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PROCEEDINGS
OF THE
32nd ANNUAL MEETING

7-13 July 1996

Pan-American School of Agriculture
Zamorano,
Honduras, Central America

Proceedings Edited
by
Wilfredo Colón

Published by the Caribbean Food Crops Society

YIELD CHARACTERISTICS OF PARVIN AND TOMMY ATKINS MANGOS GRAFTED ON DWARFING ROOTSTOCKS

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ABSTRACT. A study was conducted at the Fortuna Agricultural Substation to determine the effect of tree size-controlling rootstocks on yield of commercial mango cultivars Parvin and Tommy Atkins. These varieties were cleft grafted on Eldon, Colombo Kidney, Mayagüezano/Turpentine, Cubano, Malda, and Julie as rootstocks. Data on number and weight of fruits were collected during five consecutive crops starting two and three years after Tommy Atkins and Parvin trees, respectively, were planted in the orchard. Yield increased significantly during the first three crop years. Yield per tree was significantly higher for Parvin than for Tommy Atkins. Yields were higher for Parvin grafted on Julie and Malda and for Tommy Atkins grafted on Turpentine, Cubano and Julie. Yields were significantly lower on Eldon as rootstock irrespective of grafted variety.

RESUMEN. Se realizaron estudios en la Subestación Experimental Agrícola de Fortuna para determinar los efectos de patrones de mango que reducen la altura sobre el rendimiento de las variedades comerciales de mango Parvin y Tommy Atkins. Estas se injertaron sobre los patrones Eldon, Colombo Kidney, Mayagüezano/Turpentine, Cubano, Malda y Julie. Se tomaron datos del número y peso de las frutas durante cinco años consecutivos después que las variedades Tommy Atkins y Parvin tenían dos y tres años de establecidas en el huerto, respectivamente. El rendimiento de Parvin fue significativamente mayor que el de Tommy Atkins. Se obtuvieron mejores rendimientos con Parvin injertado en patrones de Julie o Malda; y con Tommy Atkins sobre Turpentine, Cubano o Julie. Los rendimientos fueron inferiores cuando se utilizó la variedad Eldon como patrón.

INTRODUCTION

Mango is one of the most important fruit crops produced in Puerto Rico. There are approximately 1,000 hectares of land planted to this crop. During 1991-94 the farm value of the crop was approximately \$9.25

million dollars (Anonymous). Most of the production is exported to the United States mainland and European Markets.

Mango fruits are borne on tall trees; thus harvest is difficult under conditions in Puerto Rico if trees are not appropriately pruned mechanically, which is an expensive practice. Since hand labor and arable land are scarce, and land values and wages are continuously increasing, there is a direct need to increase fruit yield per unit area of cultivated land. This increase could be accomplished by planting systems. This practice would also reduce production cost since, harvesting and cultural operations would be easier under such systems.

The purpose of this study was to determine the effect of tree size-controlling mango rootstocks on yield of two commercial mango varieties.

MATERIAL AND METHODS

Seeds of the rootstock varieties Colombo Kidney, Cubano, Eldon, Julie, Malda, Mayaguezano and Turpentine were germinated in sand seedbeds. Seedlings were maintained in a saran covered greenhouse, planted in 4 L containers filled with 1:1 soil-filter press mixture. After proper development they were cleft-grafted with scion wood of Parvin and Tommy Atkins cultivars. The grafted trees obtained were planted in the field for the experiments herein reported.

The orchard was established at the Fortuna Agricultural Experiment Station on the southern coast of Puerto Rico. The region has an annual average precipitation of 1020 mm and mean maximum and minimum temperatures of 30°C and 20°C. The soil type is San Anton Fine loam (Mollisol) with a pH of 7.4. Parvin trees were grafted in June 1986 and planted in the field in January 1987 whereas Tommy Atkins trees were grafted in 1987, and planted in February 1988.

A factorial completely randomized block design including 12 treatments (six rootstocks and two scions and three replications) was used. Each replication consisted of a group of four trees for a total of 144 trees included in the experiment. Planting distance was 7.6 X 7.6 m. Fertilizer application, irrigation, and weed control practices were performed following the recommendations of the University of Puerto Rico Agricultural Experiment Station (1985).

Tree height and trunk and canopy diameter were measured yearly and fruit number and weight were determined at time of harvest. Data herein presented include the first five years of fruit production.

RESULTS AND DISCUSSION

Fruit production increased significantly during the first three crop years as expected from young developing trees (Table 1). Amounts of fruits produced per tree at this early stage compared favorably with findings in previous reports (Cedeño *et al.*, 1987, Perez *et al.*, 1988; 1987). A significant reduction in fruit number and yield was observed during the fifth crop year, the significance of which can not be explained until further production data are obtained. Parvin was superior to Tommy Atkins both in terms of number of fruits produced by tree and weight of fruits per tree (Table 2). The decrease in production observed during the fifth crop year was more pronounced in Tommy Atkins than in Parvin.

Table 1. Combined yearly mango production for Parvin and Tommy Atkins varieties during the first five crop years.

Year	No. fruits/tree	Weight fruits/tree(kg)
1 (1990)	75 c	36.4 c
2 (1991)	120 b	58.6 b
3 (1992)	190 a	87.7 a
4 (1993)	175 a	93.2 a
5 (1994)	146 b	66.4 b
LSD= 3 (P=0.05)		LSD= 12.3 (P=0.05)

Julie and Cubano outperformed other rootstocks tested regarding of combined yields of both scion varieties (Table 3). Yields of Eldon were significantly lower than for the other varieties, including Colombo Kidney, which was included in the experiment as a standard non dwarfing rootstock. Previous studies have demonstrated that Eldon, Julie, and Malda are dwarfing rootstocks (Anonymous, 1994; Cedeño *et al.*, 1987).

