BY520-9, A Peach Rootstock for the Southeastern United States that Increases Scion Longevity

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BY520-9 is being provisionally released as bulk seed for industry testing as a rootstock for peach and nectarine [*Prunus persica* (L.) Batsch] where root-knot nematode (*Meloidogyne* spp.), peach tree short life (PTSL) associated with ring nematode (*Criconebella xenoplax* (Raski) Luc & Raski), or both are a problem. BY520-9 consists of open-pollinated seed of 69 selections from B594520-9, which traces back to S-37 and Nemaguard.

Origin

One of the early goals of U.S. Dept. of Agriculture (USDA) stone-fruit breeding programs in Fort Valley, Ga.; Belts-vine, Md.; and Fresno, Calif., was the development of a well-adapted, root-knot-nematode-resistant peach rootstock. BY520-9 lineage traces to a 1954 cross made by J. Weinberger at Fort Valley of FV235-4 × FV234-1 (Fig. 1). FV235-4 was an open-pollinated seedling of S-37, itself a seedling of an unknown flowering peach. S-37 was used in California because of its resistance to *M. incognita* (Kofoed and White) Chitwood (Lownsbey et al., 1959) and high vigor, but has fallen into disuse. S-37 apparently segregates for nectarine, weeping habit, and white flowers (Werner et al., 1985), but clonal material was unavailable for testing. FV234-1 was released in 1959 for testing and, in 1961, was named Nemaguard for its resistance to both *M. incognita* and *M. javanica* (Treub) Chitwood (Lownsbey et al., 1959). It is still used widely in California and elsewhere.

From seed of Weinberger's cross planted at Fresno in 1955, seedling F51-25 was selected. Seedlings of F51-25 were found by H.W. Fogle and J.M. Good to be resistant to root-knot nematode in tests at the USDA in Beltsville, and subsequently planted in the field under the designations B594503-B594538. Seedlings of these plants were later

screened and found uniformly resistant to *M. incognita* and *M. javanica* (unpublished data). Seedlings of B594520 were sent to Byron, Ga., where the Fort Valley breeding program now resides. V.E. Prince planted the seedlings along with other material in 1968.

At that time, there was an effort in Georgia to find a rootstock to provide longer tree life where PTSL was a problem. Scion cultivars on seedling rootstock of Nemaguard, and other root-knot-resistant seedlings from Yunnan, S-37, and Shalil were much shorter-lived than scions on Lovell (root-knot-susceptible) seedling rootstock (Ritchie and Clayton, 1981). PTSL was later shown to be associated with parasitism by the ring nematode (*C. xenoplax*) (Nyczepir et al., 1983).

Seedlings of this rootstock material were evaluated in the greenhouse at Byron for reaction to ring and root-knot nematodes by E.J. Wehunt. Selected accessions, including three seedlings of B594520 (-3, -8, and -9), were repropagated as budded trees by S. Doud and U.L. Yadava of Fort Valley State College in 1976/77. After 1979, the block was maintained by the USDA and was the source of much of the

seed tested in South Carolina and Georgia (Okie et al., 1994) in a ITSL field screen. These trees were eventually removed, including the only trees of B594520-9. Seedlings of B594520-9 that were survivors of the PTSL field screen are the source of the bulk seed being released under the designation BY520-9.

The longevity of B594520-9 and BY520-9 is surprising in light of the limited longevity of their ancestors. Possibly, one of the open-pollinated generations involved an outcross that improved survivability. High levels of resistance to *M. javanica* in B594520 apparently came from Nemaguard.

Description

The 69 individual selections making up BY520-9 vary in morphological characteristics. Most are peaches with pink flowers. About one-third are nectarines, while one-sixth are white-flowered. All have large, showy flowers with a chilling requirement of ≈850 h below 7°C. Leaves on all selections have reniform glands. All have poor-quality, white-fleshed freestone fruit that ripens several weeks after 'Elberta'.

As rootstock, seedlings of these BY520-9 parental selections cause the scion to be less susceptible to cold injury and bacterial canker (*Pseudomonas syringae* pv. *syringae* vanHall), the principal causes of PTSL death (Ritchie and Clayton, 1981), than any other rootstock tested so far in the southeastern United States. Preliminary trials show root-knot-nematode resistance comparable to seedlings of Nemaguard and excellent tree vigor. No graft incompatibility with peach has been detected in limited trials so far using 'Cresthaven', 'Redhaven', and 'Springcrest' scions.

Performance

Unbudded seedlings of B594520-9 survived well after 8 or 9 years of field screening

Fig. 1. Pedigree of BY520-9 rootstock. Open-pollinated generations designated "op."

