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Chapter 24.
Tropical Root Crop Production in Florida

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INTRODUCTION

There are four main tropical root crops produced in Florida. In order of acreage, these are: tropical sweetpotato (a.k.a. batatas, boniato or camote), taro (a.k.a malanga isleña or malanga), tannia, (a.k.a. malanga or yautía), and cassava. The following table alphabetically lists the botanical families, scientific names and both English and Spanish common names for these crops.

BRIEF DESCRIPTIONS OF TROPICAL ROOT CROPS

Cassava - a short-lived perennial tropical shrub growing 3 to 12 ft. tall (Fig. 24-1). Adventitious roots arise from stem cuttings. They vary in shape from long and slender to globose and enlarge during the starch storage process. Stems are woody and variously branched. Simple leaves, generally dark green, have palmate lobes.

Taro - produces an enlarged edible corm. Its leaves are peltate and when viewed from the abaxial surface resemble a heart with a heavily pigmented spot at the point where the petiole is attached to its adaxial surface (Fig. 24-2).

Tannia - produces an enlarged corm that may or may not be edible. Underground club-shaped cormels are produced during later growth stages (Fig. 24-3). Leaves have long petioles and broad sagittate lamina (Fig. 24-4).

Tropical sweetpotato – resembles other sweetpotatoes grown in the United States, but the skin ranges in color from light pink to a deep wine red and the flesh is white and starchier than yellow- or orange-fleshed cultivars.

VARIETIES

Cassava – varieties are often separated based of their cyanogenic glucoside (HCN) content into either low HCN, a.k.a. “sweet,” or high HCN, a.k.a. “bitter,” types. . The term “bitter” comes from a bitter flavor that is commonly believed to accompany the HCN. No named varieties are currently known in southern Florida. ‘Senorita’ was locally popular in the 1980s and attempts were made to introduce the CIAT variety ‘Mantiqueira’ at that same time because it was able to produce acceptable yields even with high levels of rootknot nematode. The range of local genopytes covers a few unnamed clones that have been imported from various Caribbean basin countries. Federal regulations prohibit further importation of cuttings or botanical seed.

Taro – ‘Malanga Isleña,’ produces one large white-fleshed central corm; a few unnamed Polynesian types are grown for the Asian market.

Tannia – ‘South Dade White,’ producing white-fleshed cormels; ‘Malanga Amarilla,’ producing a yellow-fleshed edible corm; and ‘Vinola,’ producing purple-fleshed cormels.

Tropical sweetpotato – ‘Picadito’ is the main variety grown in Miami-Dade County. It has deeply lobed leaves and wine colored skin (Fig. 24-5).

PLANTING AND SEEDING

Cassava - In Miami-Dade County, theoretically it can be planted year round (Table 1). Normally, the planting is done in the early spring due to slow early growth and the possibility of a winter frost. Stem cuttings 4–5" long (Fig. 24-6) are selected from the lower mature sections of healthy plants (Fig. 24-7) and planted horizontally, 3-6" below the soil surface in shallow Rockdale soils. Cuttings are planted by hand in furrows spaced 48” apart with an in row spacing of 24". Since unrooted cuttings are sensitive to water loss, the field should be irrigated soon after planting.

Table 1. Planting information for cassava.

Planting dates	
Miami-Dade Florida	Year-round (mainly February to April)
Planting information	
Distance between rows (in)	48
Distance between plants (in)	24
Planting depth (in)	3 - 4
Propagules needed per acre	5,445
Days to harvest from planting	270 - 360
Plant populations (acre)	5,445

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Table 2. Planting information for tannia and taro.

Planting dates	
Miami-Dade Florida	Year-round (mainly February to April)
Other areas	(after danger of frost has passed, but early enough to avoid frost or freezing before harvest.
Planting information	
Distance between rows (in)	48
Distance between plants (in)	24
Planting depth (in)	3 - 4
Propagules needed per acre	5,445
Days to harvest from planting	270 - 360
Plant populations (acre)	5,445

Taro & Tannia - In Miami-Dade County, both crops can be planted year round Table 2. Normally, the colder winter months are avoided due to slow growth and susceptibility to frost. For tannia, the top portion of the mother corm is used for planting., For taro, the smaller unmarketable side shoots are used. Both are planted by hand in furrows spaced 48" apart with an in row spacing of 24". Planting in other parts of Florida should consider dates of last and first frosts, while allowing for a 9 – 14 month crop.

