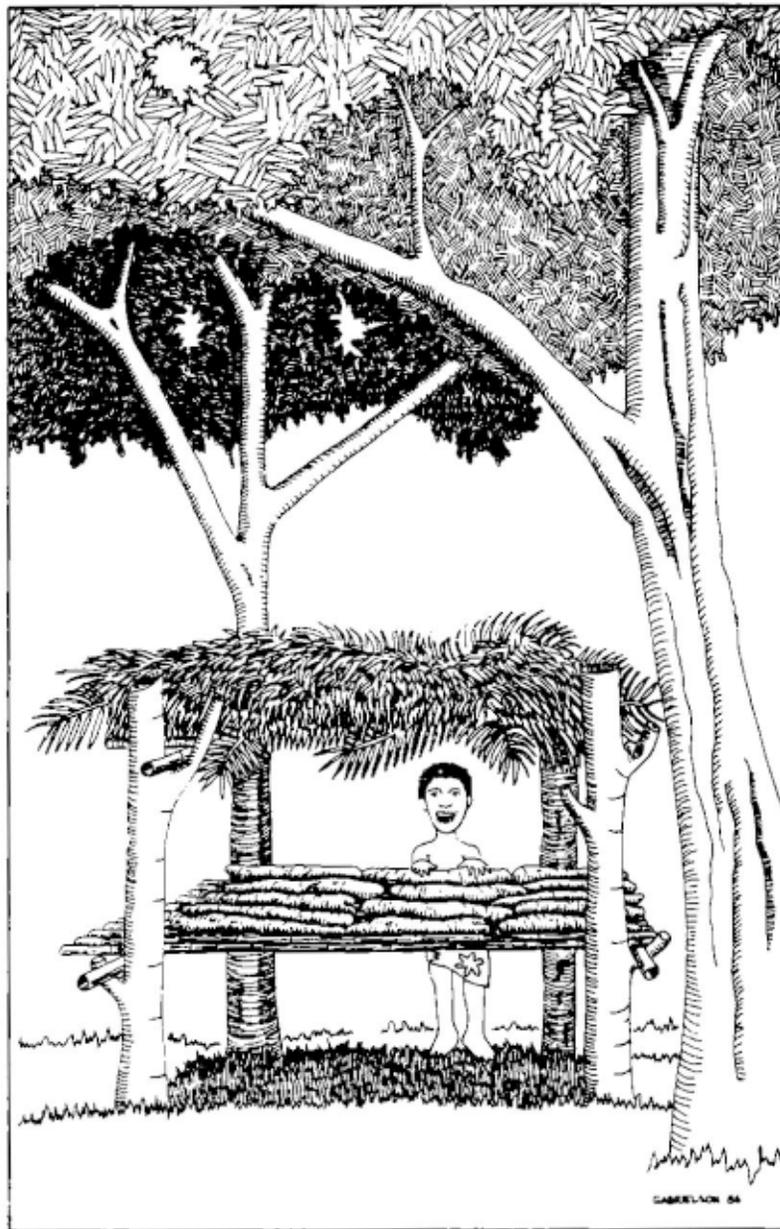




Careful Storage of Yams

Some Basic Principles to Reduce Losses



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CAREFUL STORAGE OF YAMS

Yam Storage

Yams are an important staple food crop in the Pacific, Africa and the Caribbean. In the Pacific Islands the most favoured species are the WATER YAM (*Dioscorea alata*), SWEET YAM (*D. esculenta*) and PACIFIC YAM (*D. nummularia*).

In yam “stores” traditionally used in the South Pacific, losses are often very high and much of the harvested yield is wasted. Losses are due to a variety of diseases, nematodes, insects, and to sprouting, but these losses can be reduced if proper care is taken. This booklet outlines some important principles which can improve the success of traditional, on-farm yam storage.

Yams are widely cultivated in most of the Pacific Islands but the METHODS of production and storage vary considerably from place to place. Also the TIMES for planting, harvesting and storage vary.

Occasionally, yams are left unharvested. But the most common practice is to harvest the yams and store them in a special structure.

