New Low-Vigour Apricot Rootstocks Compared

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Abstract

About ten years ago nurseries began to test several novel apricot stocks developed either to reduce plant vigour and boost early as well as high cropping or as a more suitable replacement for Myrabolan (*Prunus cerasifera*) and Apricot seedling in water-logged or chlorotic soils. These stocks were the Italian bred selections of *Prunus domestica* Penta and Tetra, the *P. cerasifera* Adara and the *Prunus insititia* Adesoto® 101, both Spanish-bred seedlings, and Plumina®, a *Prunus bessey* × *P. cerasifera* hybrid developed in France. Performance testing was carried out under a national project. The trials were set up in 2001 in plots of pilot orchards at Imola in Bologna Province, Ancona, Caserta, Palermo and Cagliari, their soil profiles differing notably from each other. They were tested against Apricot seedling and Myrabolan 29C controls grafted to cv. San Castrese. The experimental layout was split-plot with 15 replicates per plant and the trees were trained to delayed vase. Performance results after the first seven years indicate the viability of Penta and Tetra and, contrary to expectations, that Adesoto® 101 is incompatible with apricot and Adara is too weak in heavy soils.

INTRODUCTION

The introduction of foreign-bred apricot cultivars that are less hardy and more demanding in terms of crop management practices than native cultivars, called for new rootstocks as an alternative to Myrabolan (*Prunus cerasifera*). The new stocks had to be reliable under our management conditions as well as compatible with most of the cultivars in production, affording initial early bearing and being capable of balancing plant growth and yield.

The testing of these new stocks that began in nurseries ten years ago was thus aimed at reducing tree vigour and boosting yield or, alternatively, at finding stocks suited to soils prone to water-logging and chlorosis and, hence, capable of performing better than Myrabolan and Apricot seedling. As part of the national project “Fruit cultivar advisory list”, sub-project “rootstocks”, a series of experimental fields were set up in the best apricot-growing areas of Imola, Ancona, Caserta, Palermo and Cagliari and managed by as many working groups.

MATERIALS AND METHODS

The tested material included the *Prunus domestica* stock selections Penta and Tetra bred in Italy, the Spanish-bred *P. cerasifera* seedling Adara and the *Prunus insititia* Adesoto® 101 Puebla, and the French-bred *Prunus bessey* × *P. cerasifera* Plumina® Ferlenain hybrid. All the stocks were grafted to cv. San Castrese.

The scions were planted in January 2001 in a split-plot design with 12 replicates, with individual plants per plot (12 plants per rootstock). The trees were trained to vase at a spacing of 5.0 x 4.5 m. The soil profiles of the fields are reported in Table 1. The trials at Imola, Palermo and Cagliari were irrigated; water was supplied at Ancona and Caserta only to offset stress conditions.

The plant parameters recorded from year 1 were trunk diameter, pruned-wood weight, number of runners per plant and number of dead plants because of graft incompatibility. The yield parameters were logged from year 3 and included average harvest date, yield per plant and average fruit weight. Other parameters measured were trunk-section area, cumulative yield from year 3 to year 6 and yield efficiency as the ratio of cumulative yield to trunk-section area by year 7.

RESULTS AND DISCUSSION

Table 2 shows the recorded data per stock from 2001 to 2007 and the final cumulative yield per plant, average fruit weight, average harvest date, yield efficiency and cumulative pruned-wood weight. The data are given as the average of values of the individual trials run at the different sites.

Tree Growth

Plant growth differed depending on graft combination: significant differences (Scott-Knott method) were found for trunk area and pruned-wood weight (Fig. 1). The combination with Adara was the least vigorous, the trees growing little and marked by negligible spring shoot growth; the combinations with Plumina and Adesoto 101 also showed low vigour. Penta and Tetra proved to be of intermediate vigour, with values close to Myrabolan 29C, and Apricot seedlings were the most vigorous in all combinations.

Figure 2 shows plant mortality rate. Incompatibility was evident from year 1 for Adara and Adesoto® 101, with graft joint breakdown and plant collapse, respectively exceeding 90% and 70%. The mortality rate was also high with the Plumina combination (41%). Runners were few or nil.

Yield

Figure 3 shows that Myrabolan 29C and Apricot seedling had the best cropping results. Penta's performance was also good, with yields approaching those of the former two; its early bearing was notably good. The cumulated yield of Plumina and Tetra were similar, followed by Adesoto, although its output was half Myrabolan 29C. Adara yield was clearly unsatisfactory. Note too that yield from all graft combinations was poor in the last trial year because of adverse weather throughout the 2007 season.

Average fruit weight differed little among graft combinations, ranging from 46 to 51 g except for the low 39 g registered by Adara, a result in all likelihood attributable to the stressed condition of the surviving plants. There were no significant differences among combinations in harvest.

