GROWING PYRETHRUM IN THE HIGHLANDS

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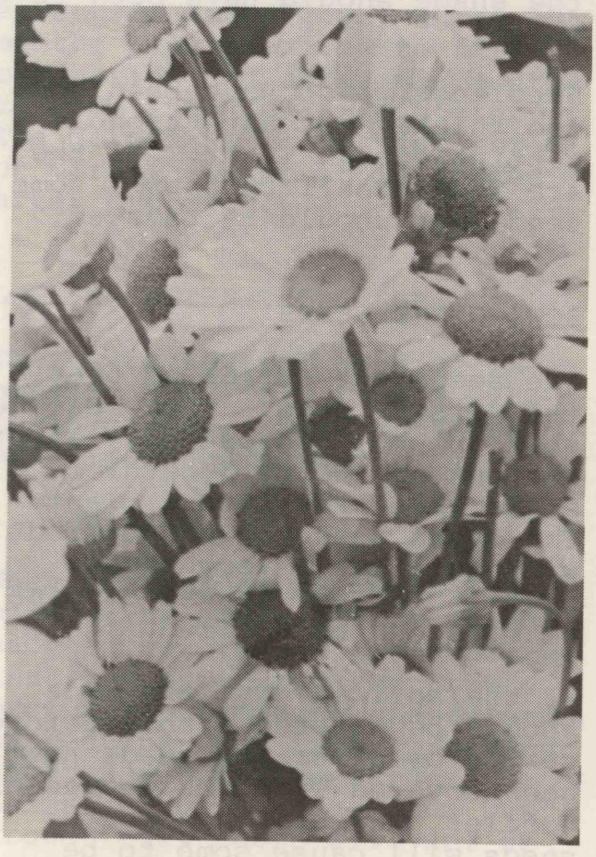
INTRODUCTION

Pyrethrum *(Chrysanthemum cinerariaefolium)* is a small plant with white flowers. These flowers contain chemicals called pyrethrins which are used to make an insecticide (insect poison). Pyrethrum was introduced in 1961 as a cash crop to those parts of the P.N.G. Highlands which are too cold for coffee growing. It grows well at heights greater than 1 800 m above sea level.



Pyrethrum flowers

PLANTING MATERIAL

Pyrethrum can be grown either from seed or from planting pieces called splits.

Splits are small pieces broken off old pyrethrum plants. They must have some roots attached to them. Splits can be planted straight into the garden.

Seeds must be grown in a nursery and then be transplanted (moved) into the garden.

THE NURSERY

The purpose of the nursery is to raise good, strong seedlings. This means that all the factors which affect the growth of the seedlings have to be carefully controlled in the nursery. These factors are discussed below:-

1. Soil nutrient level

Plants need a good supply of nutrients if they are to grow properly. Because the nursery area is relatively small, it is not too expensive or difficult to fertilise the soil. This can be done using either organic matter or commercial fertiliser.

If organic matter is used, a layer of animal manure 2.5 to 5 cm thick or a layer of compost 5 to 8 cm thick should be spread on the soil and dug in at least a month before planting. If

commercial fertiliser is used, 1 500 kg/ha of complete NPK fertiliser should be applied. This should be spread on the surface of the soil and mixed in to a depth of about 5 cm.

2. Pests and diseases

Two types of pest attack pyrethrum in Papua New Guinea:- root-knot nematodes (*Meloidogyne hapla*) and thrips. The insecticide in the plants does not harm these pests since almost all of it is in the flowers and these are not attacked.

The only important disease of pyrethrum is bud droop. This causes young buds to droop and wither. It is caused by an organism called *Ramularia bullunensis*.

Diseases and pests are always more harmful when plants are weak due to poor growing conditions. It is therefore important to follow sound agricultural practices such as crop rotation which prevents a build-up of pests and diseases in the soil. Pyrethrum beds should also be kept free of a weed called devil's pitch fork or *Bidens pilosa*. Root-knot nematodes can live in the roots of this plant and may then spread onto the crop.

3. Moisture

Pyrethrum seeds are sown on the soil surface and are not covered over with soil. Because of this, special care must be taken to make sure that the soil surface remains moist. One way of doing this is to put a light covering of yar leaves or pine needles over the seeds. Grass cuttings must not be used to cover the seeds because they would provide food and shelter for insect pests.

The beds should be watered every day in dry weather.