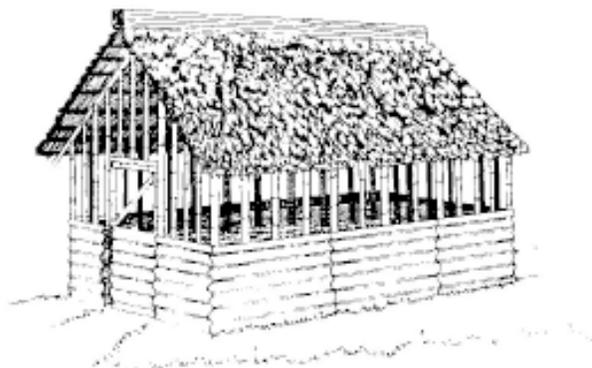
At harvest time, many yams are immediately eaten or taken to market. But most are stored to be eaten or marketed during the 5 months or longer following harvest. Some of the harvested yams will be used as planting setts for the next season and may be stored up to 6 months.

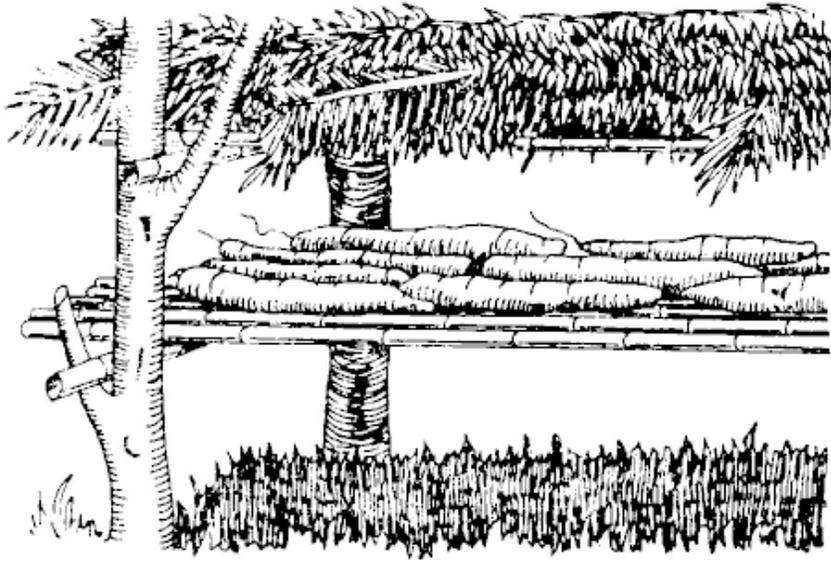
WATER YAM is the species most commonly stored. PACIFIC YAM is not stored for eating, although some planting setts may be stored for a few months.

Storage Structures

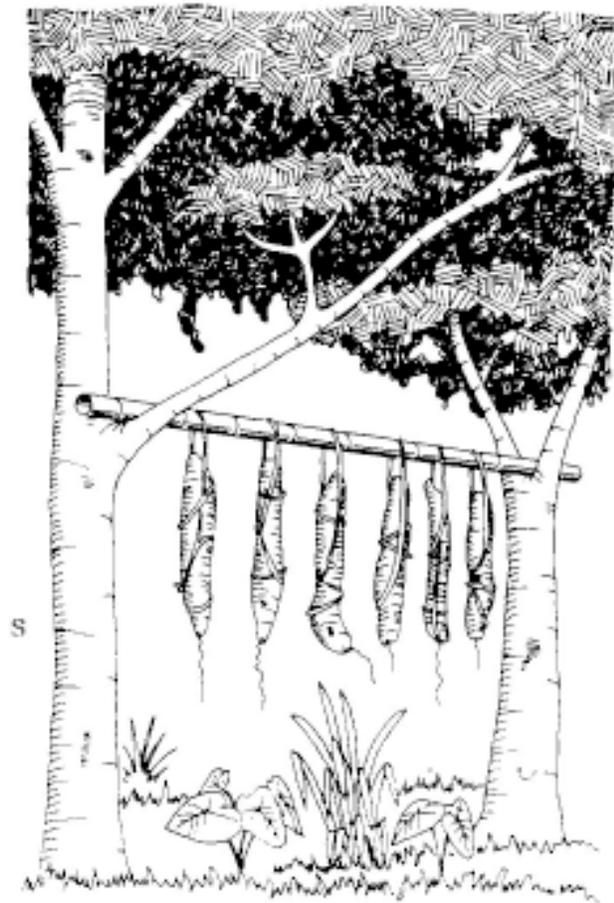
Different Types of Stores

In the Pacific Islands, yams are frequently stored in BARNs. These can be simple in design like the Tongan barn illustrated here, or they can be very elaborate like the ceremonial storage barns of Papua New Guinea.





