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EFFECT OF CONTINUOUS PLANTING OF TANIER (Xanthosoma spp.)
AT THE SAME SITE FOR TWO SUCCESSIVE YEARS

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ABSTRACT

An experiment was conducted on an Oxisol at the Isabela Agricultural Experiment Substation of the University of Puerto Rico (UPR) to determine the effect of consecutive plantings on the yield of taniers (Xanthosoma spp.). Eleven tanier cultivars were planted for two consecutive years in the same plot. A drastic decrease in yield occurred in the second year. An increase in the number of plants showing root-rot symptoms during the second growing season could have had an effect on plant growth and yield. Cultivars Tannia-Xanthosoma #1 and Palma had a higher percentage of healthy roots over the two-year period and were associated with resistance to the dry root-rot disease. Although these cultivars demonstrated resistance to the disease, the corms produced were rudimentary.

INTRODUCTION

During the past 10 years, root rot ("mal seco") has been recognized as the most important factor limiting the production of taniers (Xanthosoma spp.) throughout the tropics. Nzietchueng (1983) and Rodriguez-Marcano and Rodriguez-Garcia (1986) found that Rhizoctonia solani and Pythium and Fusarium spp., which are commonly found in soils, seem to be causal agents of root-rot disease.

Data from the Department of Agriculture of Puerto Rico indicate that tanier production has been steadily declining during the past 22 years. More than 18,000 metric tons were produced locally in 1965-66 in comparison with less than 4,500 metric tons in 1987-88. Irizarry et al., 1977; Silva and Irizarry, 1980; Abruña et al., 1987; Cedeño-Maldonado and Bosques-Vega, 1990; and Lugo et al., 1990 have shown the positive effects of cultural practices such as irrigation and disinfection of the planting material on tanier yield. However, there is no information on the feasibility of successively planting tanier crops on the same site for a number of years.

MATERIALS AND METHODS

Experiments were conducted in May, 1987, and May, 1988, at the Isabela /Agricultural Experiment Substation, UPR, in a Coto clay (Oxisol) with a pH of 6.0. Eleven tanier cultivars were

selected from UPR's collection of 76 accessions through screening for yield and tolerance to "mal seco." A randomized complete block design with three replications was used. There were 15 plants/cultivar/plot in the first year and 60 plants/cultivar/plot in the second year. During the first year, 10 plants/plot were used to estimate yield and three plants to determine "mal seco" infection and, in the second year, 24 and 6 plants/plot were used for the same purposes. Planting distances were 1.0 m between rows x 0.5 m between plants. Rainfall and supplementary overhead irrigation provided the plots with 2.54 cm of water weekly. Evik (Ametrine) was used at the rate of 3.6 kg/ha as preemergent and glyphosate as postemergent supplemented by hand weeding. A 12-6-16 fertilizer (with minor elements) was applied at a rate of 70 g/plant 30 and 120 days after planting.

Percentage of root infection was determined eight months after planting based on the number of roots affected by "mal seco" and assuming that the plants had a maximum of 60 roots (the mean of three plants). Corms were weighed after removing the growing point. Cormels were considered commercial when they measured at least 7.62 cm in length and 5.08 cm in diameter. Mean plant height for each cultivar was obtained by measuring three plants/plot for a total of nine plants. Data on total number of cormels and total number of commercial cormels were recorded.

The 1988 crop was harvested at 12 months and the 1989 crop at 10 months after planting since the second planting contained a higher number of diseased plants.

RESULTS AND DISCUSSION

Table 1 shows that cultivars Alela, Vinola, Charanelle, Viequera and Barbados produced about 5,000 kg/acre of commercial cormels. This is considered an acceptable yield when planting taniers in non-infested soil. The results confirm those obtained by Irizarry et al., (1977), Abruña et al., (1987) and Cedeño-Maldonado and Bosques-Vega (1990) as to the highest yielding cultivars in Puerto Rico. At eight months after planting, about 80% of the root systems of these cultivars were infected. At this stage of growth, if plants are over 1.26 m in height and maintain a 20% healthy root system, they can produce an acceptable yield.

According to the data in Table 2, only cultivars Vinola, Barbados and Tannia-Xanthosoma #13 produced commercial cormels during the 1989 planting. The other cultivars planted successively on the same site did not produce any commercial cormels (Table 3). Also, corm weight, number of commercial cormels, and plant height were reduced in the second planting. Statistical analysis indicates that there were no significant differences in terms of mean root infection (Table 3). Visual observations, however, indicated that "mal seco" symptoms were

not present in non-infested soil in the first planting. On the other hand, visual "mal seco" symptoms were observed three months after the second planting. Cultivars Palma and Tannia-Xanthosoma #1 were the least affected by "mal seco" when planted successively at the same site, but these cultivars, do not appear to have the genetic capacity to produce cormels. According to Sotomayor et al., (1989), Palma is a polyploid ($2n=4X=52$) while Alela, Vinola and Kelly are diploids ($2n=26$). A possible relationship may exist between polyploidy and "mal seco" tolerance.