Tropical sweetpotato – In Miami-Dade County, this crop can be planted year round, though planting is sometimes delayed if extremely cold weather has been forecast. As with orange- or yellow-fleshed varieties, vine cuttings are used for planting. Planting in other parts of Florida should consider dates of last and first frosts.

FERTILIZER & LIME

Cassava – Apply all P_2O_5 , micronutrients, and 25 to 50% of N and K_2O in a band along the planted row one to two months after planting. Sidedress the remaining N and K_2O by banding them on the side of the bed four months after planting as a layby. Specific fertilizer recommendations for Rockdale soils are not available due to lack of a reliable and readily available soil analysis procedure for this soil type. In general, cassava has a medium requirement for N, P_2O_5 and K_2O. Since the soils in Miami-Dade have a high pH, liming is not needed. There are no remediation materials for the high pH condition, though chelated forms of micronutrients such as Fe, Mg, Mn and Zn can be applied to treat deficiencies.

Taro & Tannia – Apply all P_2O_5 , micronutrients, and 25 to 50% of N and K_2O in a band along the planted row one to two months after planting. Sidedress the remaining N and K_2O by banding them on the side of the bed four months after planting as a layby. Specific fertilizer recommendations Rockdale soils are not available due to lack of a reliable and readily available soil analysis procedure for this soil type. In general, taro and tannia have medium to high requirements for N, medium to low requirements for P_2O_5 and medium requirements for K_2O.

Tropical sweetpotato – see Chapter 22, Sweetpotato Production in Florida.

IRRIGATION

Cassava - has relatively low requirements for irrigation. But, during active growth stages it must be irrigated when extended dry spells occur. Water requirements and subsequent irrigation requirements are reduced during the last few weeks of growth. This usually coincides with the dry season when cassava is most likely to be affected by mites, a situation which can be helped by using overhead irrigation since it increases humidity in the field.

Taro & Tannia - grow best when the soil is maintained moist, but not wet, at all times. Proper water management is essential for optimum corm and cormel sizing. Water requirements and subsequent irrigation requirements may be reduced during the last few weeks of growth.

Tropical sweetpotato – see Chapter 22, Sweetpotato Production in Florida.

CULTURAL PRACTICES

Soil Preparation

Cassava - grows best when the soil is turned 2 to 3 months before planting. Plowing early helps rot plant debris and reduce some nematode and disease problems. Soils in Miami-Dade County (except for marl soils) should be scarified or “rock plowed” prior to planting to improve drainage and increase available soil depth. For cassava, marl soils will always produce the best-shaped and best-looking storage roots. However, these soils are prone to flooding, making them less desirable for cassava production. Plants grown on Rockdale soils must be irrigated during periods of dry weather to avoid reduced yields. Wet weather for extended periods can cause leaching of N and K, requiring the addition of more fertilizer. More frequent applications of smaller amounts of fertilizer per application are suggested for Rockdale soils. In general, fields that have not produced a crop of cassava in the last 2 to 3 years are preferred. Avoid fields that have very high nematode populations or use a resistant variety if one is legally available.

Taro & Tanier - grow best when the soil is turned 2 to 3 months before planting. Plowing early helps rot plant debris and reduce some nematode and disease problems.

Soils in Miami-Dade County (except for marl soils) should be scarified or "rock plowed" prior to planting to improve drainage and increase available soil depth. For tannia, marl soils produce the best-shaped and best-looking cormels. These soils are preferred if supplemental irrigation cannot be supplied. Plants grown on Rockdale soils must be irrigated during periods of dry weather to avoid reduced yields. Wet weather for extended periods can cause leaching of N and K, requiring the addition of more fertilizer. More frequent applications of fertilizer using smaller amounts each time are suggested for Rockdale soils. In general, fields that have not produced a crop of tannia or taro in the last 2 to 3 years are preferred. Avoid fields that have very high nematode populations.

Tropical sweetpotato - see Chapter 22, Sweetpotato Production in Florida.

Bedding

Cassava, Taro & Tannia – Plants are established in rows on flat land. During the cultivation process, ridges are formed down the rows of plants. Ridges provide a place for storage organ formation, improve drainage and facilitate harvesting.

Tropical sweetpotato – see Chapter 22, Sweetpotato Production in Florida.

Cover Crops

Taro & Tanier – Cover crops are not recommended immediately after tannia and taro production. Cultivation is needed after harvest to prevent feral plant establishment.