In other countries, yams are stored on COVERED TABLES or hanging one by one from an ELEVATED HORIZONTAL POLE.



These ELEVATED HORIZONTAL POLES are made of wood or bamboo and are supported 1-2 metres above the ground.

Making the Storage Structure

Whatever the type of store used, the following principles should be considered:

When Building the Structure

- adequate shade
- protection from rain
- good ventilation
- security against animals, rats, thieves

Before the Yams are Put into The Store

- sanitation of the store
- selection of sound tubers

And During the Period of Storage

- regular inspection
- rapid disposal of spoiling tubers
- continued sanitation

These features are important when building the store:

Shade

This can be provided by either live or dead plant material or from iron sheeting.

- Live Shade is obtained by building the store under the shade of growing trees, or by planting posts of fast-growing trees around the store.
- Other Plant Material Shading can be made from palm leaves, mats and grass thatch.
- Iron Sheeting can also be used but it will keep the store too hot unless it is also shaded with live shade or palm leaves.

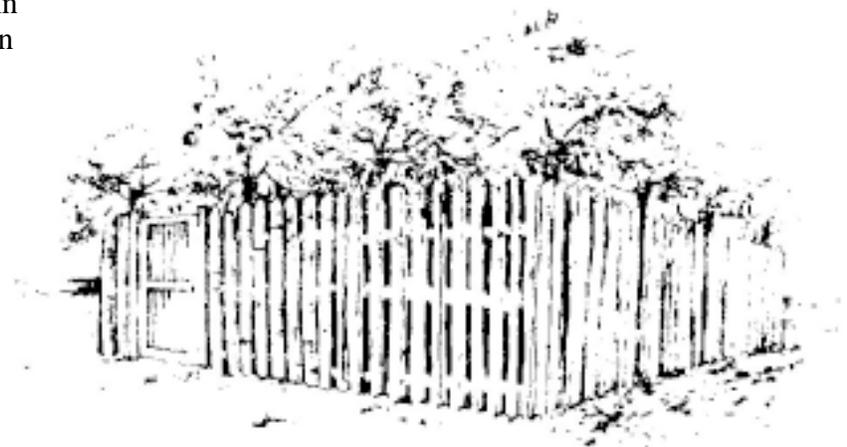
Protection from Rain

In locations having rain during the storage season, yams should be kept dry with a water-proof roof made from palm leaves, grass and thatch or shaded iron sheeting.



Ventilation

Good ventilation improves storage. The store should be in an open area, allowing air to circulate freely. The horizontal pole system provides excellent ventilation because air can circulate freely around the yams. Also it is easy to inspect the yams for insects and rotting. And rats find it difficult to hide in this store. In covered table stores and barns, yams should be stacked so that rotting and insect-infested yams can be removed easily. In barns, yams can also be laid on simple slatted shelving.



Sanitation

The store, whether it is a barn, covered table or horizontal pole, must be thoroughly cleaned before the new crop of yams is brought in.

- All old yams and debris should be removed from the store area, and burned or buried very deep (too deep to grow). If this is not done, insects and rot pathogens which are in the old yams will move into the new crop.
- Continue to keep the storage area clean and tidy throughout the entire storage season.
- If trees are used to shade the store, these trees should be trimmed 3 months before the store is used for new yams, and if possible the roof of the store removed. This permits sunlight to penetrate to the inside and

Secure Walls

These are needed when goats, rats and human thieves are likely to take the stored yams. Walls can be made stockade fashion from bamboo or wooden poles. If secure walls are needed, then so is a tight-fitting door.

clean the floor and dry it out.

Trimming also eliminates straggly growth and allows the branches to grow back into a thick shade by the time the yams are brought into the store.

- If it is available and legal, carefully sprinkle insecticide dust around the bases of all vertical supports which touch the ground to control ants. But **NEVER LET YAMS TOUCH the INSECTICIDE.** Be careful to warn people, especially children, not to touch the insecticide-treated poles or area.

