



(*Dioscorea alata* L.)



**UBI** (*Dioscorea alata* L.) or water yam is a vine which produces both aerial tubers called bulbils and underground tubers or roots. The bulbils, weighing a few grams to over a kilogram, come out of the leaf axiles three (3) months after planting. On the other hand, the underground tuber, weighing from one (1) kilogram to six (6) kilograms can be harvested six months after planting.

The ubi root has 70 percent moisture and 28 percent starch. It also contains traces of fat, crude protein, sugar, crude fiber, ash and vitamin C, B1 and B2 (Table 1).

*Table 1*

ANALYSIS OF UBI ROOTS NUTRIENTS COMPOSITION	
Moisture	70.0%
Starch	28.0%
Fat	0.1-0.3%
Crude Protein	1.1-2.8%
Sugar	0.5%
Crude Fiber	0.6-1.4%
Ash	0.7-2.1%
Vit. C (mg/100g)	5.8-8.0%
Vit. B1 (mg/100g)	0.09%
Vit. B2 (mg/100g)	0.03%

A proximate analysis on yam starch (Table 2) from white-fleshed and purple-fleshed ubi roots conducted by the Bureau of Plant Industry gave the following findings:

1. Both white-fleshed and purple-fleshed roots have an intermediate level of amylose content amounting to 21.0 percent.
2. Reducing sugar content is lower in purple-fleshed roots indicating that the purple-fleshed ubi is less prone to acid-formation inside the human stomach than white-fleshed ubi.
3. In terms of pH, the purple-fleshed is more acidic, *per se* than the white-fleshed, suggesting that the former is less susceptible to microbial growth and has a longer shelf-life.
4. From the Iodine test, both were found to have same level of amylose purity indicating that their yam starch have equal binding strength.

*Table 2*

PROXIMATE ANALYSIS OF YAM STARCH (AVERAGE COMPOSITION)		
	White fleshed	Purple fleshed
Moisture	13.30%	13.90%
Ash	0.23%	0.20%
Amylose	21.00%	21.10%
Reducing Sugar	0.24%	0.12%
Protein	0.15%	0.13%
pH	7.30%	6.90%
Iodine absorption	5.50%	5.50%

Ubi is grown primarily for its roots or tubers. The tubers can be eaten boiled, baked, roasted, flakes, chips, and processed into powder. While dehydrated yam slices for the preparation of food such as ice cream, cakes, pastries and other dessert.

The ubi skin or peeling can be used as a raw material for the manufacture of food coloring.

### 1) VU-1 (BASCO UBI)

Yield	18-20 ton/ha
Dry Matter	28.80%
Starch	21.25% (wet basis)
Protein	1.55% (wet basis)
Maturity	29 weeks
Skin Color	brown
Cortex Color	white with purlish flesh/tinge
Growth Habit	twinning
Foliage Color	green with purplish leaf veins, nodes and petiole ends

### 2) VU-2 (ZAMBALES UBI) - LA 167

Yield	16-08 ton/ha
Dry Matter	30.49%
Starch	22.61% (wet basis)
Protein	1.33% (wet basis)
Maturity	29 weeks
Skin Color	brown
Cortex Color	purple
Growth Habit	twinning
Foliage Color	green with purplish leaf veins, nodes and petiole ends
Reaction to Disease	resistant to foliar fungal disease

### 3) VU-3 (LEYTE) - LA 100

Yield	21.26 ton/ha
Dry Matter	30.10%
Starch	20.96% (wet basis)
Protein	1.52% (wet basis)
Maturity	31 weeks
Skin Color	brown with blackish tinge
Cortex Color	cream pinl
Flesh Color	white
Growth Habit	twinning
Foliage Color	green with light green veins, petiole ends

**4) KINAMPAY VARIETY** - Kinampay, known for its sweet aroma and good taste, is dubbed as the "Queen of Philippine Yams". It has smooth and round roots. Ubing Kinampay is classified into five (5) varieties, namely:

Original Kinampay	reddish purple flesh
Kabus-ok	white flesh with large roots
Tamisan	reddish white flesh and sweeter in taste
Binanag	creamy-white flesh and elongated root
Binato	big and hard root with whitish flesh color

Other local cultivars are Binalog, Ubsah, Appari, Negro, Alabat, Kameral I and Kameral II.

