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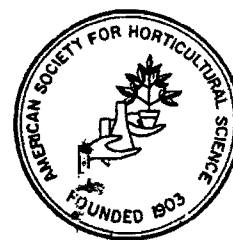
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TANNIA (*XANTHOSOMA* SPP) PRODUCTION SYSTEMS IN THE WINDWARD ISLANDS

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ABSTRACT

From a survey of tannia (*Xanthosoma* spp.) production systems in Dominica, Grenada, St. Lucia and St. Vincent conducted by the CARDI/EDF: Aroids/Arrowroot Project a description of existing production practices is given and comparisons made between the islands. The major constraints identified were tannia rapid yellowing disease, weed control and limited availability of sufficient planting material. Areas requiring further research are identified.

RESUMEN

Del estudio de sistemas de producción en las islas de Dominica, Grenada, St. Vincent y St. Lucia, llevado a cabo por el instituto CARDI/EDF: Proyecto 'Aroideo/Maranta', damos una descripción y a la vez hacemos una comparación, de las prácticas de producción de las islas mencionadas. Las mayores dificultades encontradas fueron, la enfermedad del Amarillamiento rápido del *Xanthosoma* spp., el control de hierbas y la disponibilidad limitada de suficiente material de cultivo. También se identifican las áreas que requieren una investigación más extensiva.

Keywords: Tannia, *Xanthosoma* spp.; Production systems; Windward Islands

Tannia (*Xanthosoma* spp.) is an important root crop in the Windward Islands, especially Dominica, where per capita production was 98.7kg. in 1982/83. Tannia accounts for 28 percent of total root crop production in Dominica, and over 16 percent in Grenada, St. Lucia and St. Vincent. Annual production ranges from 7,400 tonnes in Dominica to 400 tonnes in Grenada. (Table 1).

Table 1 Tannia production in the Caribbean, 1982-83.

| Country | Production (tonnes) | Per capita production (kg) | % of total root crop production |
|-------------------|---------------------|----------------------------|---------------------------------|
| Antigua | 20 | 0.2 | 2.9 |
| Belize | 10 | 0.06 | 5.0 |
| Cuba | 75,000 | 7.6 | 8.9 |
| Dominica | 7,400 | 98.7 | 28.8 |
| Dom. Republic | 35,000 | 5.6 | 16.3 |
| Grenada | 400 | 3.7 | 6.1 |
| Jamaica | 11,746 | 5.6 | 5.7 |
| St. Lucia | 1,000 | 7.9 | 16.6 |
| St. Vincent | 4,735 | 37.0 | 18.1 |
| Suriname | 50 | 0.1 | 1.6 |
| Trinidad & Tobago | 375 | 0.3 | 3.5 |

Source: Ferguson (1985)

The area under tannia production are estimated at 533, 113, 42 and 40 ha for Dominica, Grenada, St. Lucia and St. Vincent respectively.

Tannia is grown primarily for local consumption; however, limited quantities are exported to regional and extra-regional markets. Exports of tannia from Dominica have been increasing steadily over the past 5 years (Table 2) primarily to markets in the French islands of Martinique and Guadeloupe, and the more northerly Caribbean islands. Trinidad is the biggest importer of tannia in the region and St. Vincent is the major supplier (Ferguson, 1985).

In 1982 the Caribbean Agricultural Research and Development Institute (CARDI) began a four year project funded by the European Development Fund (EDF) for "Increased Production of Aroids

Table 2 Export of tannia from Dominica, 1980-84.

| Year | Tannia exports (tonnes) |
|------|-------------------------|
| 1980 | 55 |
| 1981 | 139 |
| 1982 | 123 |
| 1983 | 174 |
| 1984 | 227 |

Source: Dominica Market Intelligence Unit, March, 1985.

(Tannia, Dasheen and Eddoes) and Arrowroot in the Eastern Caribbean." One of the first activities of the project was the undertaking of a detailed survey of aroid production systems in Dominica, Grenada, St. Lucia and St. Vincent, in order to obtain baseline data, and to identify constraints to production.

This paper is a summary of the survey findings with respect to tannia (*Xanthosoma* spp.), and compares tannia production systems in the Windward Islands. Areas requiring further research work are identified.

Methodology

The survey took the form of a structured questionnaire of 75 questions on farm physical characteristics, crop mixes, cultivars, cultural practices, harvest and post-harvest techniques.

Interviews were conducted by project staff and extension agents of the local Ministries of Agriculture. Editing and subsequent corrections were carried out by CARDI personnel. A total of 278 farmers (112 in Dominica, 76 in Grenada, 50 in St. Vincent and 40 in St. Lucia) representing 10 per cent of the tannia farming community, were interviewed.