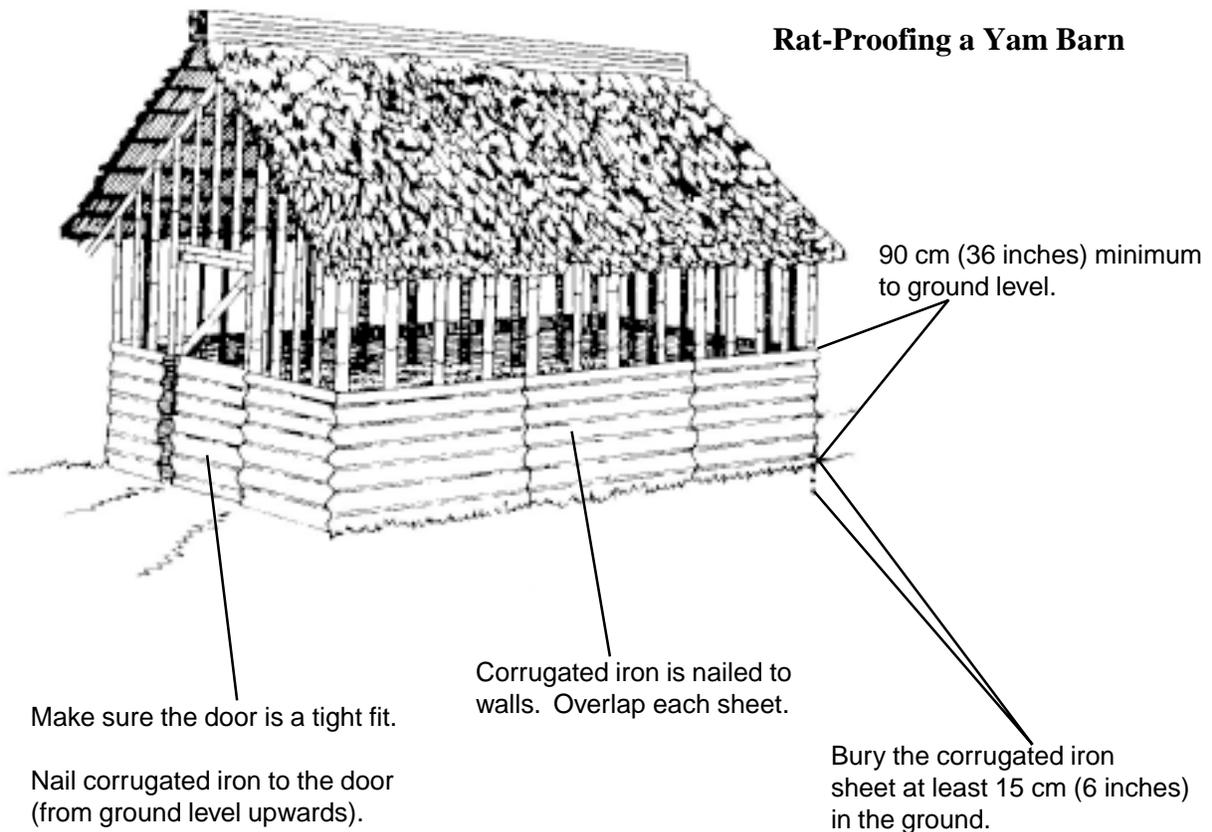
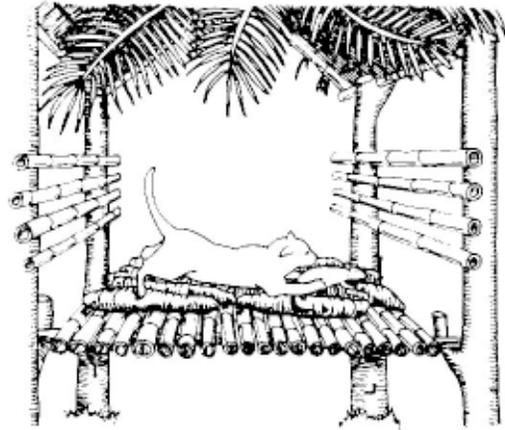
Do not store fertilizers and pesticides in the yam store.

Rat Control

Rats will readily eat stored yams if they find the store easy to enter and if they have plenty of cover where they can hide. These simple measures can be taken to greatly discourage rats from entering yam stores:

- Remove all piles of rubbish, wood, pots, tools, machinery from inside and outside the store and from underneath tables.
- Keep a cat in the yam store.
- Make rat guards to protect the store.