## SOIL AND CLIMATIC REQUIREMENT

Ubi thrives anywhere in the Philippines and in a wide range of soil types and elevation because it can tolerate adverse conditions such as droughts, and pest Infestations. However, it thrives best in sandy loam or silt loam fertile, well-drained soil and at temperature ranging from 25°C to 30°C. Ubi needs ample moisture throughout the growing season.

The crops can be grown anytime of the year. But for best results, planting should be done at the beginning or just after the rainy season when it can obtain all the moisture it needs for growth.

Photoperiodism greattly encourages crop development. A short-day length is favorable for root growth while a long-day length is ideal for vine growth. High light intensity is generally required in ubi growing.

CLIMATE	PLANTING	AREAS
Type I - Dry from November to April and wet during the rest of the year	May-June	Western Luzon, Mindoro, Negros, Palawan
Type II - No dry season with a pronounced maximum rainfall from November to January	Year-round	Catanduanes, eastern Sorsogon & Northern Camarines Sur, Camarines Norte, eastern Leyte and Eastern Mindanao
Type IV - Where rainfall is more or less evenly distributed throughout the year	May-July	Batanes, North eastern Luzon, western Camarines Norte and Camarines Sur, Albay, eastern Mindanao, Western Leyte, Northern Negros, & most of Central eastern & Southern Mindanao

## CULTURAL MANAGEMENT

### TILLAGE

- Two plowings and two harrowing are usually enough for ubi for a field that has been cultivated previously.
- Plow deeply. Ubi needs a deep loose soil.
- Harrow along and across the length of the field to pulverize the soil.

### SEEDBED

- Plant ubi on flat or ridged seedbeds. These are preferable to other types of seedbeds. If flat beds are used, plant after the last harrowing.
- If ridged beds are desired, construct ridges a one meter or 60 cm apart.
- On sloping or rolling fields, contour the ridges to minimize soil erosion.

### PREPARING SETTS

- For a hectare of land, about 20,000 to 27,778 setts are needed. There are four types of setts: head, middle, tail and whole. The first three are prepared by cutting large tubers into pieces. The fourth type refers to the whole small tuber. Setts should be obtained from healthy tubers of healthy plants.
- Slice large tubers into setts weighing from 60 g to 250 g. Do not slice tubers weighing less than 60 g.
- Be sure that each sett has enough skin area.
- Treat cut sides of setts with ash or fungicide.
- Air or sun-dry the setts until cuts are dry.
- After drying, setts may be presprouted or planted directly.

### PRESROUTING SETTS

- Sprouts emerge from setts about 3-12 weeks after planting. Presprouting the setts before they are planted is recommended to minimize weeding expenses before sprout emergence.
- For a presprouting bed, dig a shallow ditch in a shady area.
- Or, clear the ground in a shady area by removing stones, weeds and debris.
- Place setts side by side in the presprouting bed. Group setts according to type.
- Plant setts cut from large tubers either skin up or skin sideways.
- Plant whole tubers (60 to 250 g) either crown up or crown side ways.
- Cover the setts with a thin layer of soil.

- Water the presprouting bed at least once a week until most of the setts have sprouted

## **PREPARING PRESROUTED SETTS FOR PLANTING**

With presprouted setts, planting may either be staggered or done at one time.

### **1) STAGGERED PLANTING**

- The following activities must be performed in all batches of planting:
- Remove from the presprouting bed setts that have emerged to prevent sprouts from becoming too long.
- Place the sprouted setts on a platform in a shady area.
- Repeat the process every week or every two weeks until the desired number of sprouted setts for one batch of planting is obtained. Plant before the sprouts become too long to transport or before sprouts start wilting.

### **2) ONE-TIME PLANTING**

- The procedure of sett preparation is essentially the same as that for staggered planting. In one-time planting is done only after most of the viable setts have produced sprouts. At this time, sprouts of some setts are already very long.
- Cut long sprouts before transporting setts to the field for planting.