Tropical sweetpotato – see Chapter 22, Sweetpotato Production in Florida.

Disease Management

Cassava – There are several virus diseases of cassava. However, none have been reported to occur in the United States. Systemic diseases are also common in cassava. Planting material should pass through a phase of tissue culture and thermo therapy. Cassava bacterial blight (see

Table 3. Fungicides approved for disease management on cassava, taro and tannia.

Chemical Name	Rate/acre	Minimum Days to Harvest	Comments
Acrobat 50 WP	6.4 oz	30	Only for use on taro
Actinovate AG	12 oz	0	Biological material
Azoxystrobin (several brands)	See label	14	See label for maximum use rate and restrictions
Apron XL LS	0.64 oz/cwt.	0	Apply to seed pieces
Evito 480 SC	3.8 oz	7	See label for maximum use rate and restrictions
Kaligreen Fungicide	2.5-3.0 lbs	0	See label for maximum use rate and restrictions
Maxim 4 FS	0.16 oz/cwt.	0	Apply to seed pieces
Metalaxyl (several brands)	4 pts	0	Apply preplant or shortly after planting
Oxidate	1/100	0	
Potassium phosphite (several brands)	See label	0	
Presidio	4 oz	7	See label for maximum use rate and restrictions
Pyraclostrobin	See label		See label for maximum use rate and restrictions
Reason 500 SC	8.2 oz	14	See label for maximum use rate and restrictions
Regalia	0.5-1.0% v/v dilution	0	See label for specific use directions
Revus	8 oz	14	See label for maximum use rate and restrictions
Ridomil Gold EC	See label		apply preplant or shortly after planting
Scala SC	7 oz	7	
Serenade ASO, MAX	See label	0	
Soilgard 12G	2 – 10 lbs		See label for specific use directions
Sonata	2-4 qts	0	
Switch 62.5 WG	14 oz	7	See label for maximum use rate and restrictions
Trilogy	2 gal	0	

PP-40: edis.ifas.ufl.edu/VH053) and Cercospora leaf spot are known disease problems in the United States. When pathogens are present, yields can be reduced by 50% if healthy, pathogen-free or disease resistant cuttings are not used. This emphasizes the need to select clean, healthy planting material. Since cassava is vegetatively propagated, virus and other systemic diseases can be carried from one planting to another in the planting material. Effective disease control for cassava is based on prevention. Most of the important diseases are caused by pathogens that can be easily spread by wind, rain and workers or are capable of spreading systemically through the plant. It is usually not possible to restore the health of an affected plant once the disease can be detected. A crop rotation of at least 3 years is an important means of controlling diseases. Chemicals approved for management of cassava diseases are shown in Table 3.

Taro & Tannia – Dasheen mosaic virus (Fig. 24-8; (see PP-40: edis.ifas.ufl.edu/VH053)) and systemic diseases are common in tannia and taro. Planting material should pass through a phase of tissue culture and thermo therapy. Bacterial leaf blight (see PP-40: edis.ifas.ufl.edu/VH053)

and root rot are two other maladies affecting tannia. Taro has few known disease problems in the United States. Losses due to these diseases have not been documented, but they can be significant. Genetic resistance to dasheen mosaic virus and root rot diseases is not well documented. Effective disease control for tannia and taro are based on prevention. Most of the important diseases are caused by root pathogens or are capable of spreading systemically through the plant. It is generally not possible to restore the health of an affected plant once the disease can be detected. Since taro and tannia are vegetatively propagated, virus and other systemic diseases can be carried from one planting to another in the propagules. A crop rotation of at least 3 years is an important means of controlling diseases. Chemicals approved for management of tannia and taro diseases are listed in Table 3.

Tropical sweetpotato – see Chapter 22, Sweetpotato Production in Florida.

Insect Management

Cassava – Whitefly, spider mites, shoot fly and tomato hornworm are occasionally observed. Since there is no documentation of economic loss due to these pests, pesticides (Table 4.) are not normally used. Although mites can cause leaf drop, they are normally not present in significant numbers until the winter months when the plants nearing harvest. Keeping fallowed fields free of feral plants is recommended.

Taro & Tannia – Diaprepes root weevil is the main pest of tannia. Larval feeding causes physical damage to the cormels, causing them to be placed in a lower grade. Whitefly, thrips, and salt marsh caterpillar are occasionally observed. However, there is no documentation of economic loss due to these pests. Resistance is not known to any of these pests. Keeping fallowed fields free of feral plants is recommended. Table 4 lists chemicals labeled for taro and tannia.

