

6 Potassium Fertilization Strategies in Citrus Orchards

6.1 Timing and methods of potassium application

Potassium demand in fruit trees changes throughout different phenological stages, with the highest requirement generally occurring during rapid fruit growth and ripening stages. In citrus production, field studies have similarly demonstrated that flowering and fruit enlargement periods are critical stages for potassium management (Figure 3). Khan and Nabi (2023) used 20-year-old sweet lime (*Citrus limetta*) trees to compare the effects of foliar applications of KCl, K₂SO₄, and KNO₃ on different application dates, including February 15, February 25, March 7, and March 17. The results showed that potassium application on March 17, 13 days after bud emergence, produced the best performance, with an average of 739.52 fruits per tree and a yield of 63.68 kg per tree, while reducing the time required for full bloom to 20 days. Among different potassium sources, the KNO₃ treatment resulted in 808.75 fruits per tree, a yield of 69.48 kg per tree, and an average fruit weight of 85.64 g. The study indicated that potassium application after bud emergence in spring was more effective than application during the late winter dormancy period, suggesting that the period from spring bud development to flowering represents a critical window influencing flowering progression, fruit number, and yield formation.

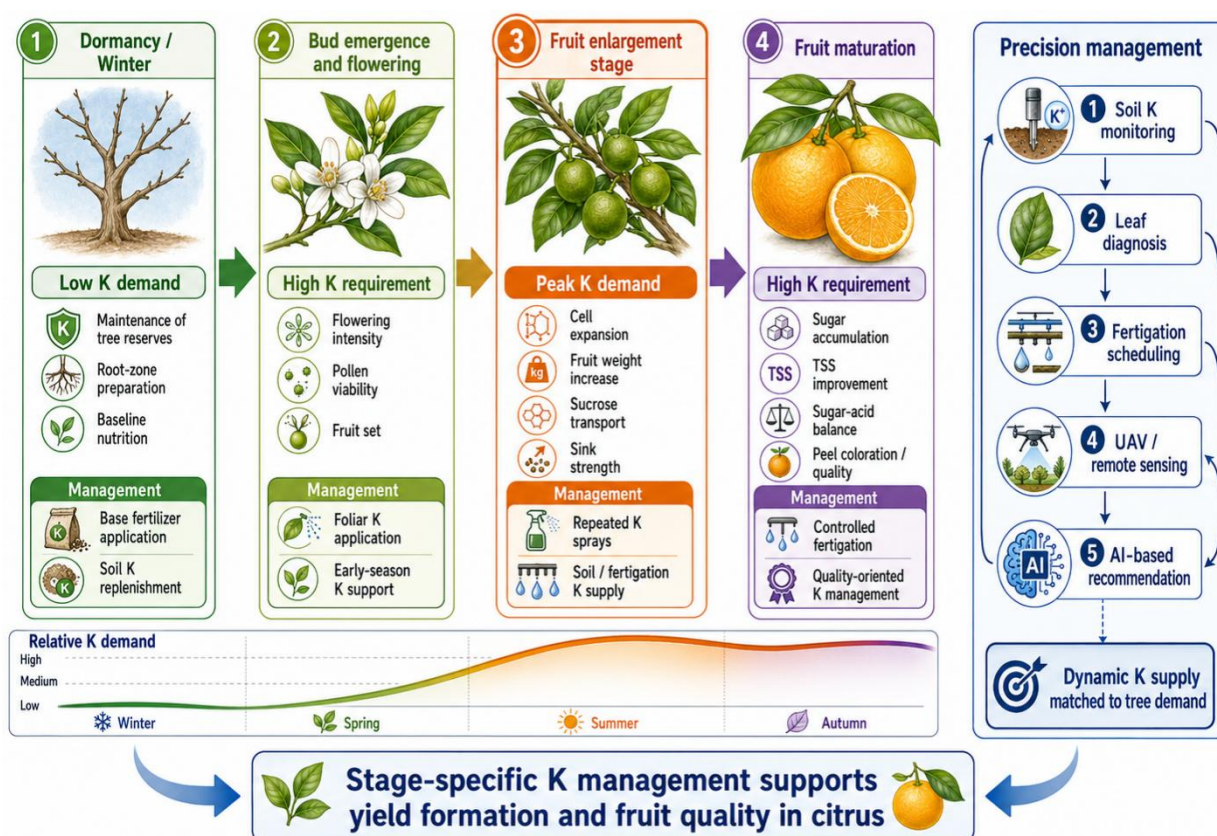


Figure 3 Stage-specific potassium demand and fertilization strategies during citrus development

Image caption: The figure presents stage-specific potassium requirements and fertilization strategies throughout citrus development. Potassium demand is relatively low during dormancy but increases during bud emergence, flowering, and fruit set. The fruit enlargement stage represents the peak potassium demand period, during which potassium supports cell expansion, fruit weight formation, and assimilate transport. During maturation, adequate potassium supply promotes sugar accumulation and fruit quality improvement. Integration of soil monitoring, leaf diagnosis, fertigation, remote sensing, and intelligent management enables precise potassium regulation according to tree demand

In sweet orange, two to three foliar sprays applied around late April, May, and August improved yield and fruit size, with 4% KNO₃ showing the best performance among the tested foliar fertilization treatments. In Washington navel orange, five foliar potassium applications from March to July improved leaf nutrient status, yield, and fruit