Investigating the impact of source/sink manipulations on within tree variations of floral induction and fruit weight

Benoit Pallas, Jean-Jacques Kelner, Dianyu Chen, Sébastien Martinez, Evelyne Costes

Investigating the impact of source/sink manipulations on within tree variations of floral induction in apple.

B. Pallas[1,a], J-J. Kelner[1], D. Chen[1,2], S. Martinez[1] and E. Costes[1]

[1]AGAP, Univ. Montpellier, CIRAD, INRA, Montpellier SupAgro, Equipe Architecture et Fonctionnement des Espèces Fruitières, Montpellier, France; [2]Institute of Soil and Water Conservation, Northwest A&F University, Yangling 712100, Shaanxi, China.

Abstract

In apple, carbon source/sink relationships and inhibiting signal produced by seeds are assumed to affect floral induction (FI). Nevertheless, the respective effect of local variations in carbon source/sink relationships and tree fruit load on FI remains unclear. This study aimed at investigating these effects, considering different distances between leaves, fruits and meristems.

Experiments were performed during two years in the south of France on adult trees of the 'Golden' cultivar. On trees previously managed to be either in low or high crop loads, 11 treatments with different kinds of local leaf or fruit removal were set up mid-June. In the next spring, FI rate was evaluated in the different parts of the tree including de-fructified and defoliated parts. FI rate variability among treatments was analyzed with a generalized linear model of the binomial family.

The FI rate was reduced in defoliated parts of the trees whatever the defoliation treatment. Moreover, defoliations had a low impact on FI in the not defoliated parts of the trees. Both together these results suggest a major impact of the local source/sink conditions on FI. In fruited parts of the trees subjected to fruit removal, FI rate was lower than expected in not de-fruited trees with a similar crop load. In the non-fruited parts, FI rate was lower than observed for OFF trees probably revealing a flux of carbon from non-fruited parts and/or an inhibiting effect of the fruits on the fruited parts.

This study shows that source-sink relationships and distances between sink and source organs of carbon and inhibiting signal have a great impact on FI. Moreover it gives new knowledge on the scale of plant organization at which source-sink relationships affect these processes.

Keywords: flowering, carbon allocation, long distance fluxes, defoliation, crop load.

[a] E-mail: benoit.pallas@inra.fr