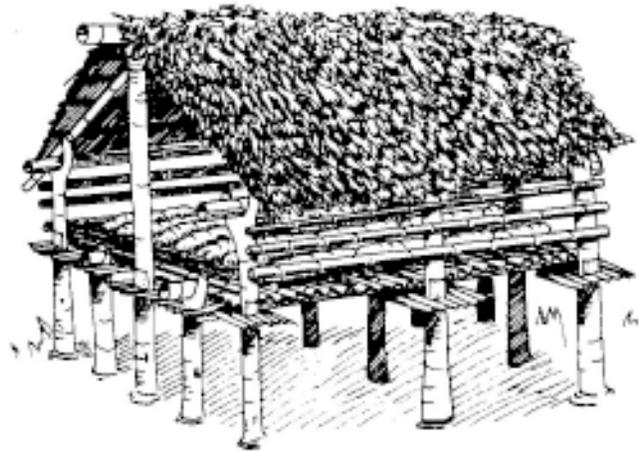
Rats cannot climb up metal sheeting. For a barn with outside walls, a continuous line of metal sheeting can be nailed up around the base of the outside wall.





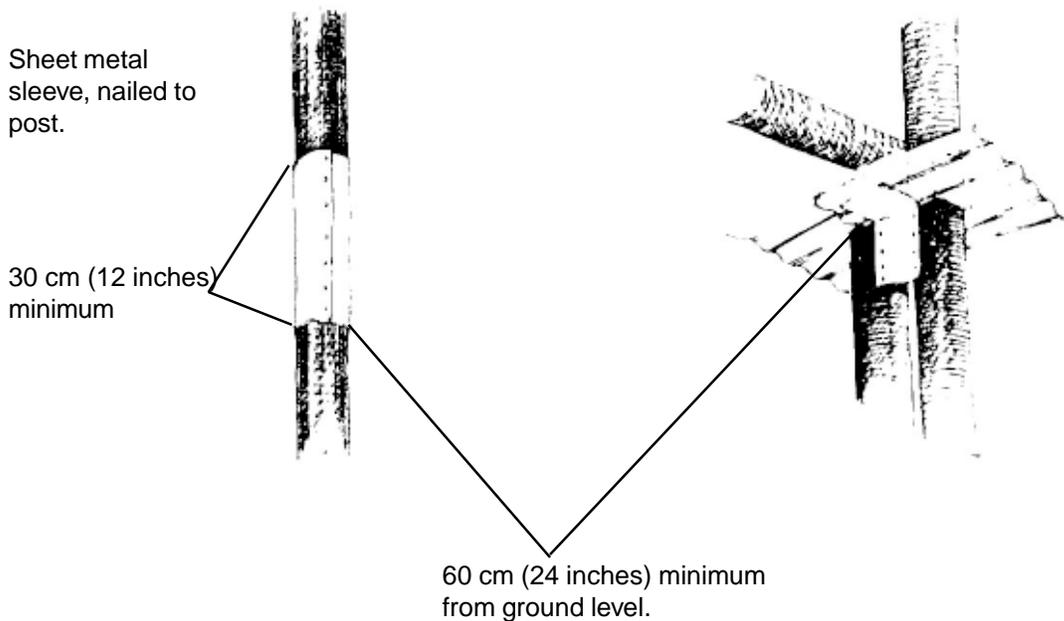
Remember that rat guards will not help if wood, tools, etc. are piled up under the table, or if tools and sticks are leaning against the table, or if tree branches hang close enough for the rats to jump down onto the store.

For a covered table or horizontal pole, or any structure with legs, tight-fitting rat guards can be attached to the legs at a height above the ground of at least 90 cm (36 inches).



Rat Guard–Sleeve Type

Rat Guard–Baffle Type



Rat poison is very DANGEROUS. Use it only if there are very many rats. At all-times keep poison away from yams and out of reach of children and household animals.

The best way to use rat poison is to put the poison inside a piece of bamboo. Find a short piece of bamboo which is hollow and is wide enough for a rat to crawl through. Lay this bamboo flat on the ground with the rat poison inside.

Different Cultivars

Some species of yams store better than others, but also within one species there are some cultivars (varieties) which store better than others. These differences are usually well known by the farmers. Of course, the cultivars which have poor storage characteristics should be eaten or taken to market soon after harvest, and NOT STORED.

