TRIALS ON GRAFTING WATERMELON AT LALOKI

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INTRODUCTION

Grafting is joining together parts of two different plants. The upper part of the graft which grows into the stems and leaves of the new plant is called the scion. The lower part which forms the root system of the grafted plant is called the rootstock or stock.

Grafting is practiced for two main reasons.

1. To propagate plants identical to the parent plant. For example, citrus trees cross pollinate. If an orange tree is grown from seed it will produce a tree with fruit different to the parent tree. If a new tree is produced by grafting wood from the parent tree onto a rootstock, the new tree will be like the parent.

2. The other reason for grafting is to join plants each selected for a special purpose. For example some plants are good rootstocks because they have resistance to a disease. (Resistant means they do not get that disease, even if it is present in the soil or the air.)

Most people know that woody perennial plants like fruit trees are often grafted. Not everyone knows that herbaceous (soft stemmed) annual plants like vegetables can also be grafted.

In Papua New Guinea grafting tomato on to eggplant rootstock has been used as a way of preventing tomatoes becoming infected with the disease bacterial wilt.

In Japan, South Korea and Taiwan, calabash has been used as a rootstock for watermelon for many years, because it is resistant to the disease fusarium wilt. Calabash is not native to Papua New Guinea but it has been grown here as a crop for a long time. Its botanical name is *Lagenaria siceraria*. It belongs to the cucurbit family. This family includes watermelon and pumpkin. Calabash is a scrambling plant like watermelon. It is also known as bottle gourd, New Guinea butter bean or white flowered gourd. In Papua New Guinea calabash grows from sea level to 2700 m. The young fruit are boiled as a vegetable. The old fruit have a hard skin and they are used as containers. The young tips and leaves are also eaten.

Mr. Yung Liang, who was the Vegetable Farm Manager at Ilimo Farms was the first to try grafting watermelon onto calabash rootstock in Papua New Guinea. Encouraged by Mr. Liang we decided to conduct some trials at Laloki. These were to find out how difficult the grafting technique was, and to see what advantages there were in grafting watermelon on to calabash rootstock under our conditions.

Many visitors to Laloki, and participants in the Laloki in-service training courses, saw the trials and practiced the grafting. This article discusses all the results of the watermelon grafting trials. It will be of particular interest to those people who saw these trials or who have tried grafting.

METHOD

Three trials were carried out at D.P.I. Laloki between 1980 and 1982. In each trial some watermelon plants were grafted on to calabash rootstocks. The other watermelon plants were not grafted. In the first trial a green fleshed rockmelon and two watermelon varieties were used. The other two trials each had one watermelon variety only.

The seedlings were grown and grafted in the nursery using the following method:

1. The calabash seed was sown singly in small pots.

2. A week later the watermelon seed was sown into trays.

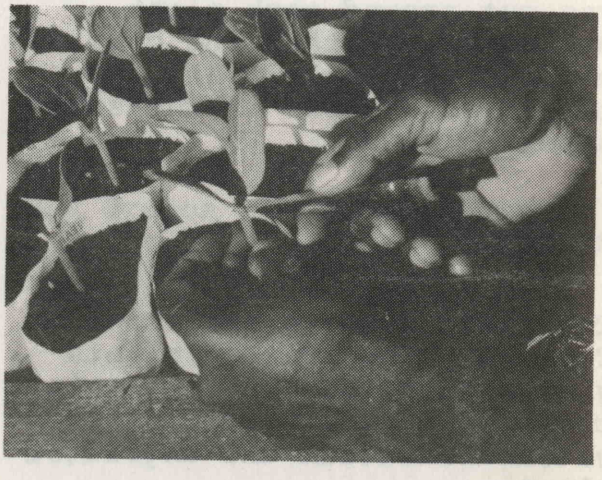
3. Grafting commenced about a week later, after the cotyledons (first leaves) of the watermelon had just opened.

First the calabash seedlings were thoroughly watered. Then the growing point on the calabash was removed just above the cotyledons. Using a piece of sharpened bamboo a hole was made right through the stem of the calabash, just below the cotyledons.

The watermelon seedling was pulled out of the soil and the stem cut off 2 cm below the top of the cotyledons. The watermelon root was discarded. A thin slice was shaved off one

The flowers and fruit of a mature plant of the calabash or bottle gourd.

