LEAF-FRUIT RELATIONSHIP IN KIWIFRUIT

(*Actinidia deliciosa* (A. Chev.)

C.F. Liang et A.R. Ferguson)

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ABSTRACT

Net photosynthetic rates of kiwifruit (*Actinidia deliciosa* (A. Chev.) C.F. Liang et A.R. Ferguson) leaves were lowered by as much as 50 $^0/_0$ of light saturated rates when the vines were shaded to half the light saturating level (280 uE m^{-2} s^{-1}). The photosynthetic response also showed a broad temperature optimum around 20 C. Vines which were grown in 10 or 30 C conditions acclimatised rapidly when they were transferred to a 20 C growth temperature, and adjusted their photosynthetic rates within 24 days.

Fruit growth in the kiwifruit was dependent on current photosynthates. Only negligible amounts of ^{14}C-label, which accumulated in the stems and roots of the vines from the previous season, were remobilized to support fruit growth. Kiwifruit leaves exported ^{14}C-assimilate when they were 60 $^0/_0$ of full expansion, or 40 days from emergence. The principal source leaves which supplied the fruits were the leaves which subtended the fruits. On an intact shoot system, each subtending leaf supplied as much as 62 $^0/_0$ of their total ^{14}C-assimilate exclusively to its own fruit. The fruit also received smaller amounts of ^{14}C-assimilate from some distal leaves via vascular connections which linked at

least, the n, n+5, and n+8 nodes. However, this pattern of ^{14}C translocation was altered when the fruiting shoot was pruned. Each fruit then received supplies of ^{14}C-assimilate from every distal leaf, plus an increased amount (78 $^0/_0$ of total leaf ^{14}C) from its subtending leaf.

The minimum leaf-fruit ratio to support normal fruit growth lies between 0.83:1 (86 cm^2) and 1.7:1 (173 cm^2). A shortfall in the supply of assimilate within a fruiting shoot below this ratio was readily met by surplus ^{14}C-assimilate from source leaves on adjacent fruiting or non-fruiting shoots, up to 8 nodes distance away. It was probably because of this flexibility in the translocation of assimilate that kiwifruit leaves did not show any photosynthetic response to increased fruit demand for carbohydrate. Both fruiting and non-fruiting shoots had similar maximum photosynthetic rates of about 657 $ugCO_2\ m^{-2}\ s^{-1}$.

The fruit growth of a kiwifruit, as determined by fruit volume or fresh weight, followed a double sigmoid pattern. Increases in fruit dry weight however were linear throughout the growth period. Final fruit sizes were partly determined by pre-anthesis factors, although vine management practices and pollination also had a significant influence on fruit growth.

Fruits which developed from early flowers were as much as 31g larger than those from late flowers. The early

flowers had bigger ovaries and were found on strong, vigorous shoots, which were mostly long shoots. It was also found that fruits produced on long shoots contained more viable seeds so that they carried larger fruits than those on short shoots, even though both developed from flowers with the same day of anthesis.

The early stage of fruit growth on a fruiting shoot was inhibited by large leaf numbers greater than 8 distal leaves, but this effect was diminished on vines older than 5 years. However, there was no effect of fruit number on fruit size within a fruiting shoot. Fruits with similar numbers of seeds developed in synchrony with each other, whereas fruits with lower seed numbers were inhibited by those with higher seed numbers at adjacent positions.

Pollination had an important effect on fruit size as fruits with high seed numbers were able to overcome the leaf inhibitory effects on fruit growth. It was also found that at equal seed numbers, fruit sizes on some vines were consistently smaller than other vines within the same orchard block. Thus there was an overall effect of vine vigour, possibly related to the rootstock, which limited the growth of the fruits on a kiwifruit vine.

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