

Evaluation of the Major Component affecting Alternate Bearing in Citrus

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From Southwick and Davenport

“The presence of fruit has also been shown to inhibit flower bud initiation and thus reduce subsequent crop yield in citrus. A similar situation has been reported for Apple and other deciduous fruit crops”.

- a. Alternations of citrus varieties bearing 600 – 1200 fruit/tree are around 20 - 40% between OFF and ON years, e.g. Grapefruit and oranges.
- b. Alternations of citrus varieties bearing 2000 – 5000 fruit/tree are around 90 - 95% between OFF and ON years, e.g. Clementine and mandarins (willking, Murcott).
- c. Willking variety can collapse up to dying as a result of “poisoning” (component) or “starving” (lack of energy) of the root system.
- d. Fruits removal from ON tree prior to the end of September will restore (not completely) the ability of the tree to flower.

- e. Starch is stored as energy reserve and is not involved in any process per se.
- f. The higher the number of sites on the tree occupied by fruits, the stronger and deeper the alternate bearing in citrus.
- g. From these observations many scientists think that lacks of carbohydrates (data support part of this idea) are responsible for the alternation and to the so called component. Others present that a component(s) moved from the fruit basipetal can be related to plant hormones or unknown staff.



Effect of autumn girdling on the type of spring flush in light-bearing ‘Shamouti’ orange trees.

Treatment	No. of Sprouts	Flowers/branch	Shoot Type (%) ¹			Flowers/Leaf
			V	LY	LS	
Control	3.4 b	102 b	20 a	22 a	58 a	0.81 b
Girdling	5.8 a	177 a	7 b	26 a	67 a	2.31 a

1 - V=Vegetative shoot, LY=Leafy inflorescence, LS=Leafless inflorescence
 Significant at P=0.05, according to Duncan’s multiple range test.

Starch content of ‘Shamouti’ orange leaves and twigs as affected by GA and Girdling. Girdling on 20 Oct. samples from starch 1 Dec. means of 6 trees/treatment, mg g⁻¹

Plant Organ	Girdled		Ungirdled		Sig. main Effects	
	+ GA	- GA	+ GA	- GA	GA	Girdling
Leaves	71.70m/t	51.67n/r	58.92a/u	45.25b/r	+	+
Twigs	100.87m/t	92.33m/r	65.97a/u	62.54a/r	-	+

Mean differentiation within plant organ by duncan’s multiple range test at 0.05 level:
a,b, for comparing ± GA, within ungirdled; m,n, for comparing ± GA within girdled;
r,r, for comparing ± girdled within – GA; t,u, for comparing ± girdled within + GA.
Goldschmidt et al. Scientia Hort. 26:159-166.

Carbohydrate concentration in leaves of 'Shamouti' & 'Murcott' from fruiting and fruitless branches (average July to January).

Branch Type	Sugar	Starch
	mg.g ⁻¹	Fr. Wt.
Shamouti + Fruit	61.3 b	12.9 b
Shamouti - Fruit	56.6 b	17.7 b
Murcott + Fruit	49.0 b	28.3 b
Murcott - Fruit	87.7 a	75.7 a

Carbohydrate concentration in **Buds** of 'Shamouti' & 'Murcott' from fruiting and fruitless branches (average July to January).

Branch Type	Sugar	Starch
	mg.g ⁻¹	Fr. Wt.
Shamouti + Fruit	61.8 a	26.7 a
Shamouti - Fruit	70.1 a	36.8 a
Murcott + Fruit	94.7 a	24.3 a
Murcott - Fruit	81.6 a	27.3 a

Effect of reciprocal grafting of 'ON' and 'OFF' branches on flowering

Scion/Stock Treatment	Number of Grafting branches	% take on at bag removal	% of Stock die-back	% of Flowering
'ON'/'ON'	32	3 c	40 a	---
'ON'/'OFF'	29	17 b	15 b	---
'OFF'/'ON'	23	70 a	15 b	30 a
'OFF'/'OFF'	26	80 a	11 b	32 a

fig. 18 Seasonal changes in GAs-like activity from fruiting and non-fruiting Murcott tangerine buds