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Table 1. Survival of B594520-9 seedlings (=BY520-9) compared to seedlings of standard rootstocks after 8 years at Elgin, S.C., and 9 years at Byron, Ga. Losses shown due to peach tree short life (PTSL) and Clitocybe root rot (ROT).

Rootstock	Elgin			Byron			
	n	Alive (%)	PTSL (%)	n	Alive (%)	ROT (%)	PTSL (%)
B594520-9	40	93	7	48	56	33	11
Lovell	47	60	40	48	25	27	48
Halford	49	47	53	49	22	43	35
Nemaguard	46	26	74	49	14	35	51
Siberian C	51	10	90	48	0	58	42

Table 2. Survival, mean bacterial canker (BC) rating, and mean trunk cross-sectional area (TCSA) of 'Springcrest' and 'Redhaven' peach scions budded on seedling rootstocks of BY520-9 in comparison to seedlings of standards Lovell and Nemaguard after 4 years at Elgin, S.C., and Byron, Ga.

Rootstock	Elgin				Byron			
	Springcrest		Redhaven		Redhaven		Redhaven	
	n	Alive ^z (%)	BC ^y	TCSA (cm ²)	n	Alive (%)	BC	TCSA (cm ²)
BY520-9	13	100 a	0.2	98	20	100 a	0.0	88
Lovell	15	67 b	2.3	67	20	65 b	2.1	48
Nemaguard	19	5 c	4.8	107	19	21 c	4.3	69
MSD ^x			1.4	37			1.4	37

^zLetters indicate differences in percent alive within a column, based on contingency tables ($P \leq 0.01$).

^yBacterial canker rated on a scale of 0 to 5, where 0 = none and 5 = dead.

^xWaller-Duncan minimum significant difference (k ratio = 100).

at Byron, Ga., and at Elgin (near Columbia), S.C. (Table 1) (Okie et al., 1994). In ongoing field trials at Elgin and Byron, using commercial scion cultivars, more trees budded on seedlings of BY520-9 have survived than those on Lovell or Nemaguard seedlings (Table 2). Seedlings of BY520-9 are moderately susceptible to Clitocybe root rot [*Armillaria tabescens* (Stop.: Fr.) Dennis], as are Lovell and Nemaguard.

Greenhouse screening indicates seedlings of BY520-9 are good hosts for *C. xenoplax*, similar to seedlings of Lovell. Greenhouse tests show at least some of the parental selections have seedlings that are as resistant as Nemaguard to *M. incognita* (Table 3) and *M. javanica*.

Commercial cultivars on BY520-9 seedlings are vigorous, as judged by trunk cross-sectional area, and productive after 4 years in commercial trial (Table 2). Long-term productivity is not yet known. BY520-9 seed is

being made available for testing at this time, despite the lack of long-term performance data, because of the needs of the peach industry in the southeastern United States. Growers are currently forced to choose between Lovell or Halford (both medium-lived on PTSL sites, root-knot-nematode-susceptible) and Nemaguard (short-lived on PTSL sites, root-knot-nematode-resistant). None of these rootstock perform well where both problems occur. Land free of nematode problems is difficult to find, and fumigation often is not cost-effective. Sites with the most desirable microclimates are often unavailable due to nematode problems. Peach production has been only marginally profitable in the past decade due to extensive crop losses from spring frosts—short tree life exacerbates the problem. Proper testing of this rootstock will take another 15 years. Potential benefits of along-lived rootstock with root-knot nematode resistance outweigh the risk associated with uncertainty about its long-term performance.

Table 3. Host suitability of seedlings of three peach rootstocks and tomato to *Meloidogyne incognita* when grown in the greenhouse for 56 days. Means of six replications, except for BY520-9 (five replications) and tomato (one replication).

Rootstock	<i>M. incognita</i> (egg masses/root system)	Host rating ^z
Lovell	56	4
Nemaguard	0.2	1
BY520-9	0.2	1
Rutgers tomato	100+	5

^zHost rating: 0 = no egg masses; 1 = one to two egg masses; 2 = three to 10 egg masses; 3 = 11 to 30 egg masses; 4 = 31 to 100 egg masses; and 5 = 100+ egg masses. Ratings ≥ 3 are considered suitable hosts.

(Over the next 5 years, seed supplies of BY520-9 will increase, allowing broader commercial testing by nurseries and growers. The USDA and Clemson Univ. have applied for a Plant Variety Protection Certificate for BY520-9. During this time, individual selections will be compared as seed parents. It is anticipated that ultimately a single selection will be made, named, and released. The bulked seed of BY520-9 will likely be withdrawn as seed of the new selection becomes available. For information about obtaining seed of BY520-9, contact authors T.G. B. or G.L.R.)

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