

REDUCING THE RISK OF BITTER PIT IN HONEYCRISP APPLES

Honeycrisp apples are the hardest to grow and the most prone to difficulties.

Bitter pit, a disorder most commonly linked to calcium deficiencies in the fruit, is one of those difficulties. And it can happen to anybody.

It's endemic to the Honeycrisp variety and growers are paying more attention to the risk factors that impact the disorder.

"If you plant Honeycrisps in your orchard, you're prone to bitter pit," said Kevin Herman, an agronomist at CHS in Traverse City, Michigan. "If you don't have a good fertility program in place, there's no way to avoid the disorder."

"Bitter pit is a huge concern for growers all over the state," said Addie Spolyar, an agronomist with CHS. "It can take a crop with a grower value of up to \$1 per pound and reduce the value to \$.06 per pound."

According to Lenny Ligon, an apple grower in Old Mission Peninsula, Michigan, bitter pit is the toughest thing for growers to overcome.

After unsuccessfully battling bitter pit in his orchards four years ago, Ligon put his trust in someone else's hands. He put his trust in Agro-K.

"I reached a point in time where I realized that I am unable to learn as much as I would like to make the decisions that can help me fight bitter pit," Ligon said. "So I took a leap of trust, I decided to spend the money and I committed to using Agro-K's program."

"My decision was based on science and I didn't take any shortcuts."

The cost of the program — and Ligon's dedication to the program — paid off.

"You can't make money by saving money, so I didn't cut corners," he said. "I did all of the required sprays and followed the program completely."

"I can see success," he said. "I've had issues in years past, but I had a very successful year battling bitter pit in 2016."

Ligon is no longer afraid to plant Honeycrisp apples in his orchards because

he believes he's found a way to manage bitter pit. It took a lot of trial and error and a lot of education.

"The threat is always going to be there," he said. "But with continued education we are going to understand the disorder well enough to know what we need to do to solve the problem."

What advice does Ligon have for other growers battling bitter pit? He encourages them to give Agro-K's program a try.

"If you're not successful now, take a leap of faith," he said. "What do you have to lose?"

"If growers commit to the program — and commit to feeding their Honeycrisp trees with weekly foliar calcium sprays — they will reap the benefits," Herman said. "We are experiencing visual and scientific results and we're growing healthier, more productive trees."

Bitter pit is significantly reducing Honeycrisp pack-outs across the country, but the risk is much greater in the Midwest and New York due to the high level of organic matter in the soil and warm nighttime temperatures.

"Anytime you have warm soil, high organic matter and moisture, nitrogen is released from the organic matter and released at the wrong time," said Ken Dart, national technical manager at Agro-K. These increased levels of nitrogen in the summer lead to more bitter pit at harvest.

Growers in the West are working to prevent a different set of risk factors unique to the region, like extended, hot summer temperatures that can drive bitter pit in Honeycrisp to very high levels.

"We are hoping to help growers become good carpenters," Dart said. "We want to encourage them to use the right tools at the right time to help fight bitter pit."

"With Honeycrisps, it's all about being a good carpenter of your craft."

According to Scott Palmer, partner of Reality Research, 100 percent of Honeycrisp growers in Michigan, New York and Pennsylvania are battling bitter pit with varying severity.



Healthy Honeycrisp apples provide a very good return to the grower.

"Many growers don't realize just how much they are losing to bitter pit," Palmer said. "They are only analyzing the number of apples they lose in storage; they fail to track how many apples they drop off the tree or leave on the tree while picking."

But they do know that every time an apple with bitter pit is picked and placed into storage, profits are lost.

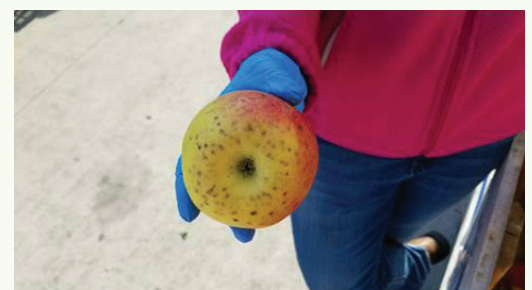
Reality Research is a family run, independent research company located in the heart of New York's apple country. The company has almost 10 years of experience working with Honeycrisp apples and bitter pit.

"Why don't we just get rid of Honeycrisps?" Palmer said. "Because it's a parent to many of the apple varieties that are being created today. If you can't fix the parent, you'll never know how to deal with the child."

If we can learn to control the bitter pit symptoms, the fruit provides a very good return to the grower.

"The apple industry has done an excellent job branding and marketing the Honeycrisp apple as a high-quality, premium product," Spolyar said. "In order to maintain the value of this crop for producers, we must meet consumer expectations."

"Growers invest higher-than-average input costs into their Honeycrisp crop and, therefore, must be able to produce fruit that will have adequate pack-outs and strong storability."



Bitter pit can be seen on the outside of Honeycrisp apples. Photo: Reality Research



Bitter pit, shown here, is significantly reducing Honeycrisp pack-outs across the country. Photo: Reality Research

It's a balancing act. The goal is to get consistent return bloom to reduce your chances of experiencing bitter pit.

"It's expensive, hard work for the grower," Palmer said. "But growers we work with have seen a significant reduction of bitter pit in their orchards."