## **PLANTING**

Planting is done from March to June. However, planting time for ubi depends upon the time tuber dormancy is broken and the start of rain in the area.

### **1) NON-PRESROUTED SETTS**

- Plant setts in the seedbed at a distance of 1 m x 50 cm or 60 cm x 60 cm.
- Plant the setts 10 cm deep during the rainy season and 15 cm during dry season, especially if the field will not be mulched.
- Setts can be planted in any position.

### **2) PRESROUTED SETTS**

- Plant the setts at the start of rain if it is not possible to irrigate or mulch the field.
- Plant the setts in the seedbed at a depth of 10 cm and at a distance of 1 m x 50 cm or 60 cm x cm.
- Be sure to orient the spouts upward in planting.
- Divide the field into four to six section and if staggered planting is applied. Each section is intended for one planting batch. The size of and the time to prepare each section depend upon the rate of sett sprouting.

## **MULCHING**

- Mulch the field to reduce soil temperature, conserve soil moisture, increase organic matter content of the soil suppress weed growth.
- Use dry coconut fronds, corn stalks, rice straw and other similar materials in mulching. See to it that these materials are free from weed seeds.
- Mulch the field just after planting.
- Make the mulch thick if rice straw or any material that rot readily is used.

## WEEDING

- With non-presprouted setts and without mulching, 3-5 weeding are needed. With presprouted setts and with mulching, only two weeding at 2-month intervals are needed.
- While plants are still short and unstaked or if the stake set-up allows, use animal-drawn implements to control weeds in unmulched fields. Vines crossing the path of the animal should be lifted and placed along the rows before plowing.
- Use handtools to weed the field once plants are already staked and the stake set-up does not allow the use of animal-drawn implement or if the field is mulched.
- With non-presprouted setts and without mulching pre-emergence herbicides applied within one week after planting, may be used to control weeds.

## REPLANTING

- Replanting is recommended about two or three months after planting since some setts usually die, particularly when planted without presprouting.
- Check hills without sprouts and inspect if there are rotten
- Remove rotten setts and replace them with new ones. Setts that have not sprouted but are not rotten need not be replaced because they may still produce sprouts later.

## HILLING UP

- Hill up ridges at least once about 2-3 months after planting. Rain and hand-weeding operations often level down unmulched ridged seedbed.
- Use animal-drawn implements in hilling up if plants are still short and unstaked or if the stake set-up allows. Vines that cross the path of the animal should first be placed along the rows.
- Use handtools (e.g. shovel) in hilling up the field when stakes are already present and it is impossible to use animal-drawn implements.

## STAKING

Place a stake for each plant before vines start crawling on the ground. Stakes should be 1-2 m long. Bamboo, wood, cassava stalks, talahib stalks, or any similar materials that can support the ubi vines for at least seven months can be used as stakes. If cassava stalk is used, it should be set up in an inverted position (young end down) to prevent the stalk from producing new shoots. Any of the following methods of staking may be used:

### 1. TRELIS METHOD

This stake set-up is not very stable and requires more materials (posts and tie wire) to support the stakes. However, weeding and hilling up operations using animal drawn implements can be done this set-up.

### 2. MODIFIED TRELLIS METHOD

With this method, ground spaces under the stake arch need not be weeded when the foliage becomes dense. Also, stakes formed in this manner provide stable support. However, weeding and hilling up operations using animal-drawn implements cannot be employed under the arches.

### 3. PYRAMID METHOD

This staking methods has the advantages and disadvantages of the modified trellis method, it has an additional advantage since it requires fewer, though sturdier, materials for stake construction and requires lesser amount of labor to construct. On the other hand, it has an additional disadvantage because ubi grown under this method usually yields lower than those grown under the modified trellis method,

## TRAINING VINES

- Ubi vine twines to the right. When vines start trailing on the ground,, tram them to climb their respective stakes.
- Train the vines again when branches crossing the rows, especially when weeding and hilling up operations using animal-drawn implements about to be done.