Calabash seedlings 2 weeks after sowing. The first true leaves have just appeared.



The calabash seedlings prepared for grafting. The growing point of the calabash has been removed. A hole is being made through the calabash stem with a piece of sharpened bamboo.

side of the lower 1 cm of the watermelon stem.

The watermelon stem with the cotyledons was carefully inserted into the hole through the calabash stem. Care was taken to make sure the cut side of the watermelon stem matched with the hole through the calabash stem.

4. After grafting the plants were kept at 100% humidity and 25-30°C. This was done by making a clear polythene tunnel over the seedlings. The tunnel was well shaded from direct sunlight.

5. After four days the seedlings were removed from shelter. They were hardened off (allowed to adapt to outside conditions), for two weeks until they were large enough to transplant.

The seedlings were transplanted in the field in double rows 4 m apart. The plants were spaced 1 m apart in the row.

In each trial there were between two and four different plots of grafted and ungrafted watermelon. The plots were arranged in an experimental design. After transplanting, 100 g of 12.12.17 fertilizer was put around each plant. During dry weather the crop was watered regularly. All the trials were grown in the same block of land.

RESULTS

The yield results are shown in Table 1. The grafted plants grew bigger, and in each trial they produced a bigger yield of watermelons than the ungrafted plants.

The yield results from each trial were analysed statistically. Only in Trial 2 was

The watermelon stem prepared for grafting. The root has been cut off.

The watermelon plant three weeks after grafting, and just after transplanting.

Watermelons at harvest. The row on the right has been grafted. See the more vigorous vine growth than the row on the left.

the yield of watermelons from the grafted plants significantly higher than from the ungrafted plants. However over the three trials the average yield increase was 60% from grafting.

In all the trials, grafting did not affect the average weight of the watermelons. In each trial, the higher yields from grafting were because, there was a greater number of fruit on each plant.

In Trial 3 the roots of all the plants were inspected after harvesting was completed. Half the grafted plants had roots damaged by root-knot nematode. None of the ungrafted watermelon roots showed root-knot galls.

DISCUSSION

The grafted watermelon plants grew bigger and in each trial gave a greater number of fruit. However from all the results of these trials we do not think that it is a good idea to graft watermelon onto calabash rootstock in the Port Moresby lowlands.

All the watermelons were planted on ridges 4 m apart. The grafted plants covered all the ground between ridges, the ungrafted ones did not. Planting the watermelon on ridges 2 to 3 m apart would increase the yield of watermelon.

In Japan, calabash is used as a rootstock for watermelon because it is resistant to fusarium wilt (Yamakawa, 1979). However, in Japan new sorts of fusarium wilt have recently been found which also infect calabash (Kuniyasu, 1980). Fusarium wilt has not been recorded on watermelon or any other cucurbits in Papua New Guinea (Shaw, 1963).

Watermelon varieties which are resistant to fusarium wilt are now available. These could be used if fusarium wilt occurs o watermelon in Papua New Guinea One variety which is resistant to fusarium wilt, and grows well in the lowlands is New Dragon hybrid (from Known You

TABLE 1. DATES, VARIETIES, YIELDS IN THE WATERMELON GRAFTING TRI

Trial no.	1	2	3
Transplanting date	October 1980	July 1981	April 1982
Varieties	Green Delicia rockmelon China Dragon New Dragon	New Dragon	Sugar Baby
Yields (t/ha)			
Grafted	25.3	33.8	34.9
Ungrafted	17.6	14.9	24.2
Watermelon average fruit weight (kg)	2.8	3.4	4.0

Seed Company). Sugar Baby, which is a good variety at present, is not resistant to fusarium wilt.

Watermelon can be damaged by root-knot nematode. But Trial 3 suggests, that calabash is more likely to be damaged by root-knot nematode than watermelon.

With practice, we found that grafting was quite easy to do. In the first trial only about half of the grafts were successful. In the third trial 90% of the grafts were successful. However, we had to be careful to sow the calabash and the watermelon one week apart so they were both the right size for grafting at the same time.

After grafting, the seedlings had to be looked after very well and protected against disease. Where rats are not a problem, watermelon can be sown directly in the field. Even if they are sown in a nursery, watermelon seedlings can be transplanted after ten days. Grafted seedlings took 5 weeks before they were ready for transplanting.

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FURTHER READING

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