EXPERIMENTS ON YAMS IN GUADELOUPE

— *by* —

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Since the establishment of the Research Institute for Tropical Agriculture and Food Crops (L'Institut de Recherches Agronomiques Tropicales et des Cultures Vivrieres or I.R.A.T.) in July 1963, work has been undertaken on yams as part of a programme of short term work with restricted aims, on vegetables, root crops, corn and other food crops.

Interest of yams in the French West Indies

The interest of this programme is justified within the general policy of crop diversification. This policy has been carried out for some years in these islands, in order to reduce the effects of an agricultural production that is too dependent upon the sugar cane and banana crops.

In the French Antilles, the yam is a traditional crop of primary importance. Local markets are far from being negligible because the vegetable tuber has remained popular not only with the small farmers, who produce it for their own consumption, but with the majority of Antillais. To these local outlets, one should add certain foreign markets, particularly in Europe, which are developing due to the presence of an increasing number of Antillais as well as to the growing attraction in these countries for tropical products. The yam seems fairly well placed to satisfy the new requirements, on the one hand because of the traditional taste for this crop of many Antillais farmers, and because of the adaptation of this plant to the different ecological regions of these islands, on the other hand. It seems quite possible to develop gradually from the numerous different types of this plant, new varieties satisfactory to the demand of new consumers, and adaptable to the special problems of storage and transport.

Aims

Presently yams are nearly always manually cultivated by farmers in small areas where mechanization is not possible. Moreover, Martinique and Guadeloupe are crowded islands, and space for expanding cultivation is more and more limited. Therefore, the problem is to promote a type of cropping in lands suitable for mechanisation, keeping the methods of intensive cultivation and high yield which will allow the yam to compete with present monoculture. It is within this very practical framework that I.R.A.T. has been experimenting with yams for the last years.

Collection:

In 1964, an inventory of the main varieties which exist in Guadeloupe was made. This inventory dealt with the following *Dioscorea species*: *alata, cayenensis, rotundata, esculenta, trifida and bulbifera,* represented by about twently clones.

Seven varieties mainly belonging to the *alata* and *cayenensis* species, coming from Dahomey, were also studied in 1964.

This collection was continued in 1965 and 1966. Some new introductions were made, such as the cultivar "Barbados", from Trinidad. Two serious hurricanes in 1964 and 1966, two hurricanes in three years, unfortunately damaged these collections, and hindered to a great extent the results.

However, these collections did allow us to achieve the following:

Develop some morphologic characteristics which will make possible identification in the field,

Estimate the length of the vegetative cycles, the periods of germination, and the length of dormancy,

Compare the sensitivity of various clones to insects and diseases,

Have an early estimation of yield potential,

Better understand the main qualities and defects of the tuber in each variety.

By way of example, we present some of the results obtained from our study during the last three years:

Simplified key based on simple morphological characteristics determined in the fields.

This key seemed necessary to us, considering the absence of sufficient local data: it has just one purpose, to help the layman and all those concerned with yam culture in every day practice.

The principal criteria are easy to observe at any period of the plant's vegetative cycle:

- twisting of the stem,
- Presence or absence of thorns,
- number of leaf lobes,
- intensity of pigmentation.

The secondary criteria allow more precise differentiations between species:

- presence or absence of bulbs,
- colour of the pulp,
- shape of the tuber,
- shape of the leaves,
- number of the veins.

Germination.

Most of the observed yams germinate between March and June, in this order of precocity: *rotundata, esculenta, trifida, alata.* For an identical group, the dates of germination are quite close. However, we must point out the germination in March of an *alata* yam from Dahomey. It follows that, in spite of the possibilities of conservation of certain yams, the production of this tuber in Guadeloupe is quite irregular all the year long. An "uncycling", for example, by means of

ethylene chlorhydrin as tried in Trinidad (Campbell, et al 1962), seems to be very useful if production is to be regularized.

Yields.

It is important to distinguish from the beginning several types of yams :

Yams particularly appreciated by the consumers: In the first group, we especially study not only the constituents of the yield, but also the differences which may exist between the clones and the susceptible factors which can modify them concerning:

- the exterior appearance of the tuber (regularity of shape, appearance of cork, absence of rootlets);
- the taste qualities (texture, fibre, bitterness);
- the qualities in connection with possibilities of storing and transportation.

Yams of little or no use for human consumption: but its high productiveness, even its hardiness, may be considered to furnish perhaps a base for animal foods.

For these sorts of yams, the searched-for qualities in priority are the high yield in dry material, the ease of culture and harvest, the possibility of conservation, the absence of toxicity, and the appetizing qualities.

Here are some obtained yields at various places in Guadeloupe, in 1964 and 1965, in areas of 100 to 1000 square meters.

- Pacala *(D. alata)*..... 15 to 20 T/Ha
- White Cush Cush *(D. trifida)* ... 15 to 20 T/Ha
- Sweet Cush Cush *(D. esculenta)*...25 to 30 T/Ha
- "En bas bon" *(D. alata)*..... 30 to 40 T/Ha

(Metric ton per Hectare).

Fertilizer response

The results given below (Tables 1 and 2) show the importance of mineral manure upon *D. trifida.* These two tests have been made on recent volcanic soils in Basse-Terre (Guadeloupe).

Table 1. The response of D. trifida to mineral and organic fertilizers with staking. (Yields in metric tons per hectare).

