

EFFECT ON GROWTH, YIELD AND FRUIT QUALITY OF FOUR MANGO CULTIVARS GRAFTED ON MONO AND POLYEMBRYONIC ROOTSTOCKS IN THE CENTRAL REGION OF BRAZIL

Víctor H. V. Ramos¹, Alberto C. O. Pinto¹, Nilton T. V. Junqueira¹,
Antonio C. Gomes², Solange M. R. de Andrade³, Maria C. R. Cordeiro³

¹Eng.Agrs.Dr., ²Biostatistics, DSC, ³Biologists, Drs., Embrapa Cerrados
Km 18 BR 020, P.O. Box 08223, 73301-970 Planaltina-DF, Brazil
vhugo@cpac.embrapa.br

Introduction

There is no conclusive research on mango rootstocks in Brazil, although the most used rootstocks are 'Espada' and 'Comum', since they have been more disseminated and easy to find. However, these rootstocks confer to tree canopy a vigorous growth, which make difficult the cultural practices and harvest, resulting in loss of fruit at postharvest. Although serve brazilian and indian mangos like 'Maçã' and 'Mallika' due to their yellow skin color, they consistently show dwarf behavior (PINTO et al., 1993). Dwarf polyembryonic rootstocks is really important to reduce the plant height, if scion has also this characteristic. However, monoembryonic dwarf cultivars used as rootstocks, might not show this reduction on the scion, since each plant may be a hybrid. The objective of this study is to identify the effect on growth, yield and fruit quality of mango cultivars on different rootstocks.

Results and Discussion

Effect of Rootstocks on tree height Regardless the Cultivar

There was a significant effect of rootstock ($p < 0.05$) on plant height regardless of the cultivar used, however, at plant age of 4, 9 and 10 years. The rootstock Amrapali (monoembryonic) promoted a significant reduction of tree height (4.25 m) compared to 'Comum' rootstock (Fig.1), which is polyembryonic, whose vigor is represented by tall tree with 4.95 m (Fig. 2), both were 10 years old (Table 1). This result is similar to those found by PINTO et al., (1993) and CEDEÑO-MALDONADO et al., (1988).

Effect of Scion Cultivar on tree height

There was a significant effect of 'Haden' (5.43 m) cultivar 10 year old, regardless of the rootstocks ($p < 0.01$) used (Fig. 3), which showed taller tree than 'Tommy Atkins' with 4.83 m (Fig. 4) and 'Van Dyke' with 4.74 m (Fig. 5). Although 'Tommy Atkins' and 'Van Dyke' had equal height, they were significantly taller than 'Winter' (3.92 m) (Fig. 6) with a dwarf behavior (Fig.7). The hybrids 'Amrapali' and 'Mallika' used as rootstocks, which genetically dwarf, did not reduce tree height of vigorous cultivars 'Haden' and 'Tommy Atkins'.

Effect of the Interaction Scion and Rootstock on Fruit Yield at eight year old trees

There was effect on yield due to interaction scion and rootstock ($p < 0.05$) at the eight year old as discussed below:

Eight Year Old

The best result at this age was shown by the combination 'Tommy Atkins' x 'Rosinha' (7.77 t/ha), but it did not differ from 'Tommy Atkins' x 'Comum' (7.04 t/ha). Comparing polyembryonic rootstock, this result is similar to that found by MOURÃO FILHO et al., (2000), when they used 'Coquinho' rootstock. The combination 'Tommy Atkins' x 'Rosinha' (7.77 t/ha), had higher yield than 'Haden' x 'Rosinha' (3.04 t/ha), while 'Winter' x 'Extrema' (7.62 t/ha) differed from 'Van Dyke' x 'Extrema' (2.42 t/ha). The 'Comum' rootstock showed a higher yield when used with 'Tommy Atkins' (7.04 t/ha) differing from 'Haden' x 'Comum' (0.52 t/ha). The combination 'Winter' x 'Imperial' (4.83 t/ha) and 'Tommy Atkins' x 'Imperial' (4.77 t/ha) had equal yield, but they differed from 'Haden' x 'Imperial' (0.61 t/ha). (Fig. 8).