Tropical sweetpotato — see Chapter 22, Sweetpotato Production in Florida.

Nematode Management

Cassava – can be damaged by root-knot nematodes. It may cause stunting and yield loss; root-knot nematodes in the storage roots may cause cracking or internal dark lesions that severely reduce the value of the product. The only step to minimize nematode injury to cassava is to include crop rotation unless nematode-tolerant varieties can be introduced legally.

Taro & Tannia – Taro is frequently damaged by root-knot nematodes. Nematodes may cause stunting and yield loss; root-knot nematodes in the corms may cause cracking or internal dark lesions that severely reduce the value of the product. Several steps to minimize nematode injury to taro include crop rotation and use of nematode-free propagules. Using a field immediately after a crop that has legally been treated for nematodes may reduce injury.

Tropical sweetpotato — see Chapter 22, Sweetpotato Production in Florida.

EPA Crop Grouping and lables

The Environmental Protection Agency establishes tolerances for pesticide residues in raw agricultural commodities. The crop grouping scheme allows tolerance to be established on a large number of commodities from research on certain specific crops in that group. The tropical root crops fall under the “Tuberous and Corm vegetable” subgroup of the “Root and Tuber Vegetable” group.

This means that if a label states that the pesticide is labeled for root and tuber crops, or for tuberous and corm vegetables, it may legally be applied to the tropical root vegetables including: arracacha, arrowroot, Chinese artichoke, Jerusalem artichoke, edible canna, cassava, chayote root, chufa, dasheen (taro), ginger, leren, sweet potato, tanier, taro, tumeric, yam bean, and true yam.
Check the labels of the pesticides to see if the crop group is listed.

Weed Management

See Table 4, Chapter 22, Sweetpotato Production in Florida.

Table 4. Selected insecticides for insect management on cassava, taro and tannia.

Chemical Name	Rate/acre	Minimum Days to Harvest	Comments	Notes
Actara	1.5 oz	14	leafhoppers	
Agri-mek 0.15 EC	8.0 – 16.0 oz	14	Colorado potato beetle, *Liriomyza* leafminer, potato psyllid, spider mites	See label for detailed use instructions
Assail 30 SG, 70 WP	see label	7	aphids, leafhoppers, flea beetles	
Avaunt	6 oz	7	various caterpillars	
Azadirachtin (many brands)	see label	0	whiteflies, hornworms	
Battalion 0.2 EC	(see label)	3	various caterpillars, pea aphid, flea beetles, leafhoppers, plant bugs	
Baythroid XL	2.8 oz	0	various caterpillars, flea beetles	
Beleaf 50 SG Insecticide	2.0 – 2.8 oz	7	aphids and plant bugs	See label for detailed use instructions. Plants back restrictions apply for unlabeled crops
Bifenthrin (various brands)	See label	See label	cucumber beetles, wireworms, flea beetles, white grubs	May be applied to soil prior to planting
Bacillus Thuringiensis (various brands)	see label	0	various caterpillars	See individual labels. Note: there are 2 strains, aizawai and kurstaki
Coragen	3.5 – 5.0 oz	14	Beet armyworm, western striped armyworm	See label for detailed instructions
Deltamethrin (various brands)	See label	3	various caterpillars, flea beetles, green peach aphid	
Fulfill	2.75 oz	14	aphids, whiteflies	
Imidacloprid (many brands)	see label	125	aphids, leafhoppers, whiteflies	soil application at planting
Imidacloprid (many brands)	see label	7	aphids, leafhoppers, whiteflies	foliar applied
Intrepid 2F	6-16 oz	14	armyworms, cutworms, loopers, webworms	
Knack Insect Growth Regulator	8 oz	3	Whiteflies	Section 24 (c) label; must be in user's possession at time of use
Lambdacyhalotrin (many brands)	See label	See label	Cutworms, leafhoppers, caterpillars, various beetles, grasshoppers, psyllids, stinkbugs, plant bugs, weevils	See label for detailed use instructions
Movento	5.0 – 5.0 oz	7	Aphids, psyllids, whiteflies	See label for detailed use instructions
Mustang (various)	See label	1	Cutworms, various caterpillars, cucumber beetle, fleabeetle, leafhoppers, weevil, aphids, tarnished plant bug	See label for detailed use instructions
Oberon 2SC	8-16 oz	7	whiteflies two spotted spider mites	
Oil, insecticidal	1-2 gal/100 gal water	1	leafminers, mites, whiteflies	
Platinum	5.0 – 8.0 oz	See label	Aphids, flea beetles, leafhoppers, whiteflies	See label for detailed use instructions
Radiant SC	See label	7	Colorado potato beetle, European corn borer, armyworms, *Liriomyza* spp. leafminers, loopers, thrips	See label for detailed use instructions
Renounce 20WP	1-3.5 oz	0	cutworms, loopers, flea beetles, leafhoppers	
Soap, insecticidal	1-2 gal/100 gal water	0	aphids	
Spinosad (various brands)	See label	7	Various caterpillars, dipteran leafminers, thrips	See label for detailed use instructions
Voliam Flexi / Xpress	See label	See label	Flexi: Aphids, beet armyworm, looper, Colorado potato beetle, European corn borer, flea beetles, potato leafhopper Xpress: above plus - cutworms, leafhoppers, various caterpillars, various true bugs, thrips, beetles	See label for detailed use instructions