	10 T/Ha Organic Manure	*Without Manure*	*Mean*
500 Kg/Ha 10.10.20	21.1	17.5	19.3
Without mineral fertilizer	17.3	14.5	15.9
Mean Yield	19.2	16.0	

Table 2. The response of D. trifida to mineral and organic fertilizers in the absence of stakes. (Yields in metric tons per hectare).

	15 T/Ha Organic Manure	*Without Manure*	*Mean*
700 Kg/Ha 10.10.10	21.2	20.0	20.6
Without mineral fertilizer	16.5	15.3	15.9
Mean Yield	18.8	17.6	

In both cases, we note:

- *A significant difference* between the plots which have been mineral fertilized, and those which have not.
- *An insignificant difference* between the plots which have been organically and those which have not.

For the second trial, for example, the increase in yield due to the mere mineral manuring (4,7 T/Ha) comes, at the present cost of this yam in Guadeloupe, to a financial profit greater than 8 (that is, the relation between the increase in value of the crop, and the increase in expenses resulting from using fertilizers).

It is interesting to note the similarity of the obtained results, in spite of the important difference beween the formula of mineral manure applied.

Finally, we must note that the first trial was obtained by staking the yams, and the second one obtained without staking.

Staking:

We treated this problem more particularly with *D. alata,* in Guadeloupe, with a brown soil of recent volcanic origin. In this test, we associated three ways of semi-mechanical preparation of ridges of earth. Besides, on the unstaked plots of land, sugar-cane straw was spread on the ridge after the planting.

There results, (Table 3) some of which may appear to be surprising, would merit further study.

Table 3. The effect of type of ridge and mulching on yield of D. alata. (Yield in metric tons per hectare).

Tillage / *Staking*	*Ridging only*	*Ridging on furrow*	*Ridging on furrow with cane leaves*	*Mean*
Mulching with cane leaves	22.5	20.0	22.4	21.6
No staking				
No mulching.	22.3	18.1	20.2	20.2
No staking.				
Mean Yield	22.4	19.05	21.3	

One does not observe a significant difference between the treatments. It should be interesting to prove such a result, to which one can try to explain the following, in other situations: the leaf development, much reduced in unstaked soils, is sufficient to give as high a yield in these plots as in the staked ones; it seems that, for the whole of the culture, there must exist a yield limitation (the law of minimum). In the present case, the reasons why the development of the tuber is limited may come from a soil-tillage that is too much superficial, as well as a quick soil-compact and silting which characterize such soils.

Independent of the economic advantage of the discontinuance of staking in such cases, we will see, more so, that mulching on the surface does not appear justified, sometimes, for the culture of this variety of alata.

Control of weeds:

Controlling the weeds in unstaked yam culture is very important, for the following reasons:

Length of culture period

Importance of period when plant does not properly cover the ground

Rather poor control of the weed by the yam itself, particularly certain types of alata

Important competition between yam and weeds, concerning the use of water and fertilizers.

To the above reasons can be added the higher and higher cost and shortage of the French West Indian labour.

A way to partially control the weeds consists in planting more densely, which of course modifies the average weight of the yams (often limited by commercial imperatives), and the net obtained yield once deducted the weight of the plants. Under this final aspect, the optimum density is often far from the one that would give the best weed control.

The mulching process is equally interesting for controlling weeds. However, on soils where surface tillage while cultivating seems necessary for making easier inner aeration and drainage of the soil, mulching can be harmful as it makes difficult such a soil cultivation. This may explain the following results Table 4 obtained at Basse-Terre (Guadeloupe):

Table 4. (A pre-emergent weedkiller was used for the whole of the test). The effect of mulching on yield of yams at Basse-Terre (Guadeloupe).

	Cane leaves Mulch	*Bare Soil*
YIELD (in T/Ha	14.2	19.2
	(Significant difference)	

Of that which concerns weed control by chemical weed-killers, the utilization of the following herbicides has been compared in pre-emergency:

Prometryne .....2 Kg/Ha
Diuron .....2, 4 Kg/Ha
Atrazine .....2, 4 Kg/Ha

Spread after planting, avoiding full pulverization on the tops of the ridges where the yams are planted.

Atrazine showed a slight phytotoxicity in dry and clayey areas.

The period of effective control by atrazine (total control : 6 to 7 weeks) appeared higher than for the two other weed-killers.

The use of these weedkillers reduces the frequency and the time of weedings. Atrazine took 15% less weeding time compared with the two other weedkillers.

For the same number of weedings done on treated and non treated plots, the yields obtained Table 5 on plots treated with weedkillers were higher than on the untreated plots.

Table 5. The effect of chemical weed control on yield of yams.

	Yield T/Ha
A) Prometryne	18.6
B) Diuron	18.6
C) Atrazine	16.1
D) Nothing	13.2

No significant difference between A, B and C.

Conclusion.

The yam is a plant for which interest in the Antilles is far from being neglected. Within a short period of time, the development of its culture supposes first on a profound knowledge of existing vegetable material and its adaptation to the diverse West Indian ecologies. It supposes further on the choice of varieties to promote, and the tuning of all techniques to grow this yam, in moreso important areas, with higher profits, at the lowest possible prices.

REFERENCES

Campbell, J.S., V.O. Chukweke, F.A. Teriba and H.V..S. Ho-a-Shu (1962): Some physiological investigations into the White Lisbon yam (**Dioscorea alata L.**).

The breakage of the rest period in tubers by chemical means. Empire Journ. of Exper Agric **30** (118): 108.