Generally the better storing cultivars have:

- good resistance to nematodes
- a long period of dormancy
- a tendency to heal if cut or scraped
- compact shapes which reduce the risk of the tubers being accidentally cut during harvest.

Store Only Sound Tubers

Only sound yams (which are free of *Pratylenchus* nematodes, rots, cuts, insects, scrapes and bruises) should be stored. Injured yams should not be stored. They should be marketed or eaten immediately.

This means that good storage begins in the field. Care should be taken during harvest and when transporting yams to the store to avoid unnecessary cuts, scrapes or bruises. Such injuries increase the possibility of rot.

Physical injuries

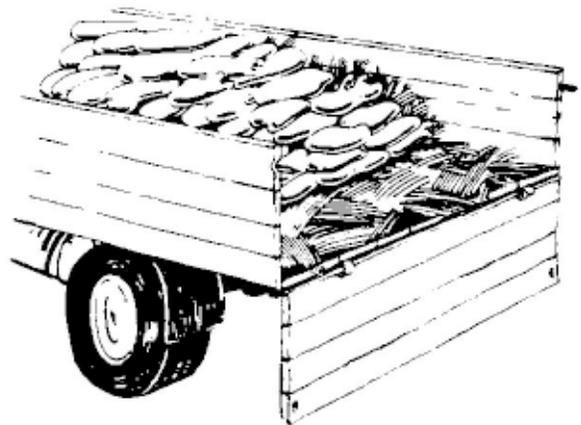
Yams which you want to store must be harvested carefully. Some cultivars have very long and uneven shapes, and when digging them out, great care should be taken not to stab the tuber or cut the skin. So instead of hacking carelessly at the soil, like the man in the picture, try to feel gently around for the yam so that it can be loosened carefully. If cut or broken yams must be stored, treat the cut surfaces by dusting with cold fire ash.



Do NOT dig yam like this.

Transport

Yams can easily be damaged during transport from the field by wagon or truck. Do not clean dirt off the yams until you have transported them to the store. The dirt protects the yams from scraping and bruising. The floor of the wagon or truck should be padded with grass or mats or sacks and the yams piled in gently. Do not pile the yams very high. Passengers and other loads should not sit on top of the yams.



Nematodes

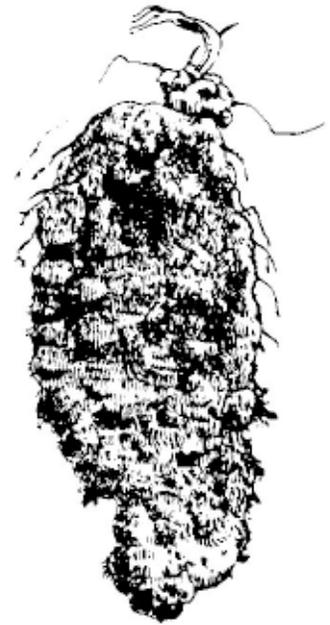
Two types of nematodes are often found in yam tubers, -- the lesion nematode (*Pratylenchus coffeae*), and the root-knot nematode (*Meloidogyne*). Only the LESION nematode (*Pratylenchus*) is a problem in storage. It is easy to recognize the difference between the two nematodes.

If a yam is sound, the flesh just under the skin is clean. But if a yam is infested with *Pratylenchus*, the skin has a cracked look and the flesh immediately under the skin is stained yellow and black/brown. This dry rot beneath the skin gradually spreads into the tuber flesh. *Pratylenchus* attack can be confirmed by scratching the skin with a fingernail or knife.

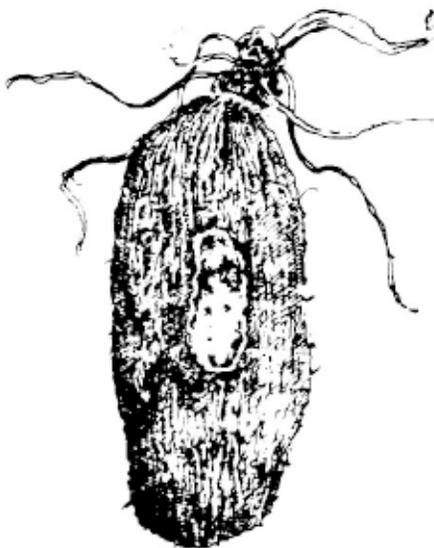
Root-knot nematode makes the yam tuber knobby and with more hairs than normal.