Why? Because people like Herman, Spolyar, Dart and Palmer are conducting countless hours of research and helping to educate the industry.

Reality Research has been working with Agro-K since the 2005-2006 growing season. Agro-K supports and analyzes the firm's research to create reliable information and science-driven nutrition recommendations for growers.

"The educational process has already started," Palmer said. "And we are hoping to be a part of that process as growers learn more about bitter pit and best practices."

Eliminating bitter pit in Honeycrisp is not realistic, but correcting a few common mistakes can significantly reduce the risk.

- Start your calcium applications early. Petal fall is too late when dealing with Honeycrisp — you need to start at first bloom during cell division, a period that lasts about 28 or 30 days.
- Use the correct form of calcium. Some growers are using calcium nutrients that are not very soluble or too large molecularly to be absorbed by the fruit during cell division. A foliar nutrient is only as good as how well it enters the fruit. Also, foliar nitrate-based calciums negatively impact nitrogen-to-calcium ratios increasing bitter pit.
- Spray often using the correct application rates. For best results, growers may need to commit to calcium sprays every five to seven days for the duration of the season.
- Don't over-thin. Over-thinning reduces fruit load but increases fruit size, leading to an increased threat of bitter pit. Fruit load management is key.
- Watch your nitrogen levels. Increased nitrogen improves vigor, but vigor

- increases the risk of bitter pit.
- Avoid alternate bearing, if possible. Make sure you have good nutrition, good sources of boron and molybdenum and good thinning practices to maximize set every year.
- Don't apply foliar potassium sprays during cell division. Because potassium moves into the cell walls much faster than calcium during cell division, the effectiveness of your calcium sprays will be significantly reduced. Potassium should be supplied after the cell division window is over.

Increased stress on the tree and fruit leads to increased levels of bitter pit. Increased tree vigor leads to the same result.

"Our goal is to bring as much science as possible to the grower to help them better understand this complex issue," Dart said. "We are conducting ongoing research and continuing to improve our products. That's what it takes when dealing with bitter pit and this variety."

The folks at Ridgeview Orchards, located in Conklin, Michigan, are benefitting from that science.

"For us, bitter pit begins when you plant the tree," said Ryan Dietrich, a partner at Ridgeview Orchards. "We need to make the right choices from the beginning."

Those choices involve extra spending up front on things like labor for hand thinning, crop load management and calcium sprays every five to seven days. It's costly and it's time consuming.

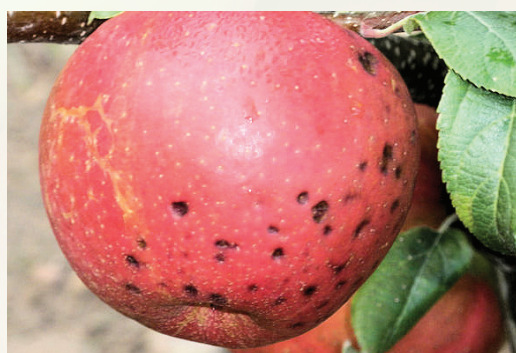
At Ridgeview Orchards, bitter pit is managed throughout the life of the tree, and Agro-K is there to help every step of the way.

"It's an expensive program that requires dedication," Dietrich said. "As long as we stay on top of the program and make sure that everything gets done in a timely manner, we see very positive results."

"It's an investment and it's money that we feel is well spent. We're real happy with the results."

It's a program that started about five years ago and will continue into the foreseeable future.

"Bitter pit is a major threat," Dietrich said. "It's probably the biggest threat that faces Honeycrisp pack-outs on our farms."



Every time an apple with bitter pit is picked and placed into storage, like the one above, profits are lost. Photo: Reality Research

Dietrich and his team are still learning about the disorder. They know that there's no cure, but they are starting to get a good grasp on how to manage it. The final goal: decrease the effects of bitter pit on their pack-outs.

"Bitter pit will always be there, but we're working hard to remove as many variables from the equation as possible," Dietrich said.

"There's no silver bullet to stopping bitter pit," Spolyar said. "But a combination of horticultural practices and the right fertility program will help growers to mitigate the effects."

For more educational information about bitter pit and Honeycrisp apples, visit www.agro-k.com or contact your local CHS crop adviser.



Here are a few of Agro-K's preharvest solutions to help growers significantly reduce the risk of bitter pit in Honeycrisp apples.

System®-CAL. System-Cal is designed for foliar use during fruit cell division and supplies calcium directly to the fruit. It's the only calcium product on the market that can be used with Apogee® or KudoS® without hindering the effectiveness of either product and has supporting data from the University of Massachusetts, Penn State and Washington State University.

Vigor-CAL™. Vigor-Cal is a foliar calcium spray based on a low pH carbohydrate formulation. It's typically less expensive for the grower than System-Cal and used as a foliar calcium source later in the season when System-Cal is no longer needed.

TOP-SET D.L. Top-Set D.L. is designed for foliar applications to prevent or correct boron and molybdenum deficiencies. It's used during first bloom in the spring to encourage increased fruit set which helps reduce bitter pit and improve yield and quality. It's used again postharvest to increase fruit set the following spring and help reduce bitter pit and increase yield.