To prevent the young seedlings from being damaged by large rain drops, light shading is necessary about 1.2 m above the bed. From this height, the water coming through the shade cover will land gently on the soil but it will still be possible to work under the shade.

Good drainage is necessary to let plenty of air into the soil so that the seedling roots can develop properly. The nursery bed should not be more than 2 m wide, or drainage may be poor.

4. Light

To allow enough light to get to the seedlings, the shade cover mentioned above is gradually reduced, starting when the seedlings are 6 weeks old. By the time the seedlings are ready for transplanting, all the shade should have been removed.

Seedlings which have been sown too thickly may have trouble getting enough light. If they are less than 1 cm apart, some seedlings should be removed.

SOWING THE SEEDS

The seeds are sprinkled over the nursery beds. They must be sown thickly because only about one out of twenty pyrethrum seeds will grow into a plant. The seeds must not be covered with soil but a very light covering of yar leaves or pine needles can be applied.

If the soil is dry, the beds should be watered either before sowing or after the seeds have been covered with the leaves or needles. Watering uncovered seeds will cause some to be buried under soil particles. Buried seeds will not produce seedlings.

PLANTING AND TRANSPLANTING

Before planting splits or transplanting seedlings, the leaves should be cut off them and the roots pruned. Removing the leaves stops the plants from drying out too quickly while cutting the roots makes it easier to plant the splits or seedlings properly.

Pyrethrum is planted at the start of the wet season in 1.5 m wide beds with 50 cm wide drains between them. The drains are 25 cm deep. The splits or seedlings are planted in rows 40 cm apart with 50 cm between the plants in the row. This gives a plant density of 50 000 plants per hectare.

The soil is pressed down well around the plants and, where possible, they are watered.

Pyrethrum takes about three months from planting to first production and about six months to come into full production. The garden will last for three or more years if it is looked after properly.

LOOKING AFTER THE GARDEN

There are several ways of improving the yield from a pyrethrum garden. Some of these are discussed below:

1. Weeding

When the garden is new and the plants are small, it is necessary to remove all the weeds so that the pyrethrum can grow properly. Removing these weeds also stops them from spreading their seeds on the garden. Later, when the pyrethrum has grown tall, there will not be many weeds except for in the furrows. These need not be removed as long as their tops are chopped off with a bush knife to prevent them from seeding.

Planting a pyrethrum split

2. Pruning

In Papua New Guinea, there is no improvement in production from pruning and so it is not recommended. If old flower stalks get in the way at harvest, they can be removed by slashing between the rows with a stick or knife. This will not be necessary in every garden and should not take place more than once a year.

3. Mulching

This has not been found very useful on pyrethrum and can have a bad effect by making it hard for air to get into the soil. Providing the garden is planted early in the wet season, the leaves will give a thick enough cover to protect the roots in the dry.

If there are serious erosion problems however, then lightly covering the soil of the beds with mulch at planting and using a heavier cover on the furrows will help to reduce soil loss.

HARVESTING

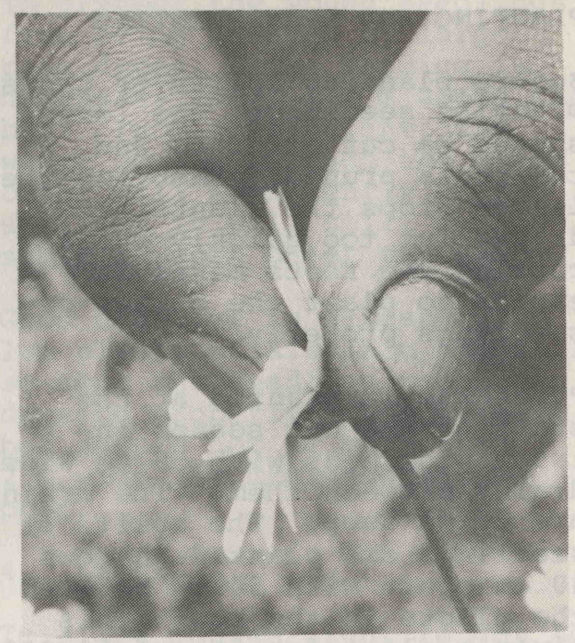
Only the flower heads are harvested, the rest of the plant, including the flower stalks, is left in the garden to produce more flowers.

Pyrethrum flowers are made up of large white petals and small yellow disc florets. The disc florets are arranged in circular rows in the middle of the flower.