Effect of Cultivar on Planting Area

There was a significant effect of scion at ten years old (canopy) ($p < 0.01$) on area of planting for 'Haden' (27.4 m²/tree) compared to 'Winter' (20.3 m²/tree), although they did not differ from 'Tommy Atkins' and 'Van Dyke' (Fig. 9). Cultivar like 'Winter' (Fig. 6) with dwarf behavior when grafted on dwarf rootstock might decrease tree height, allowing higher planting density (Alberto Pinto, personal communication, 2002).

Combination Scion and Rootstock effect on Quality of Fruits

There was a significant effect on quality of fruits regarding SS/ATT ratio. 'Winter' x 'Santa Alexandrina' produced fruits with SS/ATT of 56.95 which was equal to 'Haden' (53.73 SS/ATT), but differed from 'Tommy Atkins' (47.50 SS/ATT) and 'Van Dyke' (27.76 SS/ATT). These results do not agree with those found by PINTO et al., (1993) and SIQUEIRA et al., (1988). 'Winter' showed better quality of fruits (51.05 SS/ATT) when the rootstock was 'Mallika' compared with other scion cultivars 'Haden', 'Tommy Atkins' and 'Van Dyke'. However, when 'Winter' had 'Extrema' as rootstock the fruits (135.54 SS/ATT) had much better quality, which was equal to 'Van Dyke' (118.10 SS/ATA), but differed from 'Haden' (86.14 SS/ATT) and 'Tommy Atkins' (96.34 SS/ATT). These results show that the fruit quality seems to be dependent on the rootstock.

Conclusions

- The rootstock 'Amrapali' (monoembryonic) regardless of the scion reduced tree height in 70 cm.
- The yield of 'Tommy Atkins' (7.77 t/ha), was much better when 'Rosinha' was used as rootstock.
- 'Winter' responded with better yield (7.6 t/ha) when 'Extrema' was used as rootstock, showing that there was a significant combination effect.
- 'Haden' occupied much more planting area (27.4 m²/tree) with its canopy than 'Winter' which occupied only 20.3 m²/tree, showing a better use in dense plantings.
- 'Winter' and 'Van Dyke' produced with higher quality fruits when 'Extrema' was used as rootstock; 'Winter' fruits had 1.57 and 1.4 times higher SS/ATT ratio than 'Haden' and 'Tommy Atkins' fruits.

Material and Methods

This study was carried out in 1990 by using a mango orchard of 4 ha of area at Embrapa Cerrados experimental field, in Planaltina, Federal District, Brazil with latitude 17° 35' 3", longitude 47° 42' 30" and 1.100 m from sea-level. The climate of Central Region has two distinct seasons: a) a rainy and warm period with precipitation from 1400 to 1800 mm/year and temperature varying from 25° C to 30° C, which occurs from September to April; b) a dry and cool period with relative humidity around 40% and temperature varying from 20° C to 23° C. The experiment had two factors split-plot design laid off in blocks, in which 8 rootstocks were used as main plots and 4 scions as sub-plots and 3 replications. 'Tommy Atkins', 'Haden', 'Winter' and 'Van Dyke' were used as scion cultivars, while 'Mallika', 'Amrapali', 'Santa Alexandrina', 'Extrema', 'Imperial', 'Maçã', 'Comum' and 'Rosinha' were used as rootstocks. Planting space used between trees and in the row was 10 x 10 m. The following parameters were evaluated: height and diameter of canopy, number and weight of fruits per tree to evaluate yield. The soluble solids (SS) were evaluated by using a manual refractometer and the total titrable acidity (ATT) was determined by titulometry accord to Association of Official Analytical Chemistry A.O.A.C. (1970). Fruit quality was also evaluated by the ratio SS/ATT. The data were submitted for analyses of variance and Tukey test was applied with 5% of probability to compare mean of each parameter studied.

