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THE PRODUCTION OF TANNIA (*Xanthosoma* spp.) UNDER DISEASED FIELD CONDITIONS

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ABSTRACT

The best marketable tannia cultivars are very susceptible to the tannia rapid yellowing disease, popularly called "burning disease". On-station and on-farm tests using an improved package of cultivation practices were examined in Dominica. The indications were that the yield of tannia cormels increased dramatically from little more cormels to about 5-10 tonnes per ha at the minimum level. With the improved package of practice farmers are now able to produce tannia under diseased conditions. Emphasis is placed on site selection, drainage, planting material quality, limited use of fungicides, timely application of fertilizer and the early removal of weeds including diseased volunteer tannia host plants.

INTRODUCTION

Tannia is a staple food in the Eastern Caribbean. It is a well-liked traditional food obtained from the cormels of a few species of *Xanthosoma*. The crop is well adapted to the sub-region but the appearance of the tannia burnign disease over a decade ago has virtually wiped out around 85 per cent of the area under tannia in St. Lucia and about 65 per cent in Dominica. In 1982-83, tannia covered an area of about 748 ha in four Eastern Caribbean Islands: Dominica, 553, St. Vincent, 113, St. Lucia, 42; and Grenada, 40.

Average farmer yields fromthe smooth-skinned cultivars with white or pink pulp, vary around 8-12 t per ha. The potential yield of these same cultivars is above six times the present farmer's average.

Exports of tannia cormels within the region, to North America and to the United Kingdom, have exhibited a mild but steady increase in recent years. Dominican exports have reached the lucrative markets of the British Virgin Islands, St. Croix, Martinique, Guadeloupe and the United Kingdom. The tannia has relatively low cost post-harvest handling since the cormels keep well at ambient conditions without special treatment. However, the biggest problem has been the unrealiability of regular supplies. This problem stems directly from the effects of the tannia disease. "Management" of the disease should then remove one of the main constraints to exploiting the export potential of tannia.

The CARDI!EDF Proejct, commencing in September 1982, answered several questions pertiennt to tannia burning disease. The cause of the disease was ascertained to be a fungus which causes a rot of the tannia rotos as early as two weeks after planting. The disease is especially severe under waterlogged or porly drained soisl, especially if the planting material and soil are infested with the causal fungus, *Pythium myriotylum* (Drechsl). The fungicide mixture of Ridomil and Benlate has proved to be effective in preventing extensive root rot in susceptible tannia cultivars.

No commercially acceptable tannia cultivars were found to be resistant, though a few rough-skinned types tolerate the disease. The eddoe, which bears commercially acceptable, tannia-like cormels, is resistant to the disease. A wild **Xanthosoma** called "Jabba" in Dominica has exhibited the only resistance in the regional tannia germplasm collection.

This new information, and other recommended practices from the best tannia farmers, have been synthesized into an improved package of practices for use in diseased locations.

METHODOLOGY

On-Station Evaluation

The growth and yield of commercially desirable tannia cultivars in Dominica, cv. Rabess (smooth skin/white flesh) and cv. St. Lucia, (smooth skin/purple flesh) were compared using farmer practice versus the improved package of practices. The 2 x2 treatments were replicated five times in a randomized complete block design.

Each plot measured 9.0 m x 5.4 m. Sixty plants were arranged in a 6 x 10 layout giving a net plot of 32 plants. Four of the blocks were located at Geneva Estate and one at Grand Bay Agricultural Station. Each block was sited in a freshly and severely diseased location with some differences in natural potential drainage.

The farmer practice was as follows:

Mounds, 90 cm apart and 20-30 high were prepared by a farmer. Planting material (tops) was obtained from a random assortment collected from five farms. The material was physically cleaned by a farmer whose farm is commonly affected by the disease. At planting and throughout the crop no fungicides were used.

The package of improved practices was as follows:

Ridges, 90 cm apart and 30-40 cm high were made along the contours. Drains were dug to allow rapid run-off of water collected in the furrows in the event of heavy and persistent rains. Proper drainage was maintained at all times. Limestone (dolomitic) was applied 2-4 weeks before land preparation at the rate of 1-2 tonnes per ha. Planting material (tops) was obtained from disease-free farms and thoroughly cleaned of all debris and soil. Immediately prior to planting, the tops were dipped in a fungicide mixture (3 per litre Ridomil MZ58 and 2 g per litre Benlate WP50). This mixture was also used to drench the rhizosphere of plants grown under the improved practices. Drenches of a similar fungicide mixture in the proportion 5, 3 and 2 g Ridomil to 1 g Benlate were applied at 4,8 and 20 weeks respectively.

A mild attack of **Sclerotium rolfsii** was contained through the use of Terrachlor WP75. Weed control and fertilizer application were similar for all plots, both those with farmer practice and the improved package. Appropriate weed control was done using both manual and herbicidal methods. Fertilizer (120 g per plant) was applied to each plant at 3 and 11 weeks after planting.

At harvest, at 8 months for cv. Rabess and at 8 1/2 months for cv. St. Lucia, data on fresh weight of tops, corms and cormels were recorded. The number of cormels and a root rot score (0-4) were also noted.

On-farm Evaluation

The package of practices was the same as described above in the on-station evaluation. This stage of evaluation differed from the on-station test in that farmers' fields and labour were utilized. The farmers participated in all the cultivation practices under the supervision of the experimenters.