## FERTILIZING

- A hectare of ubi can remove about 128 kg nitrogen, 17 kg phosphorus and 162 kg potassium from the soil.
- Collect soil samples from the field first before applying fertilizer. Request the assistance of the local Farm Management Technician regarding this.
- Submit the soil samples to the Bureau of Soils for analysis. Get the results.

### 1. APPLICATION OF FERTILIZER

- The recommended amount of fertilizer should be split into two, one half to be applied about 1 month after emergence (or 1 month after planting in the case of presprouted setts) and the other half about 2 months after the first application.
- Apply the fertilizer following the band method and placing the fertilizer about 10 cm away from the plants. Cover the fertilizer with soil.

### 2. APPLICATION OF COMPOST

- Ubi responds well to organic fertilizer like compost, a mixture of decayed organic matter from plant parts and animal feces.
- Mix the compost with the soil during land preparation.
- Or, place the compost just below the setts during planting.

## COVERING EXPOSED TUBERS

- As tubers elongate rapidly towards the end of the growing period of the plant, some of them tend to heave, thereby causing them to be exposed to the sun. Heavy rains also expose tubers.
- Cover exposed tubers with soil to prevent them from greening.

## HARVESTING

- Ubi is ready for harvest when its foliage is already yellowing or drying up. For most varieties, the drying up period of the foliage starts in late November and until January the following year. Tubers intended for sett production should be harvested at the later part of the drying up period. Tubers intended for consumption or for market may be harvested earlier, even before foliage drying up sets in.
- Lift the tuber.
- Remove soil particles that cling to the tuber.
- Cut the vine at the base.
- In harvesting ubi, various digging tools may be used. For sandy soil, sturdy sticks sharpened at one end can be used to dig out the tuber.
- For clayey soil and varieties with deeply buried tubers, the PRCRTC Ubi Harvester may be used.

## TRANSPORTING TUBERS

- Thin-skinned and long tubers are easily bruised and broken, thus it is important to minimize sudden jolting motions when transporting them. Tubers should be arranged in a container in such a way that rubbing of tubers against each other and against the sides of the container can be prevented.
- Prior to transporting, separate healthy tubers from diseased ones.
- Place tubers in rattan baskets or in bamboo or wooden crates lined with soft material such as paper, banana leaves or straw. Do not place healthy and diseased tubers in the same container.
- Arrange 2-4 layers of tubers in the container, the bigger the tubers the fewer the number of layers. Place soft material between layers and between tubers in a layer to serve as cushion.
- Cover the container paper or banana leaves weave a string net over the mouth of the container if the tubers are to be transported immediately to the market. If the tubers are to be transported to a nearby barn only, no cover is needed.

## REMOVING THE STAKES

- Some of the stakes in the field may still be used for the next cropping. Those that can no longer be used as stakes can be used as firewood.
- Collect the stakes from the field. Separate those that can still be used for the succeeding crop from those that can no longer be used.
- Tie the stakes into bundles.
- Place the usable stakes and supports in a shed or in any place where they can be sheltered from rain.

## STORAGE

Tubers need to be stored in a barn while they are not yet marketed nor consumed. Tubers intended for setts need to be stored until planting or replanting time.

## TREATING DAMAGED TUBERS

- Cut away diseased and injured parts of damaged tubers upon arrival in the barn.
- Apply woodash on the cut.
- Air dry the treated tubers until cuts are dry.

## STORING TUBERS

Storage structure for ubi should be shaded and adequately ventilated. Healthy tubers and treated ones should be stored in separate sections of the barn and should be arranged so that periodic inspection can be carried out readily. Any of the following methods of storage may be employed:

### 1) BARN STORAGE

Under this method, tubers are tied to vertically arranged poles held together by sturdy horizontal poles. Durable tying materials like rope are used in tying the tubers to the poles. The vertical poles are arranged about 50 cm apart.

### 2. PLATFORM STORAGE

Large tubers are placed in one layer on raised platforms constructed in the shed. Small tubers are arranged in 2-3 layers.

