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Managing carbohydrate levels can boost citrus quality and yields

Citrus trees may spend months growing fruit, but some of their most important energy decisions happen during a much shorter window: flowering.



New research from South African firm Agri Technovation suggests **citrus flowers consume a larger share of a tree's carbohydrate reserves** than fruit development, making it a critical period for growers seeking to secure yields, improve fruit quality, and enhance long-term orchard performance.

The company's Commercial Head of Products Jakkie Stander will discuss these findings during his panel at the 2026 Citrus Conference, to be held on October 28 at the Monticello Casino Events Center in Santiago, Chile.

Why carbohydrate matters

Citrus trees rely on leaves to produce carbohydrates or sugars through photosynthesis, Stander explained, providing the energy needed for flowering, fruit development, and other plant functions. But because citrus trees are perennial, they must also maintain sufficient reserves to support the following season's flowering and production while carrying the current crop.



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According to Stander, a **commercial citrus crop can require approximately 40 metric tons of sugar per approximately 2.5 acres to support production.** He told **FreshFruitPortal.com** that the company's research identified flowering as a major consumer of these energy reserves, with flowers accounting for as much as two-thirds of total carbohydrate demand during a relatively short period.

"Our focus now from these findings is on flowering. Because if we can plan our fertilizers around the flowering period, our fruit quality is much better because then our trees have more energy left to sustain the fruit," he said.

Managing the reserves

Stander identified **potassium, phosphorus, and nitrogen management** as important factors in carbohydrate performance.

Potassium helps transport sugars from leaves to other parts of the tree, including flowers and fruit. Stander said the company's data indicate that **low potassium levels during flowering can contribute to poor flower retention and lower yields.**

He noted that some growers traditionally emphasize calcium applications during flowering. However, Agri Technovation's findings suggest that **growers should not neglect potassium during this period.**

The company is developing **potassium technologies intended to support flowering** without negatively affecting calcium levels.



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“For example, on a cool day when it's cloudy, misty, and the soil is wet, applying this product allows the stomata to remain open for longer periods,” Stander explained. “This enables carbohydrate production to continue for extended periods during the day, which can improve fruit set and fruit growth, even under cold conditions with low growing degree days.”

Stomata are small openings on leaves that regulate gas exchange and water movement. Their activity affects photosynthesis and, in turn, carbohydrate production.

Nitrogen source also matters, Stander said. Growers can apply nitrogen in different forms, including nitrate, ammonium and urea, but the tree’s ability to use each source can affect its carbohydrate reserves.

As **converting nitrate into usable nitrogen forms requires carbohydrates, the researcher explained,** when reserves are low, growers should reduce reliance on nitrate and use more reduced forms of nitrogen where appropriate.

Beyond yield, carbohydrate availability can influence several commercial fruit-quality parameters. **Stander identified fruit size as a key consideration.**

“You can have good tons per acre of fruit, but if the fruit is small, it's also not profitable to sell,” he stressed.

Color is another crucial feature, the expert said. Adequate carbohydrate availability can help citrus develop the desired deep orange color, which **can affect harvest timing and market opportunities**.

Carbohydrates also contribute to **internal fruit quality, including sugar levels, while rind integrity influences the fruit’s ability to withstand storage and shipping.** These factors matter most for citrus destined for distant export markets, where fruit must maintain quality throughout transport and distribution, he emphasized.

The three critical windows

Agri Technovation uses carbohydrate measurements alongside conventional leaf mineral analysis to help growers assess tree performance and make management decisions.

Stander said the company has accumulated approximately 290,000 leaf mineral analyses in its database, alongside about 90,000 carbohydrate analyses. The carbohydrate dataset also includes mineral analysis, allowing the company to examine relationships between nutrient status and carbohydrate reserves in commercial fruit trees.

He identified three key periods for monitoring carbohydrate status.

The first is during **flower induction, from mid-April through the end of May in the southern hemisphere.** Stander said measurements during this period can help growers assess whether trees have sufficient reserves to support the current crop and the following season's flowering. The results can also provide time to adjust management practices.



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The second window comes shortly before bud break and flowering, toward the end of July. Measurements at this stage can help growers evaluate whether trees are prepared to sustain the upcoming flowering period.

The third comes shortly after flowering, before rapid fruit growth. At this point, carbohydrate measurements, combined with observations of flowering intensity, can help growers assess potential fruit size, quality, and color.

Stander said these measurements give growers opportunities to **adjust nutrition and other practices before problems become more difficult to address.**

"We sometimes feel the temptation to cut back on inputs, and I know it's a reality that cash is always tight; but as much as possible, try to keep the plants in a condition so that when unexpected and unavoidable climate events occur, they are fully prepared," he concluded.

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