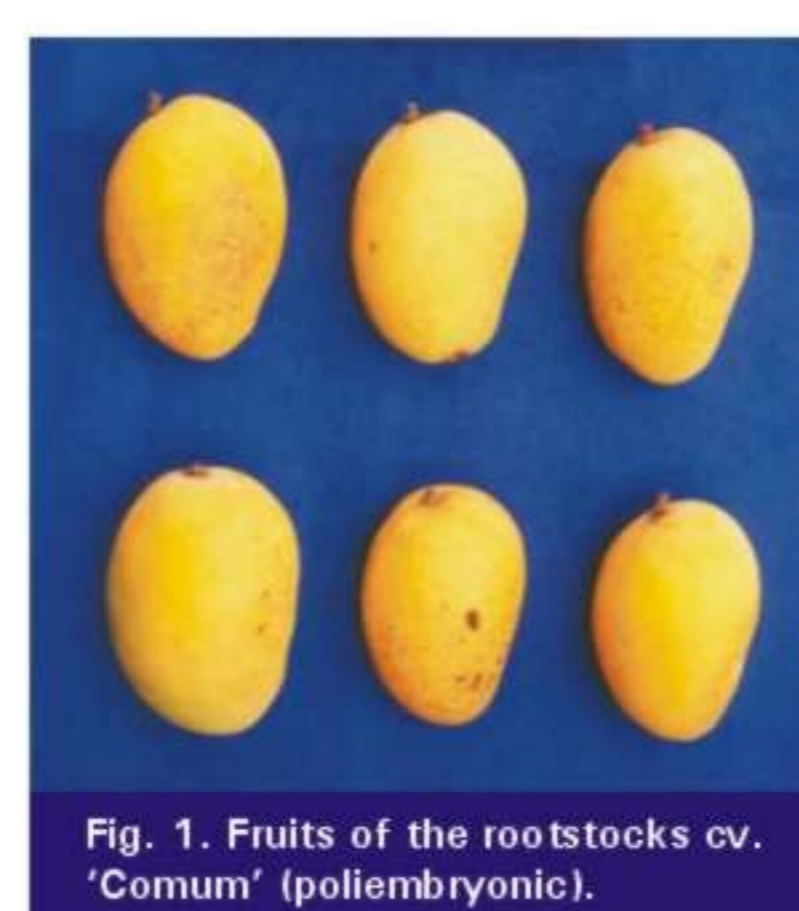


Fig. 1. Fruits of the rootstocks cv. 'Comum' (polyembryonic).



Fig. 2. Ten year-old tree rootstocks cv. 'Comum' (height of 4.95m).

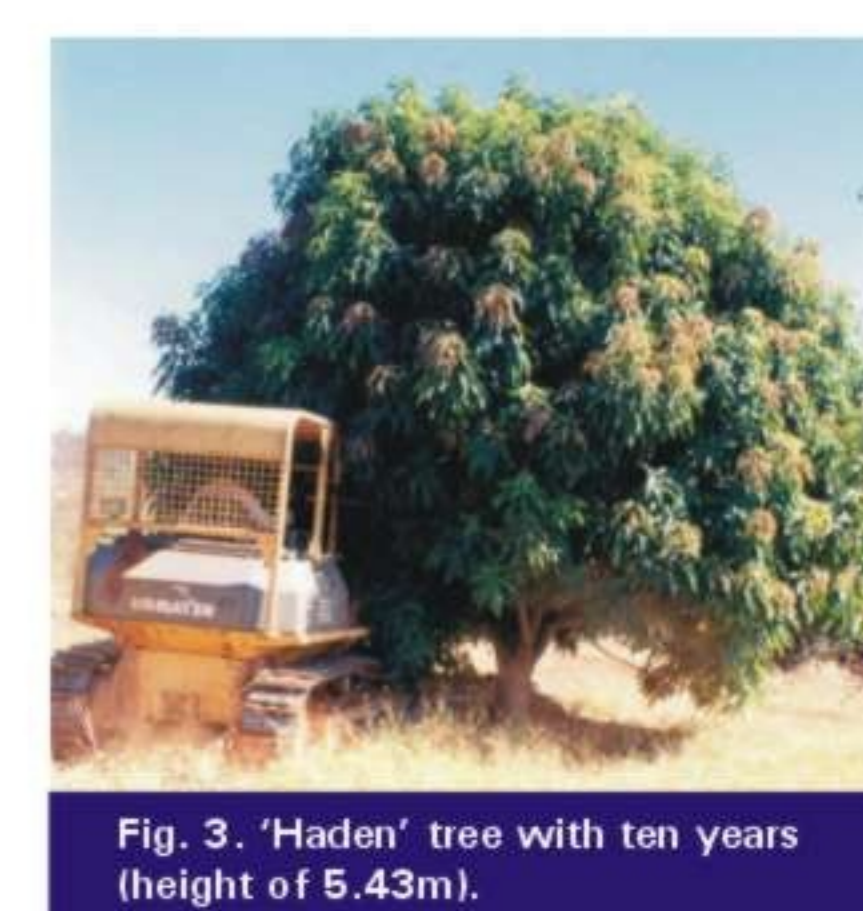


Fig. 3. 'Haden' tree with ten years (height of 5.43m).