Mayagüezano and Turpentine, both of which outperformed Eldon, were included in the experiment because of their extensive use as rootstocks in Puerto Rico and elsewhere. Cubano was included in the experiment because it is planted extensively as a dwarf variety in backyards and small orchards in southern Puerto Rico.

Table 2. Production of Parvin and Tommy Atkins during the first five crop years.

Year	Variety	Avg. no. fruits/tree	Avg. weight fruits/tree(kg)
1 (1990)	Parvin	141 d	68.2 d
1 (1990)	Tommy Atkins	8 f	4.9 f
2 (1991)	Parvin	191 c	88.2 c
2 (1991)	Tommy Atkins	48 e	27.9 e
3 (1992)	Parvin	274 a	120.0 a
3 (1992)	Tommy Atkins	101 d	55.7 d
4 (1993)	Parvin	237 ab	118.3 ab
4 (1993)	Tommy Atkins	113 d	68.2 d
5 (1994)	Parvin	230 b	101.7 bc
5 (1994)	Tommy Atkins	62 e	31.0 e
		LSD= 38 (P=0.05)	LSD= 17 (P=0.05)

Table 3. Combined performance of Parvin and Tommy Atkins on different rootstocks.

Rootstock	Avg. no. fruits/tree	Avg. weight fruits/tree (kg)
Eldon	89 d	42.5 c
Colombo Kidney	131 c	61.0 b
Mayagüezano/Turpentine	132 c	66.6 b
Cubano	167 ab	82.4 a
Malda	142 bc	67.9 b
Julie	184 a	90.0 a
		LSD= 29 (P=0.05) LSD= 13.3 (P=0.05)

Table 4. Yield of Parvin mango on different rootstock

Rootstock	No. fruits/tree	Weight fruits/tree (kg)
Eldon	126 d	56.8 d
Colombo Kidney	207 c	91.4 c
Mayagüezano	165 d	79.5 c
Cubano	240 bc	111.0 b
Malda	262 ab	123.1 ab
Julie	288 a	134.0 a
		LSD= 42 (P=0.05) LSD= 18.9 (P=0.05)

Table 5. Yield of Tommy Atkins mango on different rootstock

Rootstock	No. fruits/tree	Weight fruits/tree (kg)
Eldon	51 cd	28.2 bc
Colombo Kidney	55 bcd	30.6 bc
Turpentine	99 a	53.8 a
Cubano	95 ab	54.0 a
Malda	23 d	12.7 c
Julie	81 abc	46.1 ab
LSD= 42 (P=0.05)		LSD= 18.9 (P=0.05)

Table 6. Yield of Parvin and Tommy Atkins mangoes as influenced by rootstock

Cultivar	Rootstock	No. fruits/tree	Weight fruits/tree (kg)
Parvin	Eldon	126 de	56.8 d
	Colombo Kidney	207 c	91.4 c
	Mayagüezano	165 d	79.5 c
	Turpentine		
	Cubano	240 bc	111.0 cb
	Malda	262. ab	123.1 ab
	Julie	288 a	134. 0 a
Tommy Atkins	Eldon	51 hi	28.2 ef
	Colombo Kidney	55 ghi	30.6 ef
	Mayagüezano	99 ef	53.8 d
	Turpentine		
	Cubano	95 efg	54.0 d
	Malda	23 i	12.7 f
	Julie	81 fgh	46.1 de
		LSD= 42 (P=0.05)	LSD=18.9 (P=0.05)

For Parvin, both yield and number of fruits per tree were higher on Julie and Malda as rootstocks (Table 4). Parvin yields were significantly lower on Eldon and Mayagüezano.

For Tommy Atkins, yield was significantly higher with Turpentine, Cubano, and Julie as rootstocks than on Colombo Kidney, Malda, and Eldon (Table 5). Irrespective of rootstock variety, yields were significantly higher for Parvin than for Tommy Atkins (Table 6). Best yields of Parvin were nearly three times higher than those obtained with Tommy Atkins. For both Cultivars poorest yields were obtained on Eldon.

These results indicate that Eldon is an inferior rootstock for both cultivars tested and should not be recommended for commercial orchards. This finding contrasts with earlier findings and recommendations of this rootstock (Cedeño *et al.*, 1987; Perez *et al.*, 1987). On the basis of present results, Julie and Malda are recommended rootstocks for Parvin, while Mayagüezano/Turpentine, Cubano and Julie, are recommended rootstock for Tommy Atkins.

REFERENCES

- Agric. Exp. Sta. UPR., 1985. Conjunto Tecnológico para la producción de mango. Pub. 114.
- Anonymous, 1994. Agricultural Statistics, Department of Agriculture, Santurce, P.R.
- Cedeño Maldonado, A., A. Perez, and I. Reyes Soto. 1987. Effect of dwarfing rootstocks on tree size and yield of selected mango varieties. J. Agric. Univ. P.R. 72:1-8.
- Perez, A., A. Cedeño Maldonado, I. Reyes Soto, and I. López García. 1987. Growth and yield of mango trees at three stages of development. J. Agric. Univ. P.R. 71:341-47.
- Perez, A., A. Cedeño Maldonado, and I. Reyes Soto. 1988. Effect of dwarfing interstems on growth and yield components of mango. J. Agric. Univ. P.R. 72:501-07.