

# COMPETITION FACTORS INFLUENCING FRUIT SET OF CITRUS

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Considerable research has demonstrated that carbohydrate competition may reduce fruit set of citrus (Guardiola and Goldschmidt, reviews in this short course). This occurs particularly in cultivars where the previous crop is still on the tree at bloom and may be left on the tree through the May-June drop period in some years. This effect has been demonstrated in several citrus production areas as for example the study by Hilgeman et al. (1967).

Another cause of poor fruit set is water stress during the critical periods when fruitlets tend to drop. The most critical are the three weeks following bloom and the May-June drop period. Koo (1967) showed that irrigation during this earlier fruit development period in Florida reduced premature drop to 1/4 of non-irrigated trees. Under drought conditions, the leaves may be better competitors for limited available water (Rokach, 1953). This appears to be the case for young leaves competing with developing fruit (Albrigo, 1977). Since many of the fruitlets are marginally capable of staying on the tree, less than 5% will last past the May-June drop period (Erickson and Brannaman, 1960), water stress from this competition with leaves could easily contribute to fruit losses..

Other forms of competition between growing plant organs may exist but are not well documented. During flowering there are one to two hundred thousand flowers per tree (Erickson and Brannaman, 1960). In addition, many young expanding leaves are competing for nutrients as well as carbohydrates. During the postbloom fruit drop period, there is still some competition with leaves and thousands of fruitlets are accumulating nutrients. Sanz et al. (1987) have shown that the old leaves decline in nutrients when the young flush and fruitlets are developing. Between fruitlets, competition no doubt continues through the May-June drop period. Ruiz and Guardiola (1994) have shown that persisting fruitlets have higher nutrient content than abscising fruit. This may be a strong sink effect only, but insufficient nutrients may be involved. The transport system from the soil through the roots and stems to the leaves and flowers or fruit is a limited system that is not meant to deliver large quantities of nutrients in a very short time. If the transport system is limiting during periods of reproductive growth, then foliar feeding of nutrients directly to the flowers and developing fruit organs potentially could enhance their chances of survival.

To test this hypothesis, foliar applications of the major nutrients (N, P, K) were applied at 10% anthesis and/or five weeks later in a number of tests. In general, these applications increased fruit set suggesting that these nutrients may be deficient in some fruitlets during this competition period. Six of nine bloom tests of different urea sources resulted in increased yields. Postbloom nutrient sprays increased yields also for urea alone and urea plus P and K sources. Applications of N, P, K at bloom and postbloom after a winter urea application also increased yields. These yield increases were the result of increased fruit numbers.

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