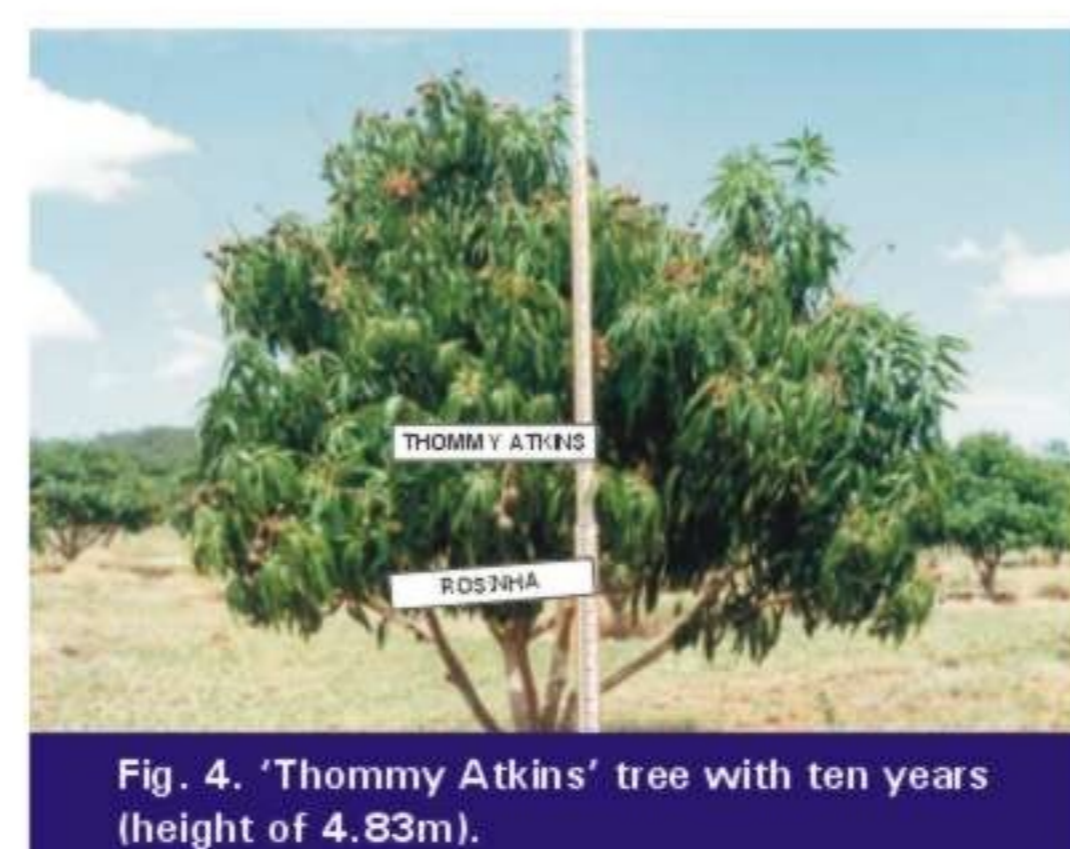


Fig. 4. 'Tommy Atkins' tree with ten years (height of 4.83m).

