

**Current root and tuber crops research in
the Caribbean**

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INTRODUCTION

MAP OF THE CARIBBEAN (WEST INDIES)



**The most economically significant root crops in the
Caribbean are:**

- Yams (*Dioscorea* spp.),
- Sweet potato [*Ipomoea batatas* (L) Lam.],
- Cassava (*Manihot esculenta* Crahtz),
- Dasheen (taro) [*Colosasia esculenta* (L) Schott var. *esculenta*],
- Tannia (*Xanthosoma* spp),
- Potato (*Solanum tuberosum* L.) and
- Ginger (*Zingiber officinale* Rose).

Of these six major root crops, only yam, dasheen, sweet potato and cassava are grown to any commercial extent in the Caribbean and of these three sweet potato and cassava have the greatest potential for increased usage and consumption.

The root and tuber crops though of vital importance for food security, and are just as nutritious as imported staples such as rice, potato and wheat, are declining in production and consumption in the Caribbean.

The decline in production and consumption can be attributed to the following:

The **lack of value added products** coupled with increasing urbanization in the Caribbean seems to be forcing consumers to shift to foods which require less preparation and are more versatile than the indigenous root crops, thus the preference for rice, potatoes and wheat flour.

Agro-processing enterprises and export ventures based on **small farm** operations, are continuously faced with high handling costs and improper storage and packing facilities. These constraints often results in wastage, periodic gluts and price fluctuations (Durrant, 1987), causing these enterprises to experience great difficulties while operating in today's highly competitive markets.

Root and tuber crops have a **short storage/shelf life**.

The production systems are **labour intensive** due to the inability to mechanize the steep and undulating locations these crops are grown on, especially in the smaller Caribbean Islands.

Because of their subsistence nature, roots and tuber crops are subjected to **limited research and development activity/support** as compared to that received by the traditional export crops of bananas, citrus, coffee and sugar cane. As a result, pest and disease problems, the use of unimproved varieties and lack of adoption of improved technologies tend to plague these crops

Since all these root and tuber crops are in most instances, are **propagated vegetatively**, **systemic diseases** can be a problem.

Productivity, which in turn is a function of competitiveness, is also affected by limited attention being given to cultivating root and tuber crops in agro-ecological zones that would allow for optimization of yield

Major (specific) constraints in production and marketing of the traditional root crops in the Caribbean

Yam

- Anthracnose caused by the fungus *Colletotrichum gloeosporioides* causes leaf and stem die back, leaf drop and sometimes plant death

- Nematodes (*Pratylenchus coffeae* and *Scutellonema bradis*) reduce storability and marketability of tubers

- Virus diseases (polyvirus) on leaves reduce yield

- Unavailability of clean planting material especially of the *D. alata* types

- Consumers tend to prefer the taste of the traditional non-commercial varieties, rather than the commercial introduced varieties

Cassava

- Unavailability of high yielding, disease resistant varieties
- A wide range of pest and diseases
- Health disorders associated with residual cyanogens
- Very few resources and low levels of technology input into the production system

Dasheen

- Non adoption of improved technological packages
- Post-harvest losses due to soft rot
- Pests -dasheen beetle (*Ligyris ebenus*) and diseases (taro leaf blight) caused by *Phytophthora colocasiae* Racib
- Despite workshops on post-harvest treatments and agro-processing, acidity in dasheen chips has constrained the expansion of that industry.

Tannia

- Tannia leaf burning disease caused by *Pythium myriotylum* Drechs
- Lack of adoption of refined and newly introduced (irrigation) technologies for controlling the disease

Sweet Potato

- Insufficient knowledge of the genetic diversity in the region
- Lack of a standardized nomenclature for the accessions/varieties throughout the islands
- Absence of local sources of clean planting material
- High incidence of pests and disease
- Low crop productivity

Sweet Potato Cont,d

Unavailability of new improved varieties (high yielding and resistant to pest and diseases)

- Lack of processing technologies and information on suitable cultivars for processing
- Traditional agronomic practices inadequate for optimal production
- Lack of proper storage and post-harvest technologies
- IPM strategies need to be developed and optimized for sweet potato production systems.

Research efforts in the Caribbean to address the above constraints

Germplasm collection, conservation, and evaluation.