The yield efficiency scores in Figure 4 show a breakdown into three groups. The Myrabolan 29C and Plumina group had the best yield-to-vigour (trunk area) ratio, followed by the intermediate performance of Penta and Apricot seedling, and the lower result of Tetra and Adesoto® 101. Adara was far behind these groups.

CONCLUSIONS

Our data indicate that none of the tested stocks had hardiness and soil-adaptability better than or equal to Myrabolan 29C and Apricot seedling. Penta alone seems to have

induced adequate tree growth and good yield in all test sites, evincing rather high yield efficiency and eliciting no particular problems of incompatibility.

Although it registered a higher tree growth score than Penta and a good degree of compatibility, Tetra had lower yield and, hence, a lower efficiency rating. By contrast, Plumina, at equal yield to Tetra, proved to be less vigorous and more efficient than the former.

Adesoto 101 and Adara showed poor adaptability to cv. S. Castrese and to trial soil conditions. Both induced poor vigour right from year 1 and showed signs of incompatibility, serious ones at times. The surviving plants were affected by chlorosis and showed poor efficiency.

ACKNOWLEDGEMENTS

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Tables

Table 1. Soil profile of the test fields.

Site	Texture	pH	Active lime (%)
Imola	Loamy-clay	7.0	none
Ancona	Clay-loam	7.5	6.8
Caserta	Sandy-loam	6.4	none
Palermo	Clay-loam	7.8	5.2
Cagliari	Loam	7.3	traces

Table 2. Vegetative-yield data of tested stocks.

Rootstock	Mortality Year 7 (%)	Trunk sect. area Year 7 (cm^2)	Pruned wood wgt (kg/pl.)	Runner (no./pl.)	Yield (kg/plant)					Cumulated yield (kg/pl.)	Avg. harvest date	Avg. fruit wgt (g)	Yield efficiency (kg/cm^2)
					year 3 (2003)	year 4 (2004)	year 5 (2005)	year 6 (2006)	year 7 (2007)				
Penta	8	121.50 a	15.9 a	4	3.45	6.41	13.30	19.61	8.83	51.60 a	27-06	49	0.42 a
Tetra	8	132.25 a	16.6 a	5	2.82	5.47	11.39	15.84	6.25	41.77 a	28-06	49	0.32 b
Adara	93	71.73 c	2.9 c	0	0.50	1.05	0.80	0.80	2.00	5.15 c	27-06	39	0.07 c
Adesoto 101	73	107.97 b	11.7 b	10	1.12	4.70	10.71	16.38	1.80	34.71 b	29-06	50	0.32 b
Plumina	41	88.43 b	10.2 b	7	2.98	6.43	14.14	14.12	3.87	41.54 b	27-06	46	0.47 a
Mir. 29C	7	139.49 a	17.2 a	4	4.87	7.92	17.92	24.17	8.95	63.83 a	28-06	50	0.46 a
Apricot seed.	7	143.40 a	19.4 a	0	4.27	7.83	18.26	22.01	8.29	60.66 a	28-06	51	0.42 a

Figures

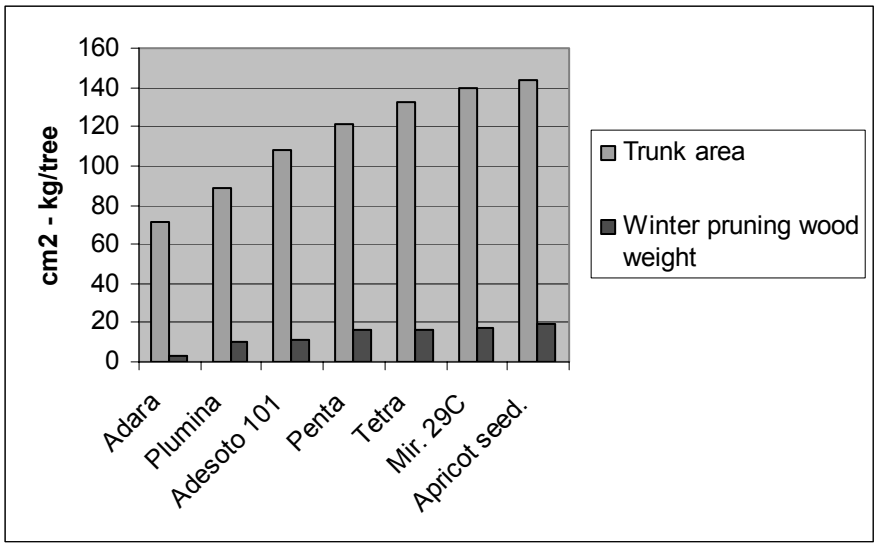

Fig. 1. Tree growth (trunk area and pruned-wood weight).