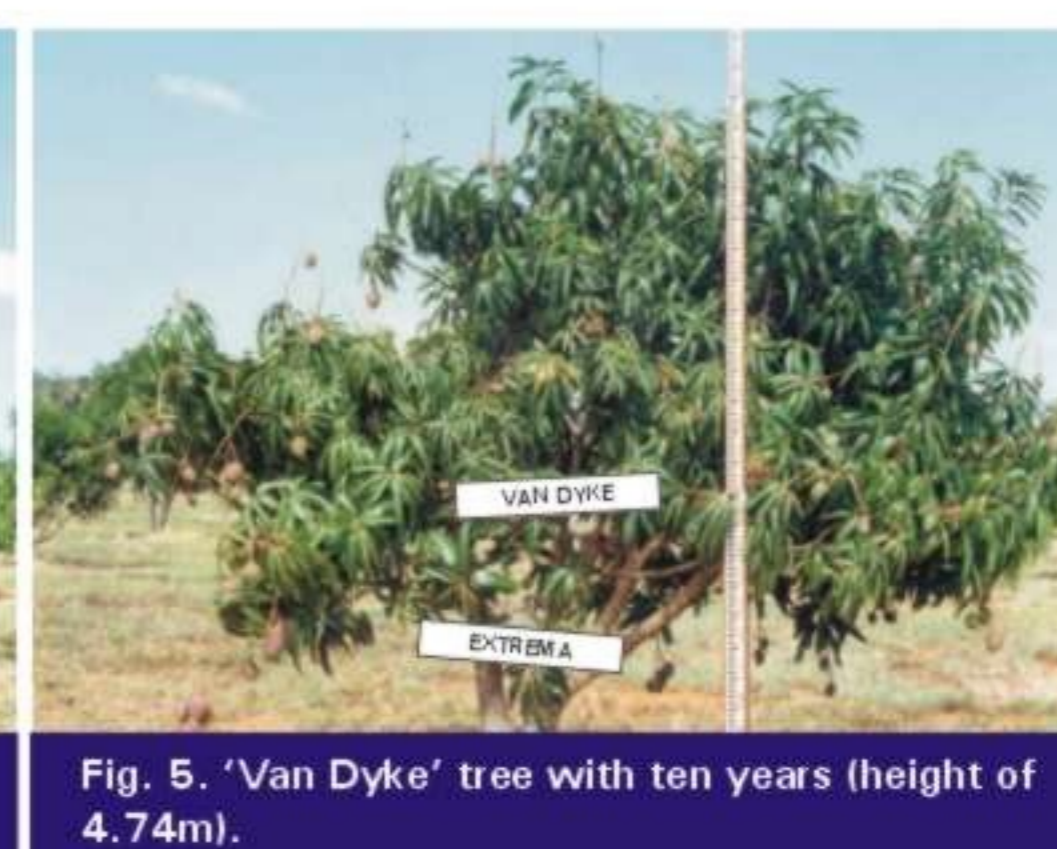


Fig. 5. 'Van Dyke' tree with ten years (height of 4.74m).