Good yam—The flesh should be white.



Yam attacked by root-knot nematode (*Meloidogyne*).



Yam with *Pratylenchus* nematode—the flesh is yellow with brown markings, and the skin is cracked.

Yams affected by *Pratylenchus* will deteriorate very quickly whereas those with root-knot will generally last through storage. Remove *Pratylenchus*-infested yams from the storage as soon as you see them. If the damage is slight, they can be cooked and eaten. But heavily-damaged yams must be burned or buried very deep (too deep to grow).

Insect Attack

MEALYBUG (*Planococcus dioscoreae*) and scale insect (*Aspidiella hartii*) attack stored yams.

As they feed, these insects reduce the food reserves in the tubers. This both reduces the value of the yams as food, and also makes the yams too weak to sprout vigorously when used as planting setts.

Other insect pests such as the **YAM MOTH** (*Blastobasis*) and **GINGER WEEVIL** (*Elytroteinus*), damage yams in storage. They lay eggs on stored yams and when these eggs hatch, the larvae bore into the yam and eat the flesh. As the larvae feed, they leave piles of brown droppings which can be seen on the outside of the yam. The larvae mature in the rotten yam.

Yams infested with mealybug, scale or other insects should be removed and eaten or taken to market as soon as you see them. Otherwise the insects will multiply and spread to other yams in the store.

Rot

Fungal and bacterial rots cause much loss in storage. Often the pathogens which cause these rots invade the yams through wounds and nematode damage.

REMOVE ALL ROTTING YAMS and burn them or bury deep or feed to the pigs.

Sunscald

When yams are being harvested, they should not be left in strong sunlight for a long time. This can lead to sunscald. The skin of the tuber is damaged and rot can set in.

SHADE ALL FRESHLY-HARVESTED YAMS with leaves or grass if there is a delay in moving them out of the sun into the store.

Sprouting

When the dormancy of stored yams is finished, they will sprout. As sprouts grow, they exhaust the food stored in the yam. Therefore, sprouts should be trimmed short once per week to slow down the rate at which food is exhausted.



Mealybug attack—clustered around the head



Scale insect attack—small white scabs all over the skin.

Curing

Stored yams will keep longer if they are cured before they are placed in the store. Curing helps heal wounds and toughen the skins.

Curing should be carried out IMMEDIATELY after harvesting and transporting yams to the storage area. Curing requires high temperatures and high humidity and is done under a cover which traps self-generated heat and moisture.

Temperatures under this cover should be between 32-40°C.

One day of curing is enough if the temperature is near 40°C and the relative humidity is 95%. But 2 to 4 days are needed when temperatures and relative humidity are lower.

One way to cure yams is to make a stack on the ground. The stack of yams should be put in a lightly shaded area. If the yams still have damp soil on them, it will help to keep the relative humidity high.

Cover the stacked yams with grass or mats. Then place a CANVAS tarpaulin over the whole stack. The canvas should cover the grass or mats, but be sure the canvas DOES NOT TOUCH THE YAMS. As an alternative, a simple wooden frame can be built and the canvas draped like a tent over the piled yams. Again, the canvas should NOT TOUCH THE YAMS.

Plastic sheets should not be used for curing. Plastic will make the yams too hot. If there is no canvas tarpaulin, then several layers of sacks or mats can be used.

The stack of yams should be left to cure for 1 to 4 days. NO LONGER. Check to be sure temperatures do not get higher than 40°C.

Cut-away view of yam curing in a stack on the ground.

Canvas tarpaulin or jute bags.
NOT PLASTIC.



At least 15 cm (6 inches) depth of cut grass or mats is placed on top of the yams.

Here in the Pacific, there is also another way to cure yams. A truck with a canvas tarpaulin cover makes a good curing shed. Put the baskets of yams inside the truck and roll down the tarpaulin on all sides and park the truck in light shade for 1 to 4 days.

Great care is needed when handling the tubers after they have been cured so that new injuries are not made.

Note that curing may make the yams taste a little sweeter. If this sweeter taste is not liked by the people in your location, then curing cannot be recommended.