In conclusion, these results indicate that successive tanier plantings for two years at the same site may not be advisable.

Table 1. Yield of eleven tanager cultivars planted in non-infested soil during 1988 at Isabela Substation (first tanager planting at this site)

Cultivar	Corm Weight kg/acre	Total Number of Cormels / acre	Total Weight Cormels kg/acre	Number Commercial Cormels / acre	Weight Commercial Cormels / acre	Infected Roots (Mean) %	Mean height ^{3/} meters
Alela	12,051.60 ab	58,564 a	6,848.58 a	35,816 a	5,541.78 a	83.33 bc	1.56 b
Vinola	10,091.40 bc	51,304 a	7,405.20 a	39,446 a	6,509.82 a	71.67 c	1.51 b
Charanelle	9,123.42 bcd	45,738 a	6,364.62 a	30,250 a	5,420.82 a	81.67 bc	1.26 cde
Kelly	12,003.18ab	18,392 b	1,573.02 b	13,068 b	1,282.62b	70.00 c	1.24 de
Viequera	11,156.22ab	67,034 a	6,594.48 a	31,460 a	4,622.24 a	83.33 bc	1.60 b
Palma	4,936.80 cde	-- b	--	-- c	--	18.33d	1.97a
Barbados	13,382.60ab	56,628 a	6,848.58 a	33,396 a	5,057.82 a	71.67 c	1.48 bc
Florida 197	4,380.18 de	52,272 a	2,347.38 b	7,744bc	919.62b	100.00a	1.41 bcd
Florida 204	2,565.18 e	47,916 a	2,274.78 b	11,374bc	1,234.20b	96.67ab	1.16 e
Tannia - Xanthosoma #13	3,388.02 e	45,980 a	1,887.60 b	4,114bc	435.60b	85.00 bc	1.21 de
Tannia - Xanthosoma #1	15,633.18a	-- b	--	-- c	--	25.00d	2.16a

1/ Including commercial and non-commercial cormels.

2/ Based on mean of three replicates of 3 plants at 8 months. Determined by using the number of roots infected by 'mal seco' per plant.

3/ Mean of three replicates of 3 plants at 8 months.

Table 2. Yield of eleven tannier cultivars planted in "mal seco" infested soil during 1989 at Isabela Substation (second planting at the same site)

Cultivar	Corm Weight kg/acre	Total Number of Cormels acre	Total Weight Cormels kg/acre	Number Commercial Cormels acre	Weight Commercial Cormels kg/acre	Infested Roots (Mean) $\frac{2}{3}$	Mean height- $\frac{3}{3}$ meters
Alela	632.23 e	2,723 b	108.90 b	-- b	-- b	98.33 ab	0.62 cd
Vinola	1,156.55 de	2,823 b	67.55 b	202 ab	18.15 ab	96.00 ab	0.70 c
Charanelle	748.17 e	1,008 b	17.15 b	-- b	-- b	97.00 ab	0.67 cd
Kelly	2,363.52 cd	4,336 ab	157.30 b	-- b	-- b	76.67 ab	0.90b
Viequera	795.58 e	3,025 b	157.30 b	-- b	-- b	72.67 ab	0.63 cd
Palma	14,841.65 a	0 b	0 b	-- b	-- b	63.33 b	1.23a
Barbaños	2,955.43 c	10,184 a	584.82 a	706 a	84.70 a	83.33 ab	0.94 b
Florida 197	259.15 a	2,420 b	60.50 b	-- b	-- b	100.00 a	0.47 de
Florida 204	396.28 e	2,118 b	140.15 b	-- b	-- b	100.00 a	0.34 e
Tannia- Xanthosoma #13	628.20 e	2,622 b	67.55 b	202 ab	18.15 ab	94.33 ab	0.67 cd
Tannia- Xanthosoma #1	7,083.55 b	-- b	-- b	-- b	-- b	18.33c	1.31 a

1/ Including commercial and non-commercial cormels.

2/ Based on mean of three replicates of 3 plants at 8 months. Determined by using the number of roots infected by "mal seco" per plant.

3/ Mean of three replicates of 3 plants at 8 months.

Table 3. Comparison of yields of eleven tannier cultivars planted for two successive years at the same site (Isabela).