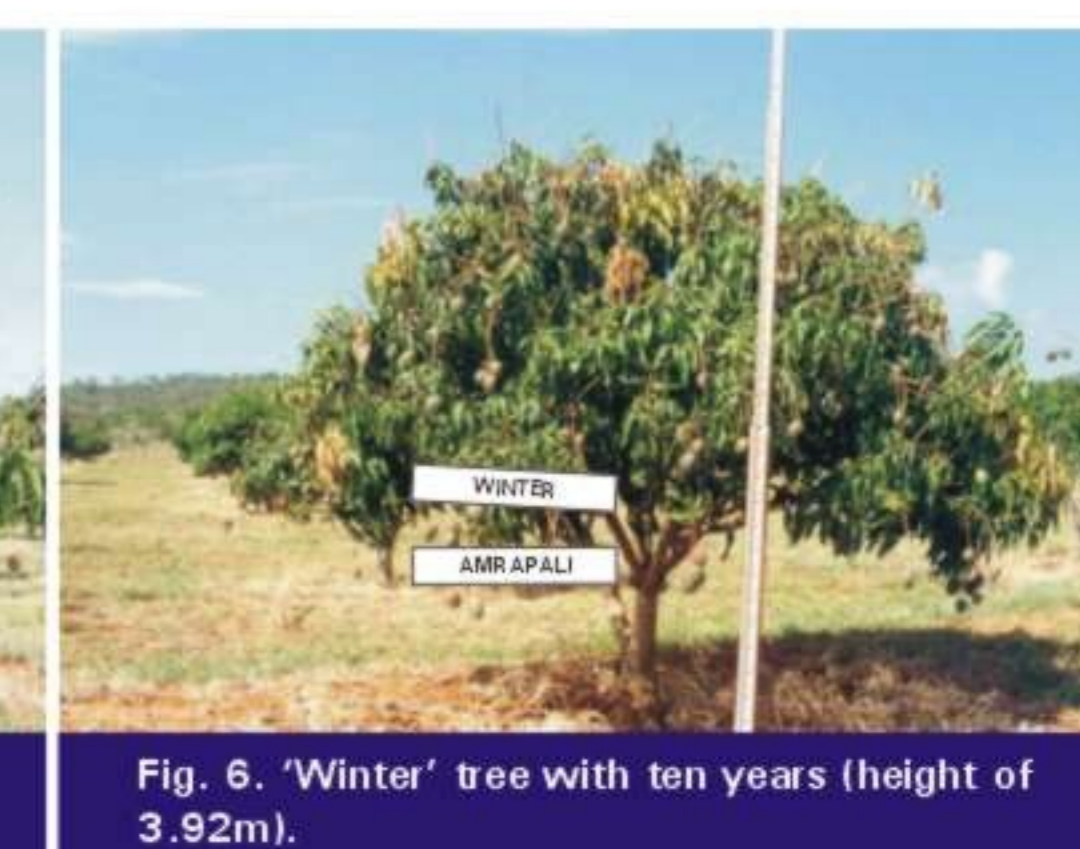


Fig. 6. 'Winter' tree with ten years (height of 3.92m).

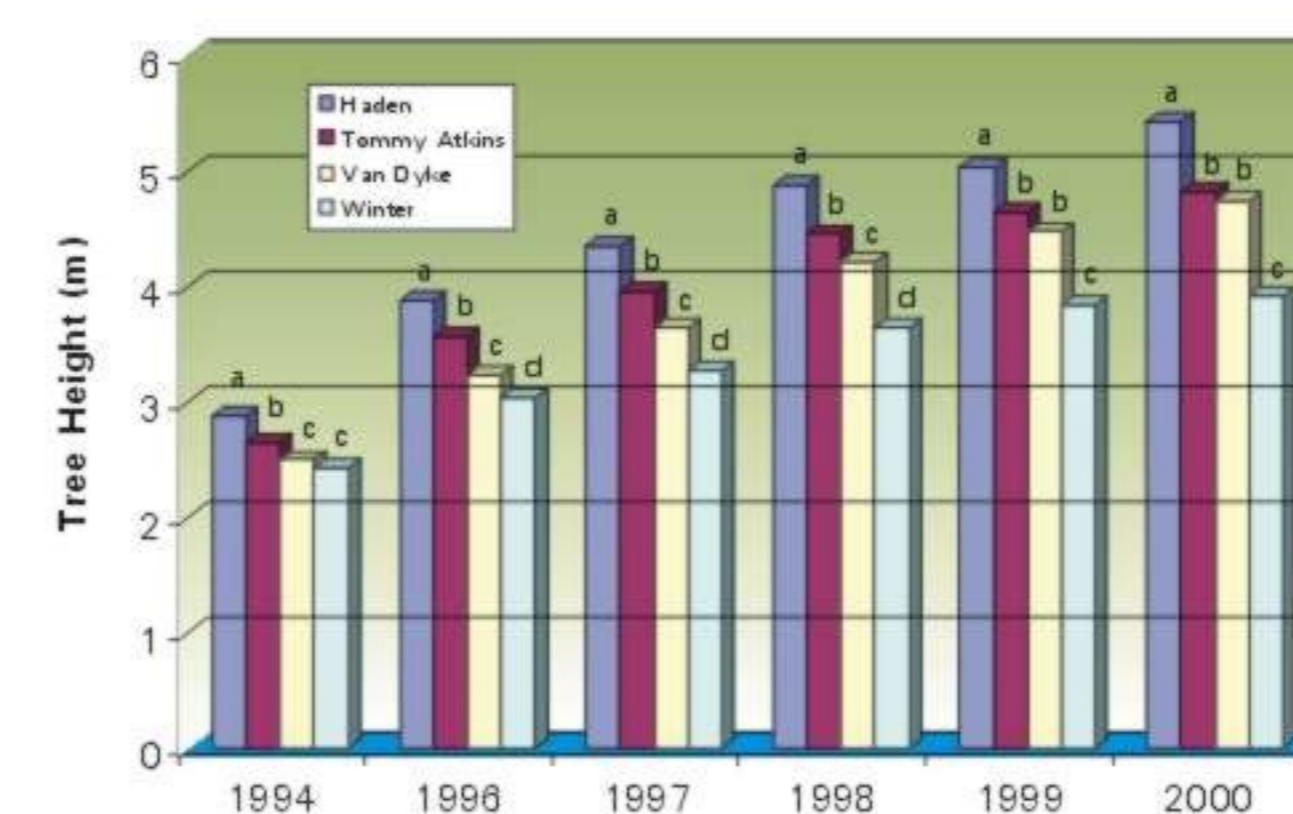


Fig. 7. Effect of cultivars on mango tree height (m), regardless of the rootstock. Embrapa Cerrados, Brasília-DF, 2002.