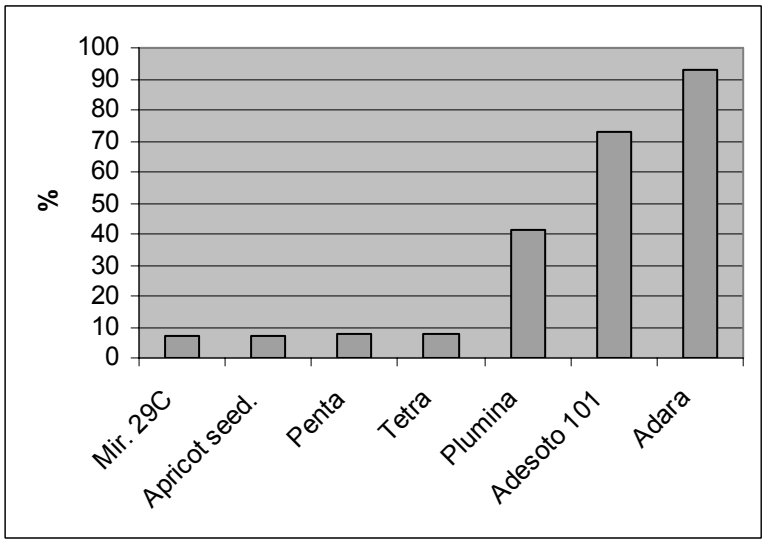

Fig. 2. Plant mortality rate.

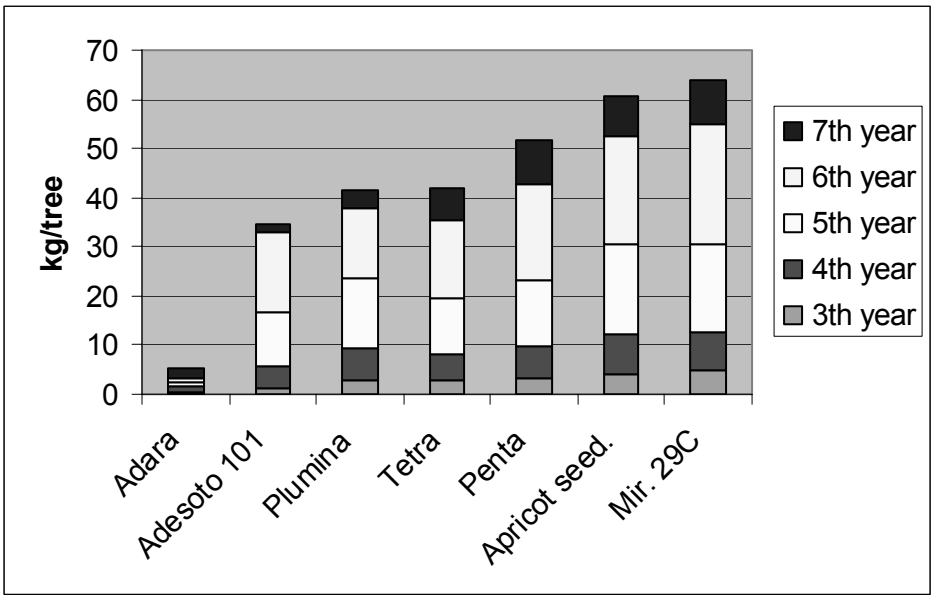

Fig. 3. Yield per plant from years 3 to 7 of orchard life.

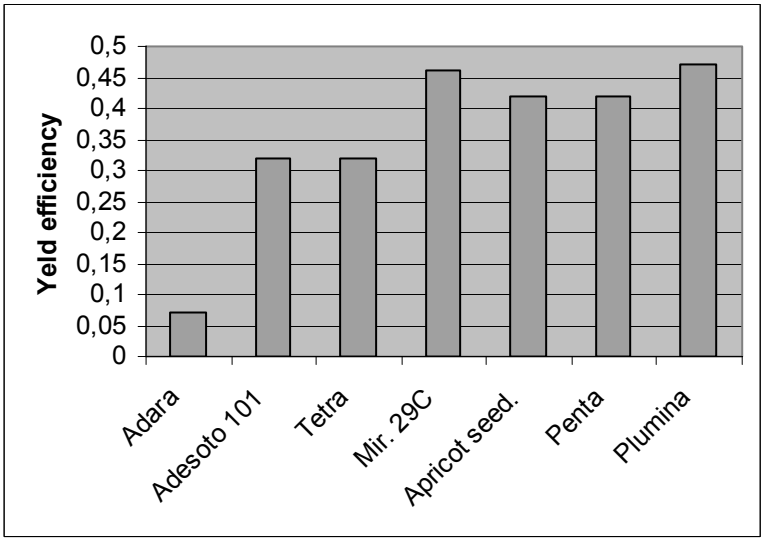

Fig. 4. Yield efficiency of the tested stocks.