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<http://www.cctec.cornell.edu/plants/GENEVA-Apple-Rootstocks-Comparison-Chart-120911.pdf>

<http://www.ars.usda.gov/Main/docs.htm?docid=15654>



GENEVA®G.213 and GENEVA®G.41
NEW ROOTSTOCKS FOR NEW
AND REPLANTING APPLE ORCHARDS

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GENEVA®G.213: A NEW ROOTSTOCK FOR NEW AND REPLANTING APPLE ORCHARDS

The joint of Cornell University and the United States Department of Agriculture-Agricultural Research Service (USDA-ARS) develop new rootstock cultivars with emphasis on productivity, yield efficiency, easy nursery propagation, fire blight resistance, tolerance to extreme temperatures, resistance to soil pathogens of the sub-temperate regions of the US, and tolerance to apple replant disorder. Among these, one of the new releases is the rootstock GENEVA®G.213.

GENEVA®G.213*: Origin and characteristics

- Origin: Plant Genetic Resources Unit, Cornell University (New York, USA).
- (*): Protected rootstock. United States Patent PP28,581 (October 31, 2017).
- License: License Agreements with Cornell University in different territories.
- Vigour: similar to M.9 Pajam®2.
- Yield: good and very precocious.
- Yield efficiency: 100-125% compared to M.9.
- Resistances: Fire blight, *Phytophthora* and woolly aphid.
- Tolerance: to waterlogging.
- In stoolbeds produce some thorns.
- Reduces winter chilling requirements and induces an excellent branching.

GENEVA®G.213*: Vigour

The vigour induced to grafted trees is exposed in Figure 1, compared to the traditional rootstocks, in particular M.9 selections.

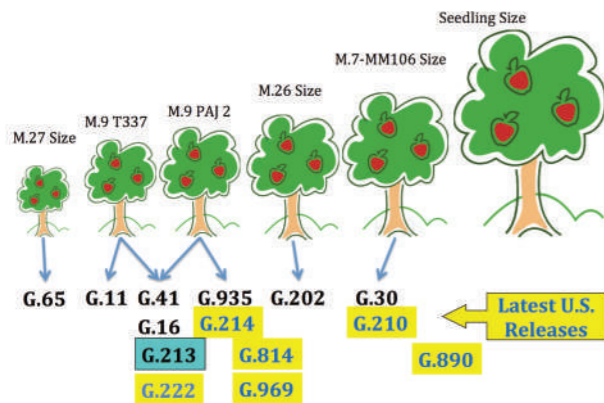


Figure 1: Tree size affected by traditional and new rootstocks, including different releases from Plant Genetic Resources Unit, Cornell University, Geneva & USDA Agricultural Research Unit (New York-USA). Source: G. Fazio. Personal com., I. A. St. Michele (Italy), September 2018.

GENEVA®G.213: Agronomical Performance

Different reports from Brazil in apple producing areas with limited chilling hours evidenced the good yield, high yield efficiency and early yielding

induced by G.203 on different apple cultivars. In Table 1 annual and cumulative yields of 'Maxi Gala' conducted in central axis using a planting distance of 4 x 1 m are exposed. Figures 2 and 3 showed the effect of rootstock on branching capacity and budding uniformity on four years old trees of 'Maxi Gala' grafted on M.9 and G.213 rootstocks.

Table1: Annual and cumulative yields of seven years old trees of 'Maxi Gala' apple grafted on GENEVA®G.213 and M.9 rootstocks in Vacaria, RS, Brazil.

Rootstock	Yield (t/ha)						
	2013	2014	2015	2016	2017	2018	Cumulative
G.213	3,2	30,6	29,4	44,7	57,5	67,7	232,7 b
M.9	2,4	20,5	25,0	43,7	64,3	64,3	189,3 c

Source: Rufato, 2018.

Figure 2: Effect of rootstock on branching of 'Maxi Gala' four years old trees in Vacaria, RS, Brazil (Rufato, 2018).

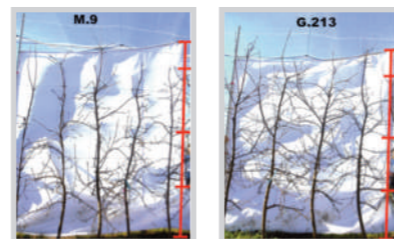
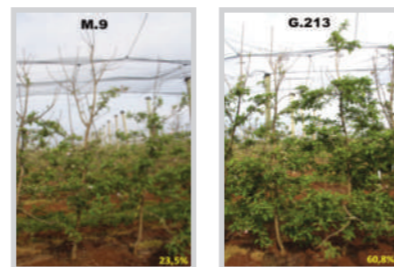


Figure 3: Effect of rootstock on budding uniformity (%) of 'Maxi Gala' four years old trees in spring 2015 in Vacaria, RS, Brazil. (Rufato, 2018).



REFERENCES

Rufato, L., 2018. Miglioramento dell'efficienza produttiva nei meleti con portinnesti della serie G in Brasile. I Apple Rootstock Seminar. St. Michele all'Adige (FEM-Trento). 18th September 2018. Personal Com.