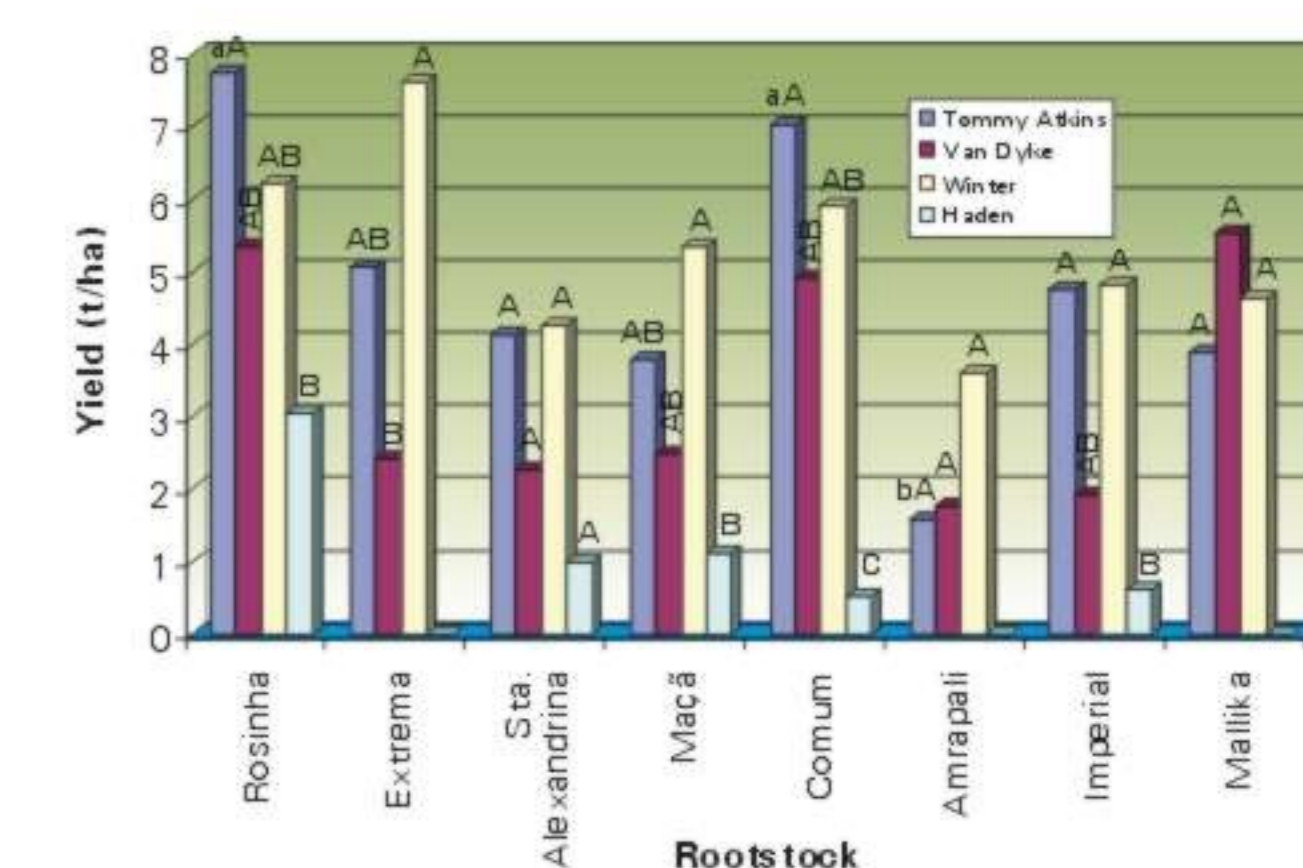


Fig. 8. Effect of interaction of cultivars x rootstocks on yield (t/ha) of eight year old plants. Embrapa Cerrados, Brasília-DF, 2002.