- * In vivo and in vitro collections. In vivo collections in all Countries, in vitro limited to the larger Caribbean Islands with more resources.
- * Crops: cassava (CIAT), sweet potato (CIP) and yams (other islands)
- * Evaluation in different agro-ecological zones and assessment of yield performance (SL,SV, SK,JA, PR).
- * Domestication of wild type *D. cordata* (GUADA)

Plant material

- * Production of certified plant material for all the root and tuber crops (All countries).
- * *Xanthosoma spp* : valuation of sprouted and un-sprouted treated plant material. Un-sprouted / treated plant material gave the highest yield (PR).
- * Ginger: validation of optimum sett size for planting in East Central Puerto Rico is 86-114g.

Crop fertility studies

“Monteith” type of growth analysis (crop cycle, leaf area development, biomass production and distribution and final yield) is used to more accurately assess the effects of fertilizer recommendations on growth and yield of yam (INRA Guadeloupe).

Weed management

- Grass and plastic mulches are evaluated as an alternative method for controlling weeds in sweet potato (CARDI JA).
- Treatments on cassava: always clean, weedy up to 35, 49, 63 and 77 days after planting, followed by weeding every 28 days until 161 days after planting. Results showed that as the period of weediness increased every 14 days, the yield decreased by 0.25/ha ($P=0.03$). The highest returns to the farmer were fields with weeds for 35 days (IDIAF, DR).

Pest and disease control

- *Yam anthracnose*
 - Introduction of new anthracnose tolerant / resistant *D. alata* cultivars (BA, DOM, GUADA)
 - Pathogen aggressiveness studies of *C. Gloeosporioides* (BA, DOM)
 - Population genetic studies of *C. gloeosporioides* (BA, DOM, SV, SL)
 - Extraction of toxins from *C. Gloeosporioides* to test for resistance in yam (DOM)

Sweet potato pests

- Weevils (*Phyllophaga* spp)
 - Chemical control using Neem-X (Azdinahtin) Actara (thiamethoxam), Pirate (chlorprifos) (SV)
 - St. Kitts introduced varieties from CIP are tested for there resistance / tolerance to *Cylas* spp and *Phyllophaga* spp.

Sweet potato pests (contd)

- IPM Programme in Jamaica
- evaluation of sex pheromones,
- cultural practices for management of sweet potato weevil,
- evaluating the efficacy of various trap types for sweet potato weevil management,
- determination of pest tolerance of various local and US varieties,
- evaluation of organic and plastic mulches for insect management and
- evaluation of biorationals to manage sweet potato pest complex

Productivity

Experiments which addressed the effects of agro-ecological zone (AEZ), seasonality and agronomic practices on corm yield and shape in the major dasheen producing AEZs of Dominica. Results showed that in Wet Area year round dasheen production is possible, whereas in the Grand Bay production of corms which meet the required market specification is restricted to the wet season.

Value added products

A study on the production of dasheen chips, using the three main edible cultivars (White, Common and Pink) in Dominica, assessed the effects of corm maturity, cultivar and agro-ecological zone on acidity. Though acidity was not completely removed, it was found that in Grand Bay, the least acrid crisps were obtained from corms of the Common and Pink dasheen harvested in 7 months and from the White dasheen in 8 months, whereas in Wet Area the three cultivars can all be harvested in 8 months.

Value added products (contd)

21 sweet potato cultivars were evaluated for market acceptance and as a source for crisp and fries production. Slice thickness, frying oil temperature and residency times were optimized for crisps and fries. Based on market demand the red skin, white flesh cultivars Black Vine and Big Red were the most acceptable. The varieties were found to be better suited to crisps production.

Cassava residual cyanogens

At the University of Puerto Rico, the problem of residual cyanogens were examined by producing transgenic cassava plants. In the process, researchers by over-expressing the hydroxynitrile lyase (HNL) gene, were able to accelerate cyanogenesis and cyanide volatilization during food processing. Importantly transgenic plants over-expressing HNL in roots, retained the herbivore deterrence (cyanogen concentration), while providing a safer food product.

Networking

PROCICARIBE, of which the Caribbean Roots and Tubers (CAROT) Network is a component, is one of the major strategies aimed at initiating sharing of information and technologies on root and tuber crop research in the Caribbean. It is designed to provide an institutional framework by which the region can design and implement strategies for the integration and coordination of agricultural research at the national and regional levels with linkages to international organizations.

THE WAY FORWARD

- Caribbean Food Crop Society
- Root Crops Associations (like those formed for the traditional export crops).
- Caribbean Hotel Schools
- Agricultural venture trust, to provide loans and technical assistance to farmers and small businesses for the production of value added products
- EDUCATION

THANKS FOR YOUR ATTENTION