Closed flowers are called buds. They open by unfolding the white petals to show the closed disc florets inside. Then the disc florets start to open beginning with the outer rows and moving inwards. The best time to pick the flowers is when 3-4 rows of disc florets have opened.

This flower is at the right stage for picking. Three rows of disc florets have opened.

If the flowers are picked every two weeks, then most of them will be at the right stage each harvest. All the open flowers should be picked but the buds should be left until next time.



Only the flower heads are harvested

DRYING AND STORAGE

At harvest, the flowers contain about 80% moisture. In this condition, they will start to ferment (rot) soon after they are picked. This will happen even faster if they are put into bags. Fermentation causes the temperature of the flowers to rise and the pyrethrins inside the flowers will be destroyed.

This means that it is very important to start drying the flowers as soon after harvest as possible. This can be done easily by spreading them out on sacks in the sun. The flowers must be turned several times during the first few days to make sure that they dry properly.

The flowers are dry enough when they break easily between the fingers. This may take 7-10 days in the dry season and more than 15 days in the wet season. The flowers must be covered up at night and when it rains.

When the weather is very wet, it is possible to dry the

flowers on trays near the fire. Care must be taken to make sure that they do not get burnt and that the moisture level is reduced quickly at first so that they do not start to ferment.

Turning pyrethrum flowers which are drying in the sun.

Another method of drying the flowers is to build a dryer using plastic sheeting. One way of making this sort of dryer is described in HARVEST 5(2): 104-108.

When the flowers are properly dry, they will keep quite well in bags or bales for a couple of months provided they are stored off the ground and out of the rain. However, because of the high humidity in many parts of Papua New Guinea, the flowers should be stored for as short a time as possible. If they must be stored for a long time, then the bags should be opened every month and the flowers redried in the sun for a day.

The dried flowers are taken to a factory at Kagamuga near Mount Hagen where the insecticide is made.

REPLANTING

Two to three years after the garden was made, the number of flowers, produced will start to fall. This is the time to plant a new garden.

It is best to plant the new garden in ground that has not had pyrethrum on it before. An old sweet potato garden would be very good. Splits from plants from the old garden can be used for the new garden.

The splits should only be taken from good plants which have had plenty of flowers on them. These plants will have a lot of old flower stems. Small plants, or plants which look as if they might have a disease, and big plants which have not had many flowers should not be used.

The selected plants are dug up and the tops and some of the roots are cut off. The plants are then broken into splits each of which must have some root on it. The splits are then planted in the new garden.

A good plant to take splits from

RESEARCH

Research on pyrethrum started at the Highlands Agricultural Experiment Station, Aiyura in 1955. At that time, pyrethrum was new to Papua New Guinea. The aims of the programme were to find out whether the crop gave satisfactory yields here and to select high yielding planting material. The early work showed that Aiyura, at 1 550 m above sea level, was too low for pyrethrum to grow very well. So in 1966 the work was transferred to a new station at Tambul, at the foot of Mt. Giluwe in the Western Highlands. The altitude at Tambul is 2 240 m above sea level. Unfortunately, research at the Tambul station was slowed down because the land was found to have a serious fertility problem.

Research with pyrethrum aims to help farmers get as much money as possible from the work they put into their gardens. This means getting high yields. Yield has two parts, the weight of flowers that a garden produces and the amount of pyrethrins in the flowers. The farmer can only see the first one of these but, if research can produce flowers containing more pyrethrins, the factory will pay a high price for the flowers the farmer sells.

Two types of research are carried out at Tambul. The first one is mainly concerned with flower yields. It deals with the best ways of planting and looking after the crop so that the plants are strong and healthy and produce high yields of flowers. Trials have been done on such things as different types of planting beds, different spacings of plants, use of fertilizers and mulch, pruning in different ways, comparison of splits and seedlings, and frequency of harvesting. The recommendations in this paper are based on the results of these trials as well as on observations in village plantings. Up to the present, this work has concentrated on finding what planting methods get the best yield from pyrethrum plants. Now that we have a good understanding of these, we are starting trials to see how these methods can be adopted into traditional gardening systems using mounds composting and the intercropping of pyrethrum with food crops.

The second type of research involves selecting and testing different kinds of planting material and it is concerned both with yields of flowers and with their pyrethrin content. This is long term work which has been going on since 1955. The planting material being distributed from Tambul now is certainly better than the material distributed in 1961 and the quality is regularly upgraded. If results of some of our present trials are confirmed, we should soon be able to supply splits of much better material than people are growing now.