POST HARVEST HANDLING– 1.

HARVESTING PERISHABLE PRODUCE

By Sr. Mary Drum,* Food Technologist, Post Harvest Laboratory, D.P.I., Laloki and Garth Atkinson, Post Harvest Horticulturist, D.P.I., Konedobu

INTRODUCTION

The Post Harvest Laboratory at D.P.I., Laloki is concerned with how crops in Papua New Guinea are handled and stored once they have been harvested. It is considered that too much fresh produce is lost because of poor treatment after harvest - i.e. poor post harvest handling.

Reducing the amount of produce spoiled or lost is not always easy as fresh fruit and vegetables start to deteriorate (spoil) as soon as they are harvested. Also, different kinds of produce need to be treated in different ways to make them stay fresh for longer. Some of the things that can cause losses are: harvesting at the wrong time; poor packaging; unsuitable storage conditions and careless handling during transport.

In this article the reasons why fresh fruit and vegetables are perishable (do not stay fresh for long) are discussed. Then some suggestions are given to help farmers keep their produce in good condition immediately after harvest.

The problems of packaging and transport are discussed in the next article.

WHY ARE FRUIT AND VEGETABLES 'PERISHABLE'?

'Fruit' and 'vegetables'

'Fruits' are the part of the plant that contains the seed. The fruits we eat are either naturally sweet, or we sweeten them before eating.

'Vegetables' come from various parts of the plant, and are usually not sweet. Some examples of vegetables from different parts of the plant are: sweet potato (the root);

Vegetables come from various parts of the plant. Cabbages (top) are the leaves; tomatoes (bottom) contain the seeds. Tomatoes are really fruit, but we call them vegetables because of the way they are used.

---

* *Present address: P.O. Box 97, Kokopo, E.N.B.P.*

celery (stems); broccoli, lowlands pitpit (flowers); pumpkin tips, asparagus (growing tips); aibika, Chinese cabbage (leaves); tomatoes, beans, pumpkin, cucumber (parts containing seeds). These last vegetables are really fruits, but because of the way they are used, we call them vegetables.

All fruits and vegetables contain a large amount of water. Even starchy tubers like cassava, sweet potato, tarò and yam contain 50%-80%, while melons, lemons and leafy greens contain 90% to 95% moisture.

After harvest

While they are attached to the plant, all fruits and vegetables breathe, use up water and nutrients (plant food) from the soil, and lose water.

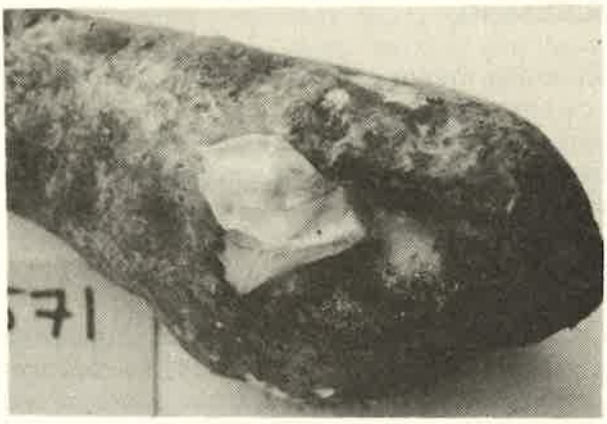
When they are removed from the plant, fruits and vegetables stay alive. They still need air to breathe, and they continue to lose water. The length of time they stay alive depends on how long enough water and nutrients remain in the fruit or vegetable. They only live a limited time before they die and start to decay. Because of this, we say that fruits and vegetables are 'perishable' produce.

The skins of fruits and vegetables are usually stronger than the flesh inside. They help to prevent water loss, and protect against disease. Produce with thick strong skins, like citrus, lasts longer than produce with thin skins and a large surface area such as aibika. Leafy greens will wilt and die soon after harvest unless the farmer does something to stop the process.

THE EFFECTS OF DAMAGE

If a fruit or vegetable is damaged during or after harvest, and the skin is broken, the produce is affected in several ways:

- Moisture and nutrients are lost through the wound, thus shortening the life of the fruit or vegetable
- Micro-organisms can enter the produce and cause disease and decay



Damage at the time of harvesting makes it easier for micro-organisms to enter and cause disease and decay. Sweet potato tubers are often damaged by digging forks or spades. Rots can easily start from these wounds.

- The broken skin spoils the appearance of the produce, especially if sap oozes out and causes staining
- Breaking the skin can cause plant tissue to discolour, soften and alter in taste. Bruising without breaking the skin can have the same effect.

Broken skin spoils the appearance of produce, and the spoiled food is no longer suitable to sell or to eat.

RIPENING

Ripening means the changes taking place in fruit which make it best to eat. The term 'fruit' here includes some 'vegetables' which are the part of the plant containing the seeds, e.g. tomatoes, eggplant, cucumber. The changes that take place when fruit ripens are:

- Fruits often change colour, e.g. pawpaws change from green to orange-yellow, and tomatoes from green to red
- The flesh softens.
- Fruits becomes easier to pick off the plant
- Fruits develop their special flavour and smell, and often become sweeter

Once these changes start, the life of the fruit is shortened and the tissues in it begin to break down.