### 3. SHELF STORAGE

This method is a variation of the platform storage. Under this method, tubers are placed on several decks of platforms instead of just one deck.



## INSPECTING STORED TUBERS

- Inspect stored tubers periodically because some of them get damaged during storage. Periodic inspection is also needed to determine whether or not the dormancy period of the tubers has passed as indicated by emergence of sprouts.
- Check the tubers every two weeks and remove those that have been damaged by pests. Treat damaged tubers and store them together with the other treated tubers.
- When the dormancy period of the tubers is broken and sprouts start emerging, remove the sprouts every week.

## MAJOR DISEASES AND THEIR CONTROL

So far, only fungal diseases are known to do great damage to ubi in the Philippines. To minimize, if not prevent the occurrence of these diseases, use only obtained from healthy of healthy plants, in addition, always burn residues of infested plants.

### LEAF SPOT/ANTHRACNOSE

This group of diseases can cause very serious damage to plants in the field. Usually starting in July or August, they appear as angular or circular dark brown spots. In severe cases, stems are also affected, thereby causing the entire foliage to dry up prematurely.

To control these diseases spray the plants with a fungicide (e.g. Benlate and Dithane) every 2 weeks. Start spraying even before symptoms appear.

### ORANGE GALLS

Orange galls appear as thickened orange specks on the leaves. Like leaf spot and anthracnose diseases, it is usually observed during the rainy season. Control measures for this disease are similar to those for leaf spot and anthracnose.

### TUBER ROTS

These diseases may be observed in the field or during storage, but are usually more common and serious in the latter. They can be observed as dark brown or decayed black portions of the tuber. The diseased part may either be dry or moist.

To control these diseases cut away the rotten portions of diseased tubers.

Treat the cuts with wood ash or fungicide.

## SOME UBI RECIPES

### HALAYA



#### INGREDIENTS:

- 3 cups mashed ubi or powdered ubi
- 1 cup evaporated milk
- 1 tbsp margarine
- 1/2 cup wheat flour
- 2 cups sugar



**PROCEDURE:**

1. Mixed three cups of masked ubi, or powdered ubi with water.
2. Blend the smashed ubi or powdered ubi with all the ingredients.
3. Cook over low heat, add lemon constantly for 25 minutes.
4. add lemon rind, before removing from heat.
5. Place in small bottles and let cool before sealing tightly.

**PASTILLAS DE UBI****INCREMENTS;**

- 4 cups ground boiled ubi
- 3 cups sugar
- 1 big can evaporated milk

**PREPARATION:**

1. Mix the ingredients together and cook in a copper vat (tacho) over a moderate fire;
2. Stir constantly to avoid burning;
3. When the ubi thickens and doesn't stick to the vat, remove from the fire and pour on a sugared board;
4. Roll the pastillas to one-and-a-half centimeters thick and then cut into desired pieces;
5. Arrange the pieces on a cooked sheet and place in the oven at 200°F for 20 minutes.

**PUTO DE UBI****INGREDIENTS:**

- 2 cups rice
- 1 1/2 cups water
- 1 cup sugar
- 2 cups mashed ubi
- 1/4 cup rich coconut milk
- 4 tbsp. baking powder

**PROCEDURE:**

1. Washed cleaned rice and soak in water overnight.
  2. Grind the rice finely using a native stone grinder, a corn meal grinder, or a meat grinder.
  3. Boil the ubi in enough water until cooked and soft.
  4. Peel the ubi and mash finely.
  5. Add xsugar and mash the ubi with ground rice, blend well and pass through a stainer to remove lumps.
  6. Add coconut milk and baking powder. Mix thoroughly.
  7. Pour the mixture into puto olds or spoon it into individual molds, filling each two-thirds full.
  8. Set the molds in a steamer over boiling water. Cover the steamer.
  9. Puto is cooked when a toothpick comes out clen and dry when inserted in the center of the molds.
- Remove from the molds and serve with grated coconut.

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**References:** UBI Culture, VISCA, Baybay Leyte

**References:** Benguet state University, Library