Taro & Tannia – are long-season crops. Control of weeds during the extended production period can be difficult. Early season competition of weeds is extremely detrimental to crop yield, so a major emphasis on weed control should be made during this period. Growers must plan a

total program that integrates mechanical and cultural methods of weed control with the use of herbicides. Cultivation is an effective way to manage weeds early in the season. Hilling blades can uproot many annual weeds that have emerged since the last cultivation.

Tropical sweetpotato — see Chapter 22, Sweetpotato Production in Florida.

Harvesting / Packing

Cassava – Unlike most vegetable crops, cassava does not have a definite stage where it is classified as mature since plants will continue to grow as long as there are green leaves. The crop should be harvested nine to 12 months after planting when it has produced the highest percentage of edible storage roots of the desired size (Fig. 24-9). The crop should be harvested before or soon after killing frosts. Critical temperatures for root damage in the field are not known. Care should be taken to avoid skinning roots during the harvesting process (Fig. 24-10). Once harvested, the roots are very perishable. Waxing of the roots is a common practice to improve shelf life.

Taro & Tannia – Unlike most vegetable crops, taro (Fig. 24-11) and tannia (Fig. 24-12) do not have a definite stage where they are classified as mature since plants will continue to grow as long as there are green leaves. The crop should be harvested when it has produced the highest percentage of the edible portion (cormels or corms) of the desired size. Tannia and taro should be harvested before killing frosts. Critical temperatures for corm and cormel damage in the field are not known.

Tropical sweetpotato — see Chapter 22, Sweetpotato Production in Florida.

Crop Rotation

Cassava, Taro & Tannia – There are usually not as many root-knot nematodes where the preceding crop was a grass or small grain. Most vegetable crops are among the worst crops to precede cassava, from the standpoint of **Vegetable Production Handbook** building up hazardous nematode populations. Sweet corn may be the best rotation crop of the vegetables. Fields that have been planted to okra as a preceding crop should be avoided since rootknot nematode populations tend to build up in okra fields. Do not plant any of these crops in the same field in successive years.

Tropical sweetpotato — see Chapter 22, Sweetpotato Production in Florida.

Flood Tolerance

Cassava – plants may tolerate a few days of mild flooding. However, storage root quality is significantly reduced and planting material may be lost if flooding is severe.

Taro & Tannia – Taro (malanga isleña) is more flood tolerant than tannia. The variety grown in Miami-Dade does not tolerate continuous flooding. Tannia plants will tolerate a few days of flooding. However, cormel quality is significantly reduced, due to wart like growths that form on the cormels.

Other Information

Cassava – HCN: Fresh roots and leaves are toxic due to the presence of free and bound HCN. The total HCN content varies considerably with variety, environment and plant age. Levels in the peel, peeled root and leaves ranged from 5 to 77, 1 to 40 and 0.3 to 29 mg/100 g (fresh wt.), respectively. Cooking the leaves or roots and changing the cooking water are methods for reducing HCN concentrations. Roots should always be peeled prior to cooling. Toxicity from cassava may develop when considerable quantities are consumed over a period of time. This is particularly true if the prepared cassava has high HCN concentrations and the diet is poorly balanced nutritionally.

Taro & Tannia – Nematode-free planting material: Do not take nematodes or other soil borne problems to the field by planting contaminated plants. If plants must be propagated from suspect soil, use cleaned cuttings to avoid carrying potential problems into the field.