	Corm weight		Total number of corms ^{1/}		Total weight of corms		Number of commercial corms		Weight of commercial corms		Infested Roots (Mean) ^{2/}		Mean Height ^{3/}	
	1988	1989	1988	1989	1988	1989	1988	1989	1988	1989	1988	1989	1988	1989
	Kg/acre		Acre		Kg/acre		Acre		Kg/acre		%		Meters	
Alela	12,005.60a	632.23b	58,564a	2,723b	6,848.58a	108.90b	35,816a	--b	5,541.78a	-- b	83.33 a	98.33 a	1.56 a	0.62b
Vinola	10,091.40a	1,156.55b	51,304a	2,823b	7,405.20a	67.55b	39,446a	202b	6,509.82a	81.15b	71.67 a	96.00b	1.51 a	0.70b
Charanelle	9,123.42a	748.17b	45,738a	1,008b	6,364.62a	17.15b	30,250a	--b	5,420.82a	-- b	81.67 a	97.00 a	1.26 a	0.67b
Kelly	12,003.18a	2,363.52b	18,392a	4,336a	1,573.02a	157.30b	13,068a	--b	1,282.62a	-- b	70.00 a	76.67 a	1.24 a	0.90b
Viequera	11,156.22a	795.58b	67,034a	3,025b	6,594.48a	157.30b	31,460a	--b	4,622.24a	-- b	83.33 a	72.67 a	1.60 a	0.63b
Palma	4,936.80a	14,841.65b	-- a	-- a	-- a	-- a	-- a	--a	-- a	-- a	18.33 a	63.33 a	1.97 a	1.23 b
Barbaos	13,382.60a	2,955.43b	56,628a	10,184b	6,848.58a	584.82b	33,396a	706b	5,057.82a	84.70b	71.67 a	83.33 a	1.48 a	0.94 b
Florida 197	4,380.18a	259.15b	52,272a	2,420b	2,347.38a	60.50a	7,744a	--a	919.62a	-- a	100.00 a	100.00 a	1.41 a	0.47 b
Florida 204	2,565.18a	396.28a	47,916a	2,118b	2,274.78a	140.15a	11,374a	--a	1,234.20a	-- a	96.67 a	100.00 a	1.16 a	0.34 b
Tannia - <u>Xanthosoma #13</u>	3,388.02a	628.20a	45,980a	2,622b	1,887.60a	67.55b	4,114a	202b	435.60a	18.15b	85.00 a	94.33 a	1.21 a	0.67 b
Tannia - <u>Xanthosoma #1</u>	15,633.18a	7,083.55b	-- a	-- a	-- a	-- a	-- a	--a	-- a	-- a	25.00 a	18.33 a	2.16 a	1.31 b

1/ Including commercial and non-commercial corms.

2/ Based on mean of three replicates of 3 plants at 8 months. Determined by using the number of roots infected by "mal seco" per plant.

3/ Mean of three replicates of 3 plants at 8 months.

REFERENCES

- Abruña, F., Boneta, E., Vicente-Chandler, J., and Silva, S. 1987. Experiments on tanager production with conservation in Puerto Rico's mountain region. *J. Agric. Univ. P.R.* 51(2):167-175.
- Cedeño-Maldonado, A., and Bosques-Vega, A. 1990. Yield performance of cocoyam cultivars propagated by the single bud method. *J. Agric. Univ. P.R.* (In press).
- Irizarry, H., Capiel, M., and Acosta, A. 1977. Yield of twelve tanager cultivars grown with and without irrigation in East-Central Puerto Rico. *J. Agric. Univ. P.R.* 6(1):100-105.
- Lugo, W.I., Lugo-Mercado, H., Badillo, J., Beale, A., Santiago, M., and Rivera, L. 1990. Response of tanager to different water regimes. *J. Agric. Univ. P.R.* (In press).
- Nzietchueng, S. 1983. Root rot of Xanthosoma sagittifolium caused by Pythium myriotyllum in Cameroon. In: *Tropical Root Crops: Production and Uses in Africa*. pp. 187-88.
- Rodríguez-Marcano, A., and Rodríguez-García, J. 1986. Root-rot of taniers, H-137 Project Report. *Agric. Exp. Sta., Univ. P.R.*
- Silva, S., and Irizarry, H. 1980. Effect of depth of water table on yields of taniers. *J. Agric. Univ. P.R.* 64(2):241-243.
- Sotomayor, A., Schertz, K.F., and Rivera, E. 1989. Chromosome number and cytological observation of selected Xanthosoma and their possible importance in breeding for dry root-rot resistance. *Proc. Caribbean Food Crops Soc. 25th. Meet. Jul. (2-8)*. Pointe-a-Pitre, Guadeloupe. (In press).