

Geneva® 41 A New Fire Blight Resistant, Dwarfing Apple Rootstock



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ABSTRACT

The Geneva® Apple Rootstock Breeding program which was initiated in 1968 by Dr. James Cummins and Dr. Herb Aldwinckle of Cornell University and which has been continued as a joint breeding program with the United States Department of Agriculture Agricultural Research Service (USDA-ARS) since 1998, has released a new dwarf apple rootstock which is named Geneva® 41 or G.41. G.41 (a progeny from a 1975 cross of 'Malling 27' X 'Robusta 5') is a selection that has been tested as CG 3041 at the New York State Agricultural Experiment Station in Geneva, NY, in commercial orchards in the U.S., and at research stations across the USA and Canada and in France. G.41 is a fully dwarfing rootstock with vigor similar to M.9 T337 but with less vigor than M.9 Pajam2. It is highly resistant to fire blight and *Phytophthora* with no tree death from these diseases in field trials or inoculated experiments. G.41 has also shown tolerance to replant disease. Its precocity and productivity have been exceptional, equaling M.9 in all trials and surpassing M.9 in some trials. It also confers excellent fruit size and induces wide crotch angles in the scion. It appears to be very winter hardy and showed no damage following the test winter of 1994 in NY. Propagation by layering in the stool bed G.41 is not consistent and will require highly stool bed planting densities or tissue culture mother plants to improve its rooting. G.41 also produces some side shoots in the stool bed. In the nursery liners of G.41 produce a smaller tree than G.16 liners but similar to M.9 which is very acceptable. Unlike G.16, G.41 is not sensitive to latent viruses. G.41 has similar graft union strength to M.9 and requires a trellis or individual tree stake when planted in the orchard. Suggested orchard planting densities with this rootstock are 2,000-4,000 trees/ha. This rootstock has been released for propagation and commercial sale by licensed nurseries. Liners of this rootstock should be available in the near future.

ORCHARD PERFORMANCE

Geneva 41 has been trialed in several locations in the U.S. and abroad. In 1992, 1993, 1994, 1998 and 1999 replicated rootstock trials were planted at multi-locations in the United States and Canada. Each trial had from 1-7 CG rootstock clones with appropriate Malling rootstock controls and other rootstocks of interest to the NC-140 group with 7-10 replicates. For each planting, the plots had a uniform tree spacing across sites and trees were also managed in a uniform manner with certain orchard practices such as fertilization, irrigation and thinning were left to local control. The individual cooperators collected annual yield, fruit size, tree size, and survival data.

Table 1. Performance of CG rootstocks with Liberty in the 1993 NC-140 trial at Geneva.

Rootstock	Trunk Cross Sectional Area (% of M.26)	Cumulative Yield Efficiency (% of M.26)
CG.3247	60 c*	175 a
G.65	61 c	122 bc
G.41	71 c	138 b
CG.3007	79 c	131 bc
M.26	100 bc	109 c
G.11	100 bc	88 cd
G.202	116 b	106 cd
G.30	120 b	138 b
M.7	135 b	81 d
MM.111	182 a	56 d

*Mean separation by LSD p<0.05.

Table 2. Performance of CG rootstocks with Jonagold and Gala in the 1998 NC-140 trial at Geneva.

Variety	Rootstock	Trunk Cross Sectional Area (% of M.9)	Cumulative Yield Efficiency (% of M.9)
Jonagold	M.9EMLA	100 a***	100 b
	G.41	111 a	142 a
	G.16	103 a	122 ab
	G.16 (LTC)*	111 a	102 b
Gala	M.9EMLA	100 b	100 a
	G.16 (TC)**	133 a	87 ab
	M.26	135 a	76 b

*LTC= Liners derived from tissue cultured stoolbed plants.

**TC= Tissue cultured plants used as liners.

***Mean separation by LSD p<0.05.

In most trials Geneva 41 has performed as well or better than its main competitor M.9.

Liberty / M.9EMLA

Liberty / CG.3041



Table 3. Performance of CG rootstocks with Liberty in the 1993 NC-140 trial at Geneva.

Rootstock	Trunk Cross Sectional Area (% of M.26)	Cumulative Yield Efficiency (% of M.26)
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*Mean separation by LSD p<0.05.

DISEASE RESISTANCE



Progeny of Geneva 41 inoculated with *Phytophthora cactorum* (causative agent of crown rot). Geneva 41 survived such a test as a seedling and it's resistance has held up in several field trials.

Rootstock resistance to fire blight (*Erwinia amylovora*) is tested in the field as young trees (3rd leaf) are inoculated with a mixture of virulent strains of the bacteria during bloom as in this rootstock fire blight experimental orchard (July 2005) Geneva, NY. Scions budded on fire blight susceptible rootstocks will eventually die (girdled) whereas scions on resistant rootstocks will require simple pruning of affected branches as needed.



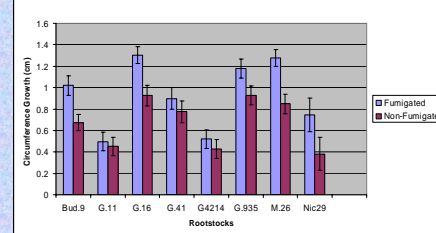
Table 6. Rootstock infection with fire blight of Gala after blossom inoculation during bloom in 1999 at Geneva.

Rootstock	% of Trees with Rootstock Infection*	% Tree death**
M.26 EMLA	100	92
M.9EMLA	100	83
MM.111	0	8
Bud.9	0	0
G.11	25	25
G.16	0	0
G.30	0	0
G.202	0	0
G.41	0	0

*Recorded at the end of 1999.

**Recorded at the beginning of 2000.

WAPATO REPLANT SITE



Apple Replant Disease can cause severe production losses in an orchard as exemplified in the above graph which compares the growth of trees in non treated soil (replant) to the growth in fumigated soil. B.9, M.26, G.16 and M.9 (Nic 29) show the greatest difference in tree growth between treatments. Geneva 41 is relatively unaffected.

NURSERY PERFORMANCE

The stool bed productivity (liners/meter) of Geneva 41 is about 70 % of M.9 EMLA. Rooting capacity varies from nursery to nursery as shown below where liners from two different nurseries in the U.S. have remarkably different rootings. Liners harvested in Geneva, NY generally have at least three good roots.



Budded liners of Geneva 41 in a nursery in Washington State. Survival of #1 liners is above 95%. In the nursery, grafted and budded trees on G.41 display similar growth to M.9.



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