GENEVA®G.41: A NEW ROOTSTOCK FOR NEW AND REPLANTING APPLE ORCHARDS

Among the new rootstocks released by the joint Cornell University and United States Department of Agriculture-Agricultural Research Service (USDA-ARS) Apple Rootstock Breeding and Evaluation Program develops, G.41 is one of the most promising. Its origin, main characteristics and performance are reported below.

GENEVA®G.41: Origin and characteristics

- Origin: Plant Genetic Resources Unit, Cornell University (New York, USA).
- (*): Protected rootstock. United States Patent PP17,139 (October 10, 2006).
- License: License Agreements with Cornell University in different territories. Sublicense Agreement with EFTR in the territory of Europe.
- Vigor: similar to M.9 Pajam®2.
- Yield: high and very precocious, highly productive.
- Yield efficiency: high, 105-115% compared to M.9.
- Resistances: Fire blight, *Phytophthora* and woolly aphid, waterlogging, replant disease.
- Very cold hardy.
- Highly Resistant to Fire Blight and Crown Rot and Woolly Apple Aphid
- Difficult to propagate in stoolbeds
- Brittle graft union with some cultivars

GENEVA®G.41: Vigour

The vigour induced to grafted trees is exposed in Figure 4, compared to the traditional rootstocks, in particular M.9 selections.

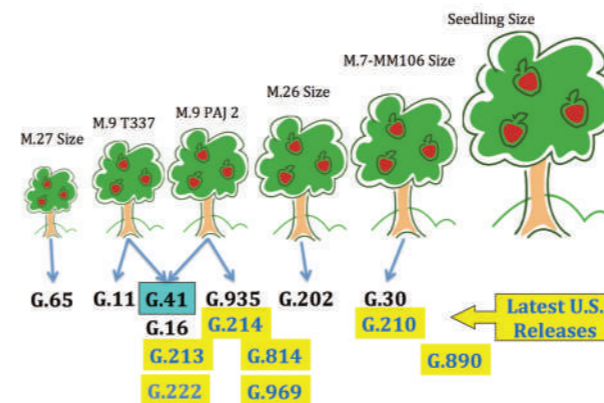


Figure 4: Tree size affected by different traditional and new rootstocks, including different releases from Plant Genetic Resources Unit, Cornell University, Geneva & USDA Agricultural Research Unit (New York-USA). (G. Fazzi. Personal com., I. A. St. Michele-Italy, September 2018).

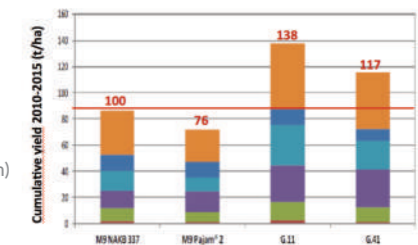
GENEVA®G.41: Agronomical Performance

Different reports from USA and Europe, in this case from the EUFRIN,



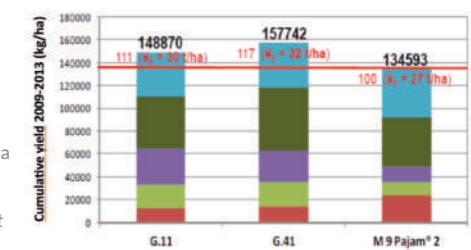
evidenced the good performance of different rootstocks from "G" series, in particular the G.41 and G.11 grafted with the cultivars 'Brookfield® Gala' and 'Golden Reinders®'. Annual and cumulative yields of 6 years old trees of 'Brookfield® Gala' grafted on different rootstocks are exposed in Figure 5 compared with reference rootstocks, corresponding the best results to G.11 and G.41.

Figure 5: Effect of rootstock on annual and cumulative yields of seven year old trees of 'Brookfield® Gala' apple grafted on different rootstocks in the EEA IRTA-Mas Badia (Girona-Spain) planted in February 2009 in a non replanted plot (Carbó et al., 2015).



When G.41 and G.11 were tested in a replanted situation the production was also superior to the reference rootstock, as illustrated in Figure 6. In both cases fruit size were not affected by the rootstock whereas I Class of fruit colour (>90% fruit colour) was increased by 28 and 26%, respectively, compared to M9 Pajam®2. Also in both trials yield efficiency was equal or better compared to M9 Pajam®2, with a similar vigor or increased in the case of G.41.

Figure 6: Effect of rootstock on annual and cumulative yields of six year old trees of 'Brookfield® Gala' apple grafted on different rootstocks in the EEA IRTA-Mas Badia (Girona-Spain) planted in February 2008 in a replanted plot (Carbó et al., 2015).



REFERENCES

Carbó, J.; Iglesias, I.; Avila, G.; Bonany, J.; Alins, G., 2015. ¿Que nos aportan los nuevos portainjertos de manzano?. IRTA- XX Jornada Frutícola, Mollerussa, 22 octubre 2015, 41-53pp.