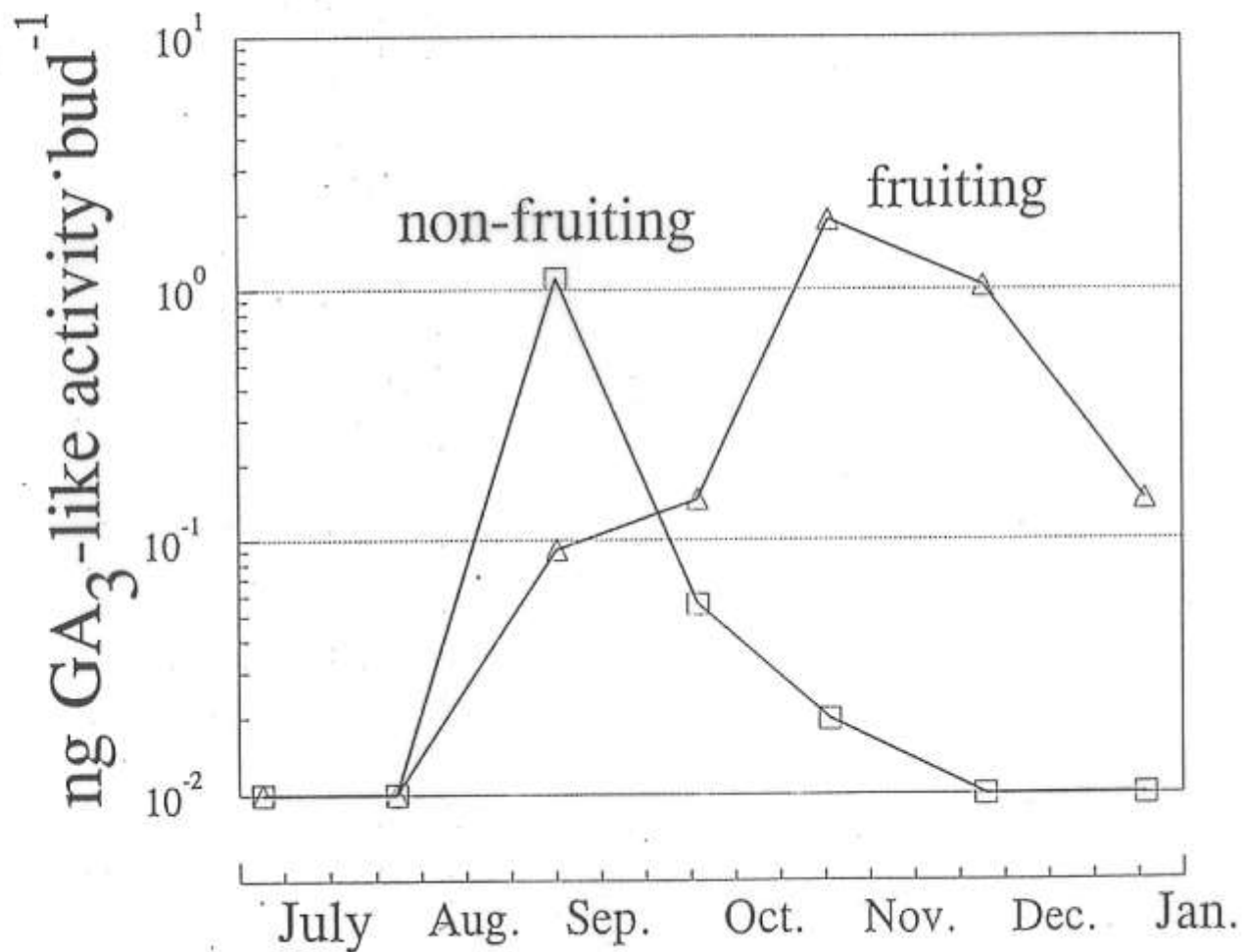
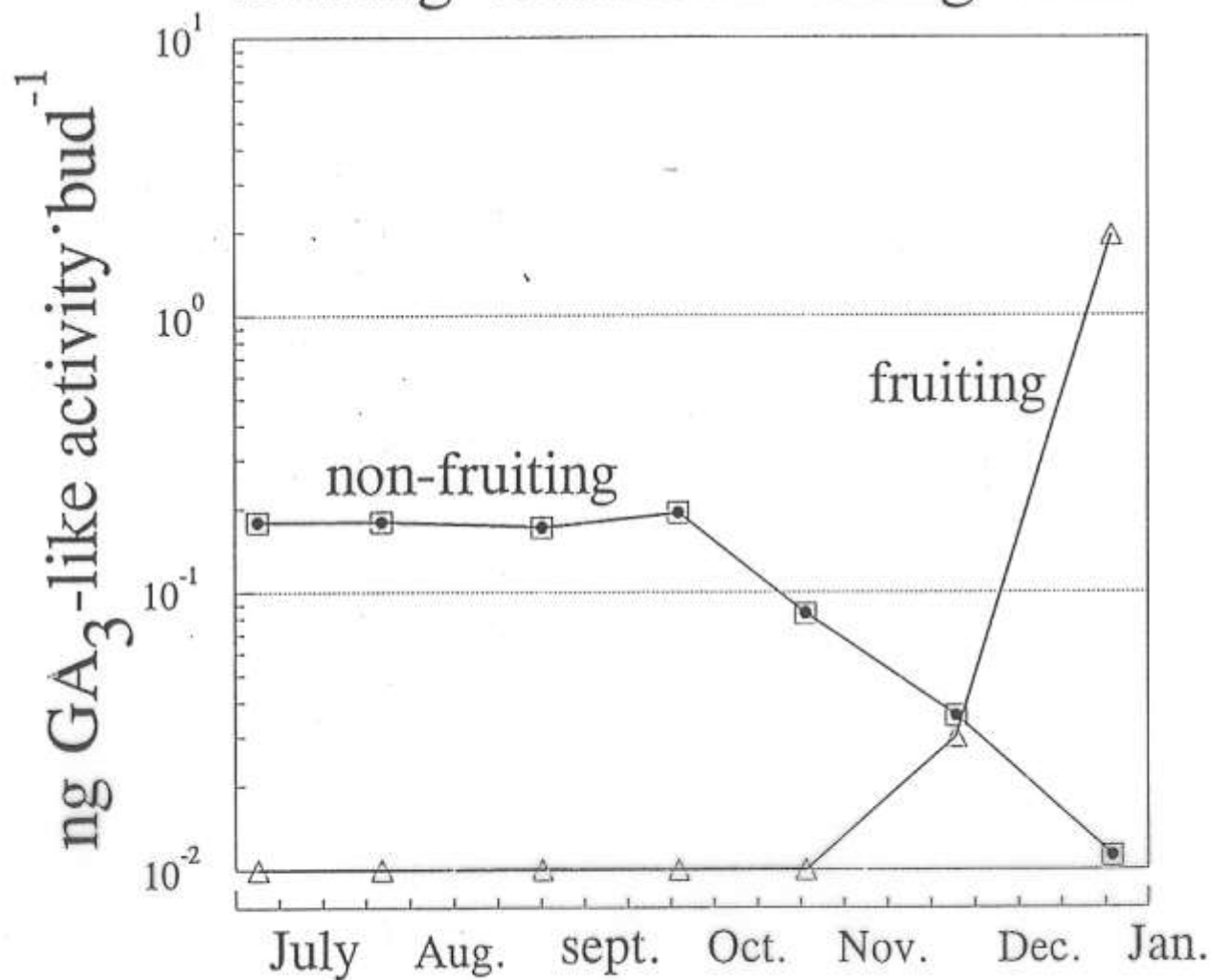


fig.17 Seasonal changes in GAs-like activity from fruiting and non-fruiting 'Shamouti' orang buds











Summary

- If carbohydrates (energy) are responsible for the alternate bearing why we could not find any differences in buds?
- Trees with sufficient carbohydrates did not induce flowering on grafted branches from ON tree.
- OFF branches grafted on ON tree will flower although the tree was relatively lack of carbohydrates.

- Branches from ON or OFF tree have a memory (component), no matter if the other parts of the tree have sufficient or lack of carbohydrates and will or will not flower accordingly.
- I think, that basipetal movement of a component(s), excreted by the fruit, inhibit the flowering of the following year.
- Gibberellins accumulate in buds of ON trees towards the autumn, at the time of flower induction, inhibit flowering.

- I assume that the major component responsible for the alternate bearing in citrus are Gibberellins but cannot exclude the involvement of other component(s).



Ice on plants, Cachi to Salta

Thank You