

# Increase Almond Yield with Unique Modes of Action



Marrone Bio Innovations proves that tank-mixing biologicals with traditional chemistries gives growers control alternatives.

TWO PRODUCTS from Marrone Bio offer almond growers more opportunity to increase yield. One of them, Haven<sup>®</sup>, was first developed as a sun protectant for nuts and other fruit crops. But further research has revealed it is more than that. Haven<sup>®</sup> works within plants' cellular processes to dissipate excess heat and moderate solar radiation. By keeping leaves at an optimal temperature and reducing abiotic stressors, photosynthesis can continue at the level needed for maximum yields.

"While sun damage isn't an issue in almonds, we do see decreases in photosynthesis during hot periods," says Dr. Melissa

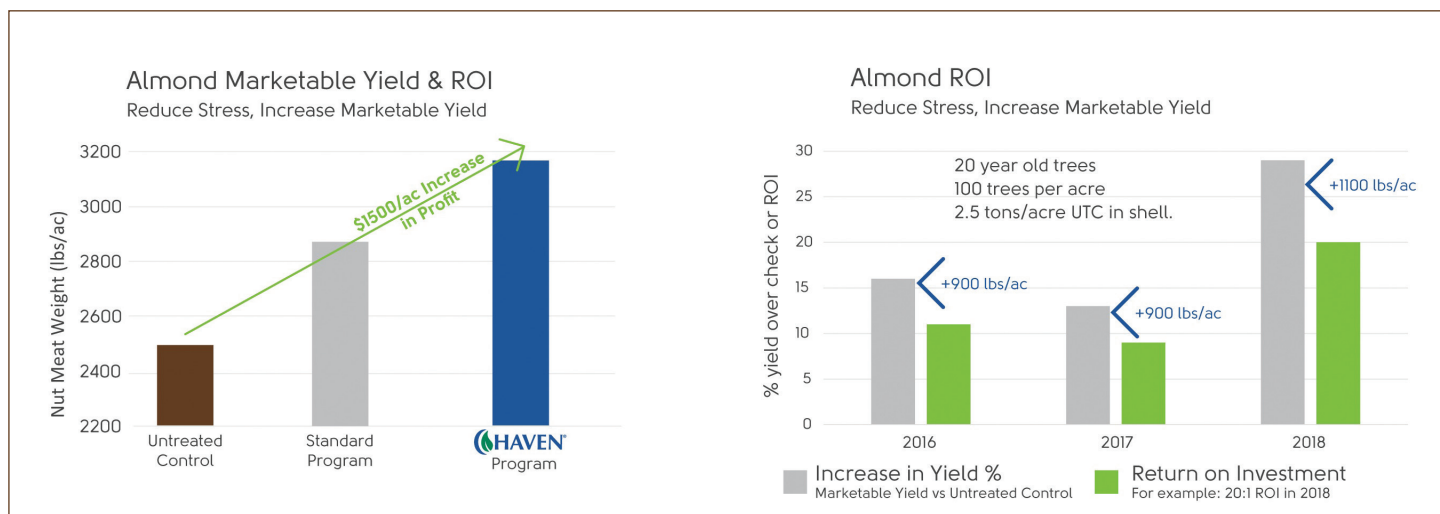
O'Neal, Product Development Manager for the Western U.S. at Marrone Bio Innovations. "Of course, decreases in photosynthesis impact the yield."

O'Neal says Haven's active ingredient, stearyl alcohol, is derived from coconut oil extract. She emphasizes that it doesn't work in the same way as other solar stress protectants.

"The majority of these types of products are applied just prior to a heat stress event," she says. "Haven isn't applied that way, and it's very important to use it at the timings we recommend to see the increase in yield."

Because Haven is working within the plant at the molecular level, it must be applied at certain growth stages of the plant to have benefit. O'Neal says there should be three

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(Left) Incorporating Haven in an almond program resulted in a 200 lb/acre yield increase over a standard program. (Right) Over a three-year period, reducing stress in almond trees with applications of Haven at key stages resulted in a yield increase of 900-1,100 lbs/acre over the untreated control.

applications: At petal fall, two weeks after petal fall, and at June drop.

"You can't apply Haven a week before a heat event and expect results," O'Neal says. "But if used as recommended, it makes a big impact on yield. Five years of research trials have demonstrated that."

The numbers are significant. Lindsay Guthrie, product manager at Marrone Bio Innovations, says studies have shown a 19- to 21-percent increase in yield and an average ROI of 8:1 when Haven is used on almonds.

By decreasing the canopy temperature and reducing temperature spikes, plants can better use their resources for growth.

"With the warmer temperatures California has been experiencing, we are excited about being able to give almond growers this new option to increase the yield of their orchards," Guthrie says.

"Heat stress is a key issue in the early growth stages of almonds, because these stages are very important to kernel development. Now growers have a new tool to help manage this."

### HELPING THE PLANT HELP ITSELF

Regalia® fungicide is another yield-boosting tool for almond growers that offers a unique mode of action. It controls brown rot blossom blight (*Monilinia laxa*) by stimulating the plant's own defensive mechanisms. The active ingredient in Regalia is an extract of giant knotweed (*Reynoutria sachalinensis*). Rather than killing fungi directly, it triggers the systemic acquired resistance (SAR) and induced systemic resistance (ISR) responses within the plant to thicken its cell walls and prevent fungal penetration.

Regalia's unique mode of action makes it an ideal component in an integrated pest management, (IPM) program, O'Neal says.

"A number of fungicides that are used to treat the diseases Regalia controls have documented resistance and don't always work," she says. "The fungi continue to evolve. Regalia doesn't have documented resistance, and it helps to preserve the



**Shot hole disease decreases yield by damaging leaves and reducing the area for photosynthesis. Regalia triggers the plant's own defenses to resist this disease.**

efficacy of other fungicides by avoiding repeating their modes of action. It also has the additional benefit of a four-hour worker reentry interval, because it's a biological plant extract and has an excellent worker safety profile."

O'Neal says Regalia must be used preventatively so it has time to work within the plant in advance of disease pressure. For brown rot blossom blight, Regalia should be applied at pink bud, 50-percent bloom and full bloom.

"It's either two or three applications depending on disease pressure, weather conditions and site history," O'Neal says. "We typically recommend 2 qts/acre at the first two timings, and 1 qt/acre at full bloom when sensitive floral parts are present."

Regalia also helps to control shot hole disease and scab, two other major fungal diseases in almonds. Shot hole disease causes many tiny holes in the leaves, reducing the area for photosynthesis, which means less energy for the plant and less yield. Scab causes lesions on the almond fruit itself, which means less marketable yield. Applications for these diseases are later in the season, and label instructions should be followed for rates and timings.

