth and Tang, 2018).

Fruit quality can also be affected by high temperatures and water deficiency. Research has shown that 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).

Parka’s MOA

Parka is a phospholipid and polysaccharide-based product that was originally designed to supplement the plant’s cuticle. This additional layer of protection reduces microfractures and fruit cracking. 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 both net CO_2 exchange and stomatal conductance (IRTA, 2020).

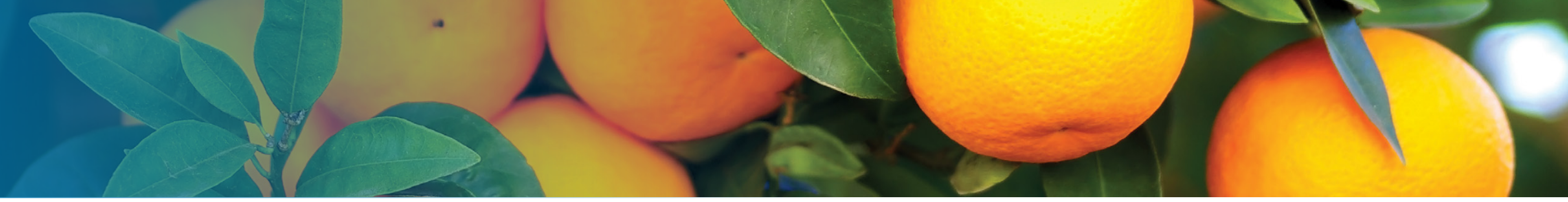
As a result, plants treated with Parka are better equipped to sustain growth under environmental stress conditions to deliver high fruit quality and marketable yields.

Parka’s impact on citrus fruit quality and yield

The importance of fruit size as a quality parameter has significantly increased in recent years and therefore it has become as important as yield in the determination of profitability for citrus growers. Fruit size is determined by the genetic potential of the cultivar but is also significantly affected by environmental conditions such as temperature (Guardiola, 1997). Stomatal conductance, net carbon dioxide assimilation, and transpiration rates can be negatively affected by high temperatures and water deficit, resulting in a decrease in photosynthesis and CO_2 assimilation which reduces overall growth, fruit yield, and quality (Shafqat W, et. 2021).

Parka was tested on Clementines in a California study. The results showed Parka applications increased marketable yield by 9,302 lbs/acre (22%) compared to the control (Figure 1). Parka also improved citrus fruit quality by increasing the percentage of fruits in the Sunkist quality category from 78.5% to 90.5% (Figure 2). Additionally, Parka applications had no significant effect on fruit size (Figure 3), meaning that the yield increase showed in Figure 1 was likely related to a reduction in fruit drop for the Parka treatment (data not collected). Parka was applied at 1 gal/ac rate applied before first fruit drop and repeated every 21-30 days.

Sunburn damage



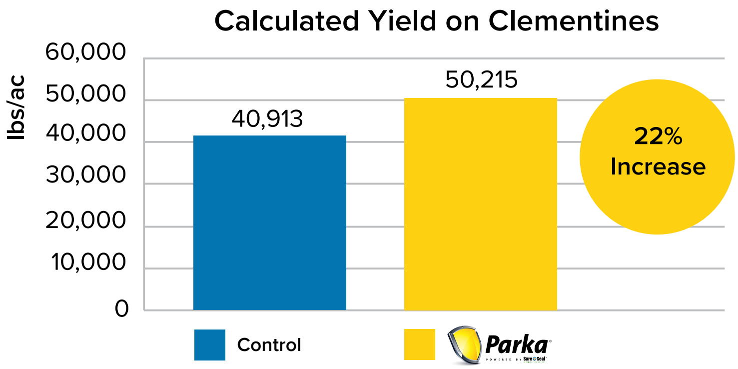


Figure 1. Citrus yield improvement as a result of Parka applications compared to the control (Research for Hire, 2020).