Sometimes the ripening process can be started more quickly by bringing certain fruits into contact with a gas called ethylene.

Some fruits, such as bananas, pawpaws, passionfruit, mangoes, avocados, melons and tomatoes, produce ethylene themselves as they ripen. Therefore storing ripening fruit with other unripe fruit will cause all of it to ripen.

All these bananas are from the same bunch. Those on the left were treated with ethylene, while those on the right were not. Both lots were stored for 4 days at about 23°C, in separate rooms. The bananas treated with ethylene ripened, while the others stayed green.

If you intend to transport these fruits long distances before selling them, then it is a good idea to pick them before they are fully ripe. The unripe fruit is less easily damaged because the flesh is still firm. The fruit will gradually ripen as more ethylene gas is produced.

Other fruits, such as citrus, pineapples, strawberries and cucumbers do not produce large amounts of ethylene, and are not affected greatly by the gas, although some changes do occur when in contact with the gas, e.g. change in skin colour.

Vegetables do not ripen like fruit does. They may be ready to eat before they are really mature, e.g. green vegetables are best picked and eaten when they are young and crisp. Other vegetables will have a very short storage life if harvested too young, e.g. English potatoes.

It is not a good idea to store vegetables with ripening fruit, as the ethylene from the fruit will cause the vegetables to discolour and to lose their crispness.

TREATMENT AND STORAGE OF PRODUCE AFTER HARVEST

A very important thing to remember after harvesting is that produce keeps much better if it is kept cool. If produce is picked and packed when it is hot, it will tend to become even hotter, because high

Heat causes produce to spoil and disease to spread more quickly.

temperatures cause a higher rate of respiration (breathing), which in turn causes the produce to give off more heat. The heat causes produce to lose water, to die and to spoil more easily. Also diseases spread more quickly.

At the same time, you should also remember that very low temperatures can be just as damaging as very high temperatures. All fresh fruits and vegetables are damaged by freezing.

Tropical fruits such as bananas, pineapples, paw paw and mangoes will suffer chilling injury if they are stored below 10-12°C. Kaukau, cucumbers, capsicums and unripe tomatoes are examples of vegetables that are sensitive to chilling. In these fruits and vegetables, chilling leads to darkening of the skin or flesh, pitting of the skin in cucumbers and capsicums, and loss of flavour or a change in flavour.

Many vegetables, like corn, cabbage, lettuce, carrots, and leafy greens, do store better the lower the temperature, as long as they are not frozen.

Farmers usually do not have access to expensive refrigeration equipment, but there are some things that farmers can do to keep their produce cool, and make it last longer:

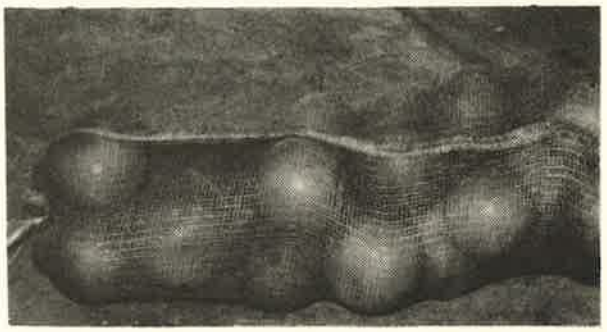
1. Harvest as early in the day as possible, straight after first light, when it is coolest.

2. After harvesting, place the produce in a shaded area. If there is a light breeze as well this is even better.

3. If possible, sprinkle leafy greens with water to stop them wilting and keep them cool.

4. As water evaporates from a surface, it has a cooling effect, e.g. old copra sacks dipped in water and hung in a breeze around the produce will help to keep the area cool.

5. Do not pack produce into containers that will not allow it to breathe. Do not use plastic bags, or very big containers. Use hessian sacks, string bags or small boxes, depending on the type of produce. (See the next article in this series for more information.)



Citrus packed in a string bag, allowing it to breathe.

6. Try to get harvested produce to market as soon as possible.

In general high temperatures have a bad effect on fresh produce. However, staples like sweet potato, cassava and yam have an improved storage life if they are held at about 30°C, 90% humidity for 3 - 5 days after harvesting. This is called 'curing'. Curing is a healing process where the outer

These two hands of bananas are from the same bunch. The bananas on the right were frozen. The skin turned completely black, and the flesh inside became brown and mushy.

skin toughens up and corky tissue forms over wounded areas which reduces water loss and stops rotting during further storage. After curing it is important to try to keep the staples as cool as possible, but not in a cool store unless the temperature is 13°C or higher.

CONCLUSIONS

From the above discussion we can pick out a few rules that will help farmers maintain the quality of their produce after they have harvested it.

1. Take care when harvesting your fruit and vegetables. Try not to break the skins or cause bruising. One damaged fruit which becomes infected with a disease can ruin a whole boxful.

2. Do not store vegetables and ripening fruit in the same place. The vegetables will loose their crispness.

3. Harvest fruit while it is not quite ripe, especially if it is going to be transported long distances.

4. Harvest produce in the morning when it is cool, and keep the produce as cool as possible afterwards.

5. Do not freeze fresh produce. Certain fruits and vegetables are damaged if they are chilled below 10 - 12°C.