Results

Cultivars

Farmers in all four islands grew a number of local cultivars, distinguishable primarily by petiole colour, cormel flesh colour and texture of cormel skin. Farmers in Grenada and St. Lucia reported seven commonly grown cultivars, while Dominican farmers

described nine cultivars, and St. Vincent farmers five (Table 3). In all cases a mixture of two or more cultivars were grown.

Table 3 Common tannia cultivars grown in the Windward Islands

| | |
|-------------|--|
| Dominica | Purple, Rabess, St. Lucia, Jamaic, Bruce, White, Yellow, Sasan, Elsure |
| Grenada | Red, Crede, Pink, Purple, White, Bajan, Grand Bay |
| St. Lucia | Jamaica, Blanc, Bris, Bucco, Button, Eugene |
| St. Vincent | Barbados Smooth White, John Shott, Red Seed, Nut, Grambe |

In each of the islands the two preferred cultivars were a white and a pink-fleshed type. In Dominica 77 per cent of the farmers grew "Rabess" a white-fleshed cultivar, while 45 per cent grew "St. Lucia" (purple-fleshed). Grenadian farmers favoured the "Red" (83 per cent) and the "White" (43 per cent). In St. Vincent all the farmers grew 'Barbados Smooth White' while 50 per cent grew 'John Shott' (white-fleshed).

Choice of cultivar was based on a variety of factors, and the most popular cultivars scored well in all eight categories of responses which were: yield, tolerance to pests and diseases, availability of planting material, marketability, taste, cooking quality, storage quality and tradition.

Crop mixes

Intercropping of tannia was a common practice in all four islands and pure stands of tannia were seldom seen. In most cases the crop mix consisted of tannia and one or more other crops. Tannia was usually the main crop when intercropped with vegetables, and a minor crop when grown in association with perennials.

The species of intercrop found was generally a reflection of the main crop of the island. The most frequent crop mix in all the islands was tannia, dasheen and banana. Tannia and citrus or coconut were common in Dominica, Grenada and St. Lucia. In Grenada tannia was also intercropped with nutmeg or cocoa (Table 4).

Table 4 Crops commonly intercropped with tannia in the Windward Islands

| | Dominica | Grenada | St. Lucia | St. Vincent |
|--------------|----------|---------|-----------|-------------|
| Dasheen | * | * | * | * |
| Banana | * | * | * | * |
| Citrus | * | * | * | |
| Coconut | * | * | * | |
| Cocoa | | * | | |
| Nutmeg | | * | | |
| Eddoe | | | | * |
| Yam | | * | * | * |
| Sweet potato | * | * | | * |

Time of planting

In Dominica the main planting season was from May to June. Farmers in Grenada planted from February to April; in St. Lucia from January to May, and in

St. Vincent from April to July. The reason identified for planting at these times was the onset of the rainy season. In areas where rainfall was evenly distributed some tannia was planted throughout the year.

Soil texture and topography

Table 5 shows the distribution of tannia farms with respect to soil texture. Clay loams were the most widely used soils for tannia production in St. Lucia, Grenada and Dominica while in Grenada only 25 per cent of the farmers interviewed cultivated tannia on clay loams.

Tannia was seldom cultivated on clays or sandy soils — except in St. Vincent where almost one third of the tannia production was on sand and 44 per cent on sandy loams.

Table 5 Distribution of tannia farms with respect to soil texture in the Windward Islands

| | Soil texture | | | |
|-------------|-------------------|-----------|------------|------|
| | Clay | Clay loam | Sandy loam | Sand |
| | % of Tannia farms | | | |
| Dominica | 9 | 63 | 27 | 1 |
| Grenada | 13 | 71 | 13 | 3 |
| St. Lucia | 1 | 95 | 3 | 1 |
| St. Vincent | 0 | 25 | 44 | 31 |

In all the islands more than 50 per cent of the farmers cultivated on soils with a slope of 10 – 30°. Seventy per cent of tannia farmers interviewed in St. Lucia utilized slopes of 30 – 60°. Flat land (< 10°) was used by 38 per cent of farmers in Dominica. Steeper terrain (> 60°) was seldom used. (Table 6).

