Studies on Characters of Chironja Seedling Trees[1]

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ABSTRACT

A search for good chironja clones was performed on several chironja seedlings grown on a Typic Tropohumults soil at the Corozal Agricultural Substation.

This research demonstrated that chironja seedlings can be selected for yield per tree, fruit size, number of seeds per fruit, peel weight, citric acid, pH, soluble solids to acid ratio, and quality index. However, the high coefficient of variability for number of seeds, cumulative weight and number of fruits per tree during eight bearings and the quality index indicates that the probability of selecting for these characters is higher than that for fruit size, citric acid, pH, and soluble solids/acid ratio.

The study also showed a great variability of the seedlings, following the frequency distribution typical of populations, indicating that in order to maintain uniform populations the chironja must be propagated through vegetative plant tissues, like grafting, instead of by seeds.

INTRODUCTION

The fresh citrus fruit industry income in Puerto Rico amounted to $5.5 million during 1974, suggesting the great importance of this crop to the island. Therefore, any effort to further increase this industry is justified.

This research was initiated in search for good chironja clones. According to Moscoso (4, 5, 6, 8) the chironja is apparently a natural hybrid between *Citrus sinensis* and *C. paradisi* with intermediate characteristics of the parents. However, cytological research (7, 11) did not demonstrate sufficient evidence to sustain such hybridicity.

There is no doubt that this virtually new citrus would contribute to the growing citrus industry of the island because of its feasibility for processing (1) and storing (2), and because of the discovery of new clones reported in this research.

MATERIALS AND METHODS

Chironja seedlings were used for this study. The orchard was established on a Humatas clay (Typic Tropohumults) at the Corozal Substation. All trees were labeled in a numerical order, and each one treated as an individual clone. Clones B1, T1, M1 and M2, previously selected by Moscoso (5, 9), and grafted on unknown rootstocks were used as checks for comparison.

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TABLE 1.—*Frequency distribution for the cumulative number of fruits per tree, cumulative weight of fruits per tree, fruit size, number of seeds per fruit, peel weight per fruit, soluble solids, citric acid, ratio of soluble solids to acids, pH, and quality index of different chironja seedling trees.*

Unit of measurement	Class group												n	$\bar{x}$	s	C.V.
	Cumulative						Number of fruits (8 bearings)									%
Fruit/tree	770	1070	1370	1670	1970	2270	2570	2870								
	7	6	7	9	10	7	3	1					50	1616	422.00	26.10
	Cumulative						Weight of fruits (8 bearings)									
Kg/tree	336	473	609	745	882	1018	1155									
	8	4	9	9	8	6	5						49	1469	636.60	43.30
							Fruit size									
Kg/fruit	.327	.350	.373	.396	.419	.442	.465	.488	.511	.534						
	1	1	4	5	6	9	12	6	1	3			48	.441	0.10	10.31
							Number of seeds									
Mean/fruit	10	12	14	16	18	20	22	24								
	1	1	0	2	17	24	2	1					48	20	14.43	71.46
							Peel weight									
Grams/Fruit	82	91	100	109	118	127	136									
	1	4	8	15	10	7	3						48	114		0.13
							0.01									
							Soluble solids									
°Brix	10.0	10.2	10.4	10.6	10.8	11.0	11.2	11.4	11.6	11.8	12.0	12.2				
	3	5	13	8	5	5	2	4	3	0	0	1	49	10.6	0.04	1.77
							Citric acid									
Mg/100 ml of juice	675	725	775	825	875	925	975	1025	1075	1125						
	3	10	4	10	13	1	3	3	0	1			48	855	13.25	15.49
							Soluble solids-acids									
Ratio of soluble solids/ citric acid	11	12	13	14	15	16	17	18	19							
	1	3	12	10	8	4	8	1	1				48	15.1	1.86	12.33
							pH									
	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3								
	2	8	21	8	6	2	0	1					48	3.84	0.27	7.02
							Quality index									
All factors	60	70	80	90	100	110	120	130	140							
	2	4	2	8	11	9	8	2	2				48	101	38.84	38.28

The orchard management was performed in accordance to the recommendations for citrus fruits of the Puerto Rico Agricultural Experiment Station (3).

The data to screen for fruit characters and yield started to be collected when the trees were 6 years old and was recorded in the following manner:

A) Cumulative number and weight of fruits per tree during eight bearings; B) fruit size measured as kg/fruit during three bearings; C) number of seeds and weight of peel per fruit. These data was analyzed during 3 years; D) the soluble solids (°Brix), pH and citric acid content of the juice were analyzed following the methods of the A.O.A.C. (10). The data was recorded for only a 1-year crop; E) Brix to acid ratio by dividing Brix by citric acid content; and F) the quality index for each clone was determined according to the method of Moscoso and Capó (8).

RESULTS AND DISCUSSIONS

Table 1 shows class mark of the various clones. These data show that progress could be made by selection on chironja seedlings for yield per tree, fruit size, number of seeds per fruit, peel weight, citric acid, pH, soluble solids/acid ratio, and quality index.

The high coefficient of variability for number of seeds, cumulative weight and number of fruits per tree and the quality index indicates that probability of selecting for those characters should be higher than that for the other characters studied.

Apomixis is a special situation that exists in citrus fruits and several other plants. In this process the new citrus plants for propagation produced from seeds are developed asexually from diploid maternal tissue, thereby bypassing the usual meiotic division. The genetically similar lines maintained in these plants are referred to as apomictic. This was not the case of the variable chironja seedlings reported in this study. On the contrary, an array of completely new varieties might be developed suitable for large scale exploitation with chironja seedlings.

Therefore, in order to maintain uniform populations, the chironja must be propagated through vegetative plant tissues instead of seeds.

RESUMEN

Se estudiaron los caracteres de chironjas producidas por árboles propagados por semillas y sembrados en un suelo de la serie Humatas en la Subestación Experimental Agrícola de Corozal.

Los chironjos se evaluaron con respecto a los siguientes caracteres: número y peso acumulativo de las frutas de ocho cosechas; peso de la fruta, peso de la cáscara y número de semillas por fruta; sólidos solubles; pH; ácido cítrico; razón de sólidos solubles a ácido; e índice de calidad.

Según los datos, con chironjos propagados por semilla se puede adelantar más en la selección para rendimiento por árbol y para los caracteres mencionados anteriormente.

Los altos coeficientes de variabilidad en número de semillas por fruta, en el peso y número de frutas por árbol de las ocho cosechas y en el índice de calidad indican que la probabilidad de selección a base de estos caracteres debe ser mayor que para los otros que se incluyeron en el estudio.

Los resultados de este estudio demostraron también una gran variabilidad en los chironjos propagados por semilla, lo cual indica que, para obtener uniformidad en un huerto de este frutal es necesario propagarlo por métodos asexuales, como la injertación.

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