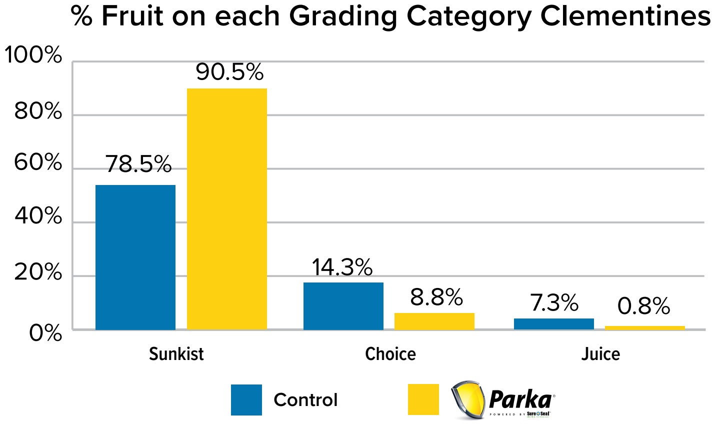


Figure 2. Citrus quality improvement as a result of Parka applications compared to the control (Research for Hire, 2020).

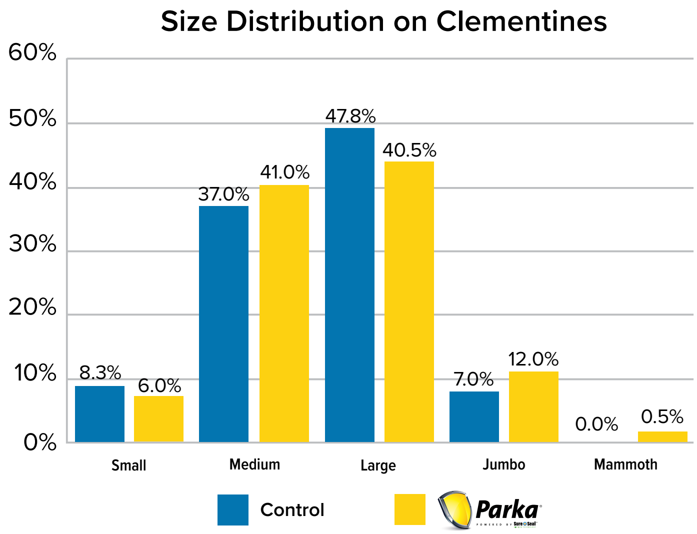


Figure 3. Citrus fruit size distribution as a result of Parka applications compared to the control (Research for Hire, 2020).

Parka's impact on citrus sunburn

Even though citrus plants can withstand high temperature, elevated summer temperatures in conjunction with excessive solar radiation can cause severe sunburn in fruits. High temperatures and radiation trigger the production of reactive oxygen species (ROS) that are responsible for photo-oxidative damage, the main process responsible for sunburn injury. These oxidative compounds decrease cell membrane integrity which leads to cell leakage and death (El-Tanany et al., 2019).

In the same California study, Parka applications reduced the percentage of fruit sunburn damage by 56% compared to the control (Figure 4). Parka helps decrease the production of oxidative compounds by increasing the production of antioxidants. Parka was applied at 1 gal/ac rate applied before first fruit drop and repeated every 21-30 days.

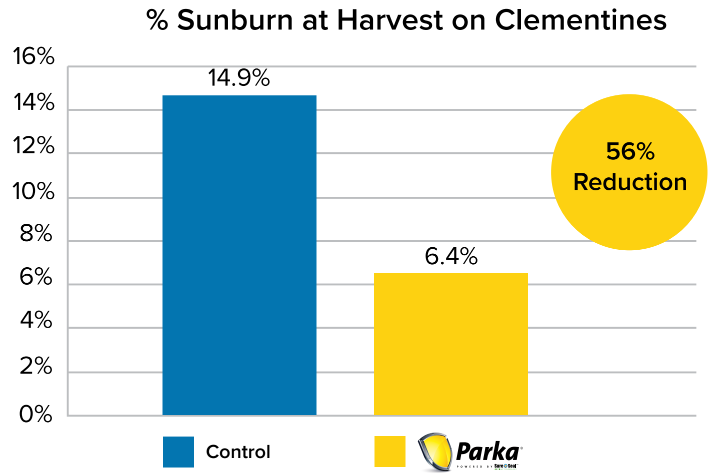


Figure 4. Citrus sunburn incidence reduction as a result of Parka applications compared to the control (Research for Hire, 2020).

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