Table 6 Distribution of tannia farms with respect to topography in the Windward Islands

| | Gradient of slope | | | |
|-------------|-------------------|--------|--------|------|
| | <10° | 10–30° | 30–60° | >60° |
| | % of farms | | | |
| Dominica | 38 | 64 | 23 | 6 |
| Grenada | 16 | 66 | 18 | 0 |
| St. Lucia | 17 | 52 | 70 | 9 |
| St. Vincent | 10 | 50 | 40 | 0 |

Land preparation

In all of the islands the implements used to prepare the land for planting were the cutlass, the hoe and the fork. Over 75 per cent of the farmers interviewed in Dominica, St. Lucia and St. Vincent planted on mounds, while in Grenada 57 per cent of the farmers preferred to plant on the flat and 34 per cent on ridges.

Few of the farmers in any of the four islands practised minimum tillage (Table 7).

Planting material

The majority of farmers in Grenada (82 per cent) used lateral suckers as planting material; head setts (30 per cent) and corm bits (30 per cent) were used to a lesser extent. Dominica farmers used either

Table 7 Methods of land preparation used by tannia farmers in the Windward Islands

| | Mound | Flat | Ridge | Minimum tillage |
|-------------|--------------|------|-------|-----------------|
| | % of farmers | | | |
| Dominica | 76 | 11 | 10 | 3 |
| Grenada | 1 | 57 | 34 | 8 |
| St. Lucia | 83 | 10 | 4 | 3 |
| St. Vincent | 90 | 5 | 0 | 5 |

lateral suckers (20 per cent) or head setts (32 per cent) as planting material. In St. Vincent lateral suckers (25 per cent), head setts (38 per cent) and corm bits (33 per cent) were all used as planting material although there was some preference for lateral suckers (56 per cent) (Table 8).

Table 8 Types of planting material used in tannia production in the Windward Islands

| | Lateral suckers | Head setts | Corn bits | Whole corms | Whole cormels |
|-------------|-----------------|------------|-----------|-------------|---------------|
| | % of farmers | | | | |
| Dominica | 20 | 32 | 8 | 9 | 11 |
| Grenada | 82 | 30 | 30 | 6 | 6 |
| St. Lucia | 56 | 48 | 30 | 13 | 35 |
| St. Vincent | 25 | 38 | 33 | 4 | - |

In all the islands, planting material was selected at harvest of the preceding crop. In Dominica and Grenada the majority of farmers replanted tannia in the same area immediately after harvest. In St. Vincent, immediate replanting of tannia was not practised, 75 per cent of the farmers allowed their fields to lie fallow after tannia production, while 25 per cent planted a different crop species.

Farmers in all four islands cleaned the planting material of soil, roots and rooted portions before planting. Chemicals were not used to treat planting material but a few farmers in Dominica and St. Lucia reported treating their planting material with ashes prior to planting.

Spacing and planting depth

Planting distances varied widely between farmers on the same island. A spacing of 30 - 60cm x 30 - 60cm was used by farmers in all the islands. Farmers in Dominica and Grenada also planted at a spacing of 90 - 120cm x 90 - 120cm, and in St. Lucia at 60 - 90cm. Planting distances varied depending on whether the tannia was planted in pure stand or as an intercrop. When tannia was grown in association with perennial crops, the perennials were dominant and the spacing of the tannia was increased as the trees matured.

Planting depth varied from 7 - 15cm in Dominica to 13 - 30cm in Grenada

Fertilizer use

Over 90 per cent of the farmers in Grenada, St. Vincent and St. Lucia, and 75 per cent in Dominica used compound NPK fertilizer on the tannia crop. The formulations used were 16:8:24:2MgO and 16:8:16, prepared for use on bananas and arrowroot

respectively. Other fertilizers such as Sulphate of Ammonia and Urea were occasionally used by the minority of farmers. Fertilizer was applied at rates of 60-120g per plant within 7 weeks of planting. A few farmers applied fertilizer twice. The fertilizer was applied either in a circle around the base of the plant or banded; it was not usually incorporated in the soil.

Weed control

Weed control was the most important cultural activity carried out by farmers in all the islands. Weeding was done one to four times in the life of the crop, with more than 50 per cent of farmers weeding twice, and 25 per cent weeding three times (Table 9). Weed control was carried out mainly on the 2-10 week old crop, but several farmers in St. Lucia first weeded after 6-7 months. A few farmers in St. Vincent reported using the herbicide paraquat, but the main method of weed control on all the islands was manual, using hand, hoe and cutlass.

Table 9 Frequency of weed control in tannia in the Windward Island production systems

| | No. of weedings | | | |
|-------------|-----------------|----|----|----|
| | 1 | 2 | 3 | 4 |
| | % of farmers | | | |
| Dominica | 6 | 57 | 32 | 5 |
| Grenada | 4 | 71 | 25 | 0 |
| St. Lucia | 0 | 68 | 21 | 11 |
| St. Vincent | 0 | 48 | 36 | 16 |

Pest and disease problems

Farmers reported no serious pest of tannia, although aphids, white flies, slugs and snails posed an occasional problem. The only disease reported was tannia "leaf burning" which was serious problem in Dominica, St. Lucia and St. Vincent.