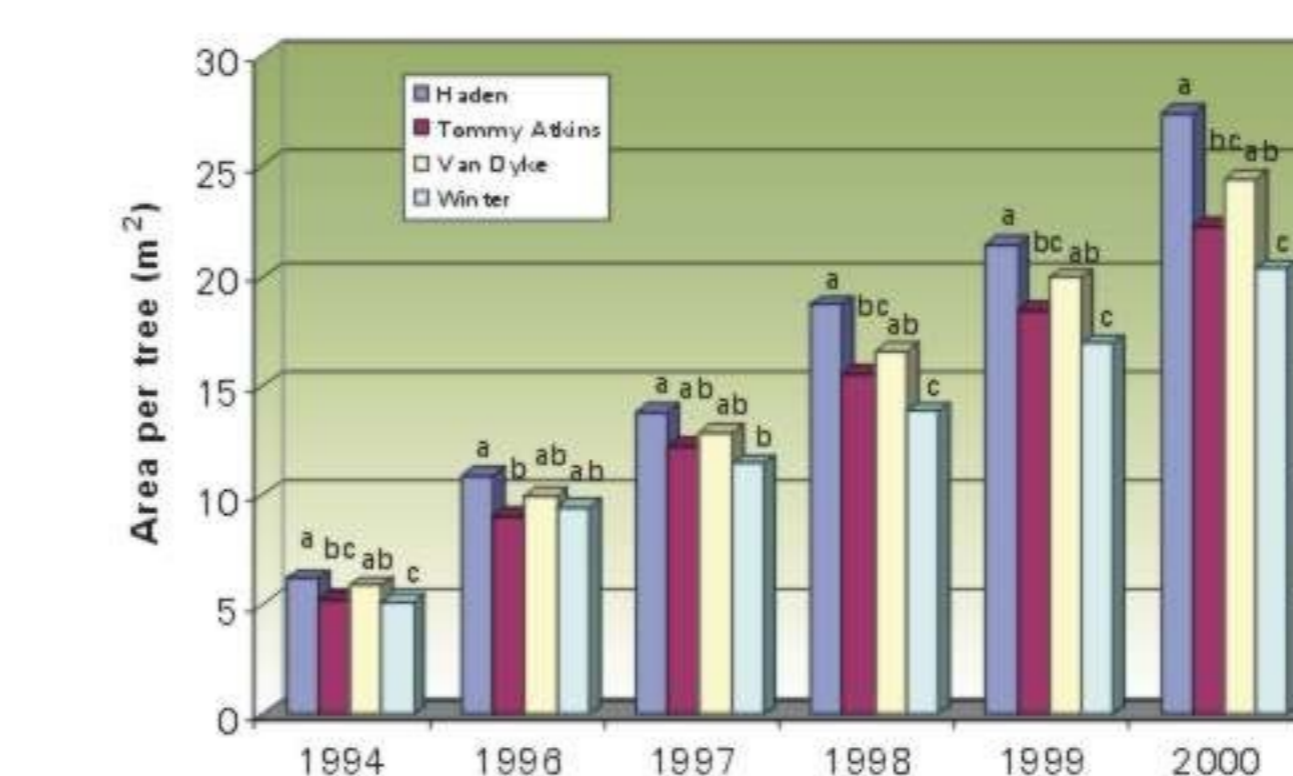


Fig. 9. Effect of mango cultivars on planting area per tree (m²), regardless of the rootstock. Embrapa Cerrados, Planaltina-DF, 2002.

TABLE 1. Effect of the rootstock on height of mango tree, regardless of the cultivar used during years 1994, 1999 and 2000. Embrapa Cerrados, Brasília-DF, 2002.

Rootstock	Embryony	Tree height (m)		
		1994	1999	2000
Comum	P	2.71 a	4.71 a	4.95 a
Maçã	M	2.61 a b	4.59 a b	4.76 a b
Rosinha	P	2.72 a	4.54 a b	4.80 a b
Imperial	P	2.62 a b	4.52 a b	4.74 a b
Sta. Alexandrina	M	2.51 a b	4.50 a b	4.74 a b
Extrema	M	2.59 a b	4.36 a b	4.43 a b
Mallika	M	2.49 a b	4.14 a b	4.37 a b
Amrapali	M	2.36 b	4.01 b	4.25 b
CV(%)		8.4	9.1	9.1
F(rootstock)		3.07 *	3.33 **	3.29 **

Embryony: Polyembryonic - P; Monoembryonic - M
Means with different letters differ statistically by Tukey test: * 5% probability and ** 1% probability.

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