Seven plots in diseased areas of Dominica were selected at Grand Bay, Cockrane, La Plaine, Soufriere, Elices, Vieille Case and Roseau. A total of 3,018 plants were divided between the seven farms in varying numbers so that the smallest plot received more than 100 plants. There were no replications within farms and data were collected from 10 randomly chosen plants. Cv. St. Lucia and cv. Rabess were planted. Some of the farmers intercropped with beans and plantains.

RESULTS AND DISCUSSION

On-station Evaluation

Based primarily on the symptoms above ground it was clear that regardless of the cultivar, tannia cultivated under the farmer practice was affected early and severely by the tannia burning disease. Diseased volunteer tannia plants nearby had rotted roots and an active inoculum of **Pythium myriotylum**. On the contrary, the plants cultivated under the improved package of practices appeared to be extremely healthy, based on the appearance, number and size of leaves. They were generally vigorous except for the occasional bacterial marginal necrosis of the leaf (Table 1).

Table 1. Comparison of selected yield parameters of two tannia cultivars under two management levels

Tannia yield parameter	Farmer practice cv. Rabess	Improved practice cv. Rabess	Farmer practice cv. St. Lucia	Improved practice cv. St. Lucia
Mean number of plants harvested	18	23	17	29
Mean fresh wt (kg0 per plant of				
Top	0.06	0.62*[1/]	0.07	0.18*
Corm	0.22	0.73***	0.19	0.73***
Cormels	0	0.58**	0	0.47**
Number of cormels per plant	0	4.28***	0	4.90***

1/ Differences between improved and farmer practice within cultivars significant at P = 0.05(*) P = 0.01(**) and P = 0.001 (***).

One important feature of the improved package of practices was the use of ridges and drains for rapid run-off water. This was a decided advantage after rainfall when there were no pools of water in and among the plants cultivated by the improved practices. In the plants cultivated by farmer practices, pools of water around the mounds were observed for long periods after rainfall. This latter condition is favourable for the rapid growth and development of the disease and the poor drainage, coupled with the rapid growth of the fungus, caused early and rapid infection among the plants cultivated using the usual farmer practices.

At harvest, praedial larceny from plots with improved practices, and deaths in plots with farmer practices affected the number of plants harvested. Out of a maximum of 32 plants, an average of 20 plants was harvested from the improved cv. St. Lucia plot with significantly fewer plants in the other treatments (Table 1). Significant differences among blocks were also observed. This was interesting because an attempt was made to cover a range of conditions under which the disease occurs.

The fresh weight of tops of both cultivars grown under farmer and improved practices differed significantly ($p < .05$). There was no significant difference in the fresh weight of tops of the two cultivars when grown with improved practices. Similarly, the fresh weight of corms of the two cultivars grown under improved practices were significantly greater than those grown under farmer practice. Again, there was no difference in corm fresh weight between the two cultivars when grown with improved practices (Table 2).

Table 2. Growth parameters of tannia plants of different ages at seven sites in Dominica grown according to the recommended package of practices

Site	Total no. of plants per site	Age of plants (months)	No. of leaves per plant[1/]	Leaf area index[1/] (cm)	Plant[1/] height (cm)	Per cent diseased plants	Per cent dead plants
Grand Bay	500	4.0	4.6	20.7	53.3	0	0
Soufriere	325	4.5	4.4	14.1	36.4	0	0
Vieille Case	500	2.0	3.0	12.8	29.1	0	0
Delices	555	4.5	6.7	25.5	66.6	0	0
Roseau	113	3.0	4.4	14.1	36.4	0	6
La Plaine	400	3.0	3.3	11.9	35.7	2.5	0.5
Cockrane	625	6.0	6.5	26.0	74.0	0	0.9
Mean	-	3.9	4.7	17,8	47.4	0.4	0.2

1/ Means of 10 randomly chosen plants.

No cormels were harvested with the farmers usual practices. With improved practices cv. Rabess produced a mean of 0.58 kg of fresh cormels, and St. Lucia, 0.47 kg per plant.

Although the harvest of cv. St. Lucia was early there were differences in the number of cormels produced by the two cultivars. The lower numbers recorded in cv. Rabess was due to praedial larceny of the larger cormels. It was somewhat early for full cormel initiation and development in cv. St. Lucia.

On-farm Evaluation

No plant exhibited symptoms of tannia burning disease at six of the seven sites at the time of observation in May 1986. A few plants died at Roseau, La Plaine and Cockrane due to a period of drought. Severe drought produced above-ground symptoms which could be confused with the disease. However, below-ground parts did not show the root rot symptoms of tannia burning disease.

Based on the number of leaves per plant, plant height and leaf area index (Table 2), plants were vigorous at all seven sites. In fact, difference between plants of cv. Rabess and cv. St. Lucia in the test plots, and those planted by farmers in nearby fields, was very dramatic; most of the farmers' plants died or were severely retarded by the second or third month after planting. Plants on the test plots were still in excellent health.

Observations made in July 1986 showed that the test plots were still free of tannia burning disease symptoms. The older plots at Soufriere, Cockrane and Delices were near harvest which promised to be very good.

CONCLUSIONS

The on-station and on-farm evaluations showed that tannia could be successfully grown in endemically diseased soils. The cultivars, Rabess and St. Lucia, the most marketable, but also the most susceptible to the tannia burning disease, were cultivated with dramatic success in severely diseased fields from which these cultivars had all but disappeared. Because of the effectiveness of the improved package of practices, both on-station and on-farms, it is recommended for tannia cultivation by farmers. Larger scale field tests are necessary to measure the range of economic factors and the cost-effectiveness of the improved package of practices.