Harvest and storage

In all the islands, the tannia crop was harvested 8-12 months after planting (Table 10) depending on cultivar and market demand. Approximately 80 per cent of the farmers staggered the harvest according to market demand and household requirements. Harvesting was done manually, using forks and/or cutlasses. The plants were uprooted and the cormels separated from the corm and cleaned of adhering soil and roots. Occasionally the cormels were removed without uprooting the plant, which was left to produce another crop. Few of the farmers stored the cormels for any length of time, and no storage problems were reported.

Table 10 Period from planting to harvesting of tannia in the Windward Islands

| | 6-8 months | 8-10 months | 10-12 months |
|-------------|--------------|-------------|--------------|
| | % of farmers | | |
| Dominica | 12 | 48 | 25 |
| Grenada | 0 | 41 | 59 |
| St. Lucia | 0 | 39 | 78 |
| St. Vincent | 0 | 63 | 37 |

Discussion

The results show that the production systems for tannia are fundamentally similar in all four islands. The main inputs were labour, fertilizer and to a lesser extent herbicides. Since tannia was so often intercropped, it benefitted from inputs into the major agricultural enterprises such as banana, arrowroot, or tree crops.

One of the major constraints to tannia production identified was the tannia 'leaf burning' disease which was reported in Dominica, St. Lucia and St. Vincent, and has more recently been observed in Grenada. Tannia leaf burning now referred to as "tannia rapid yellowing disease" (TRYD) is caused by a severe root rot accompanied by a stunting of growth and a rapid successive yellowing of the outer leaves (CARDI/EDF, 1985). This disease has had a major impact on tannia production in Dominica, St. Lucia and St. Vincent; Clarendon (1982) reported that 68 per cent of the Dominica crop was affected. The tannia crop of Martinique was also affected by TRYD. The identification of the causal organism and management of the disease has been the major focus of the CARDI/EDF Aroids/Arrowroot Project over the past three years. A workshop on this subject was conducted in Dominica in March 1984 (Adams, 1984).

Limited availability of planting material was another constraint identified by the survey. Although farmers recognized head setts and lateral suckers as better types of planting material, the need to obtain sufficient quantities led to the use of "inferior" planting material. This constraint also led to the use of diseased material which encouraged the spread of tannia rapid yellowing disease. Work done by CARDI/EDF: Aroids/Arrowroot Project (unpublished) has shown that corms, cormels and corm bits are satisfactory planting material, comparable in quality to head setts and lateral suckers, provided sprouting and growth is induced prior to planting. A technique for rapid production of disease-free planting material from corm and cormel bits was developed in Grenada (Adams et al, 1985). Using this technique an output of 10,000 every 20 weeks is achieved.

The third major constraint was weed control. The high rainfall experienced in these islands encouraged the rapid growth of weeds, and weeding was a difficult and time-consuming exercise. The use of herbicides, especially pre-emergent herbicides should greatly reduce the amount of time spent on weeding.

The CARDI/EDF Aroids/Arrowroot Project is currently conducting herbicide trials on aroids.

Frequency and levels of fertilizer application were similar in all four islands. The relatively low productivity of the crop at present, (8 t. ha⁻¹), compared to a potential of 30 t. ha⁻¹, suggests the need for research to determine optimum levels of fertilizer, frequency and timing of application.

More than five different tannia cultivars were reported by farmers in each of the four islands. On the spot observations indicated a number of similarities between cultivars given different names on the same island or on different islands. This discrepancy in cultivar names indicated the need for classification of the cultivars in order to identify the different genotypes which exist in the area and their characteristics. Of special significance is the identification of any source of resistance to tannia rapid yellowing disease. The CARDI/EDF: Aroids/Arrowroot Project has carried out National Elite Varietal Trials in Dominica, Grenada, St. Lucia and St. Vincent and an extensive germplasm collection is being maintained in Trinidad. High producing cultivars in each of the four islands have been identified, and a comprehensive list of tannia descriptors has been developed, leading to the identification of 12 tannia cultivars (Adams et al, 1985).

Conclusions

The survey was successful in providing information on the 'state of the art' of tannia production in the Eastern Caribbean. Production systems were very similar in all four islands. The major areas identified for further research work were:

- Identification and management of tannia diseases
- Weed control.
- Evaluation of planting material.
- Fertilizer studies.
- Classification of tannia cultivars.

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