ROOTSTOCK AND SHOOT PREFORMATION IN PISTACHIO AND THEIR INFLUENCE ON CANOPY ARCHITECTURE AND YIELD COMPONENTS

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ABSTRACT

'Kerman' pistachio (*Pistacia vera* L.) is a major nut crop grown in the California central valley. Currently there are three rootstocks used in commercial production consisting of two species and one hybrid: *P. atlantica* (Atl), *P. integerrima* (selection Pioneer Gold – I, PG-I), and *P. atlantica* x *P. integerrima* (selection UCB-1). Trees grown on PG-I and UCB-1 rootstocks are much more vigorous than those grown on Atl, resulting in a much more open canopy with less branching. This increased vigor is due to more **neoformed** growth in trees on PG-I and UCB-1 compared with Atl. Neoformed growth is shoot growth in which node initiation and expansion occur simultaneously as opposed to **preformed** growth where there is a temporal separation of node initiation and expansion, usually in the form of bud dormancy. In temperate deciduous species like pistachio the initial spring growth flush is preformed, whereas later flushes are neoformed. We dissected the terminal, dormant bud from ~300 shoots from both cropped and non-cropped trees on all three rootstocks at time of harvest (data not shown) and during the dormant season to assess preformation in pistachio. Data indicate that there are 8-9 nodes preformed in the dormant terminal bud and that this does not vary with rootstock, crop load, shoot carbohydrate concentration or canopy location (Table 1). This suggests strong genetic control of preformation in 'Kerman' pistachio. However, rootstock does have a substantial effect on neoformed growth. Data indicate that maximum neoformed growth occurs at the same time as maximum nut dry weight gain (data not shown), indicating there is potential for strong competition between vegetative and reproductive sinks. Preliminary data indicate that yield components do not differ for fruit harvested from neoformed shoots compared with fruit harvested from preformed shoots (Table 2). However, there is a significant reduction in inflorescence bud retention on neoformed shoots compared with preformed shoots (Table 3). These data indicate that controlling neoformed growth may significantly increase yields of trees on PG-I and UCB-1 by increasing the fruiting potential. Additionally,

Table 1. Number of leaf primordia in dormant terminal buds of cropped and non-cropped 'Kerman' pistachio trees on three rootstocks and total non-structural carbohydrate (TNC) concentration in current season and 1-year-old stems.

			mg Glu equivalents / g DW	
			TNC	
Rootstock	Crop	# of leaf primordia (±SE)	current season stems	1-year-old stems
Atl	on	8.3±0.19	100.0bc[z]	78.0b
	off	8.5±0.18	102.5abc	103.0a
PG-I	on	8.3±0.23	115.0ab	94.0ab
	off	8.4±0.14	119.0a	83.0ab
UCB-1	on	8.5±0.18	112.5abc	84.0ab
	off	8.8±0.16	94.0c	83.5ab

[z]Lower case letters indicate significant differences within columns (*P*=0.05).

Table 2. Yield components for nuts harvested from preformed and neoformed shoots.

Shoot type	% split nuts	% non-split nuts	% blank nuts
Preformed	39.3	41.6	19.1
Neoformed	43.3	36.5	20.2

Table 3. Inflorescence bud retention for preformed and neoformed shoots on three rootstocks.

Rootstock	Shoot type	% bud retention
Atl	Pre	77.1a[z]
	Neo	60.5cd
PG-I	Pre	64.8bc
	Neo	55.9d
UCB-1	Pre	70.7ab
	Neo	63.9bc

[z]Lower case letters indicate significant differences within columns (*P*=0.05).

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understanding the cause of neoformed growth and being able to manipulate it would be beneficial in training young pistachio trees. Growers frequently have trouble stimulating sufficient and uniform growth in young trees to develop scaffold limbs. Being able to stimulate neoformed growth in young trees would minimize labor inputs and potentially decrease the time required to develop the structure of young orchard trees.