

Preliminary Studies on Bitter Gourd  
(*Momordica charantia*)

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**Introduction:** Of the cultivated gourds, melons and cucumbers, the bitter gourd (Tamil - *Pavakkai*, Telugu - *Kakara*, Hindi - *Karela*) is a common vegetable plant grown in almost every kitchen garden in South India. It is reported to be cultivated throughout India, as also in Malaya, China, Tropical Africa and America. People in Europe call it Balsam-Pear; but no information is available to show that the fruits are used by them for edible purposes.

Among the six species of *Momordica* found growing in the Madras State, only *Momordica charantia* is cultivated as a vegetable crop, in all the plains districts. This is a climbing annual herb with small, five to seven-lobed leaves, small yellow flowers and spindle-shaped fruits, green when young and bright orange on ripening, softly tubercled, splitting irregularly from the apex with the seeds surrounded by a crimson pulp. The plant is unisexual and monoecious.

The plant is grown for the tubercled, fleshy fruits. As the name signifies, the fruits are bitter in taste, but they are rich in iron and vitamin A. They are considered very good for culinary purposes. Almost every part of the plant seems to be used medicinally not only in India but also in countries like China and Africa. It is mentioned that the bitter gourd fruit is cooling, digestive, laxative and antipyretic and its administration cures biliousness, blood diseases, rheumatism and asthma. The leaf is used internally as a laxative and as an ointment for sores. In Ayurveda the juice of fresh leaves is prescribed for diabetes.

Work connected with the improvement of bitter gourd was carried out at the Agricultural Research Station, Tindivanam (South Arcot 1944 - '46. This paper records the observations made during the District) during course of this study.

**2. Materials and Culture:** Thirty-two samples of seeds were obtained from different localities in the State and from nurserymen. Circular pits (two to three feet in diameter and two feet in depth) were dug at intervals of seven feet and manured with well-rotted farm-yard manure. One row of four pits was allotted to each sample. Three seeds were sown in each pit to allow for possible defective germination. It took six to eight days for the seeds to sprout. A week after germination, the plants were thinned, leaving only one plant in each

pit and props were provided for the plant to climb up. A small pandal of five feet square at a height of five feet was erected for each plant. The plants were pot-watered when droughty weather prevailed.

3. **Observations:** (a) *Varietal studies:* Among the collection, there could be seen only two distinct habits of growth, one climbing and the other prostrate or runner. The latter is commonly called *Mithipagal* which name has probably been derived on account of the method of harvest of its fruits (i. e., the fruits are picked by feeling with hand or foot). In the collection grown, four had prostrate habit. Late and early bearing types were also observed in the collection.

There was not much difference among the types with regard to their morphological characters except slight variations in the size and colour of leaves. But with regard to the fruits there were clear differences in size (length varying from 4.5 to 10 inches), thickness, colour (dark green, light green and dull white) and surface (tubercled and smooth ribbed). The differences in the shape and size of the fruits of the important types are shown in Plate I.

Though bitter gourd can be cultivated throughout the year, it is grown chiefly during the rainfed season (July to December.) Where facilities are available for irrigation it is also raised during the summer season (February to July). Of all the types studied, the following were found to be good yielders, besides possessing such desirable characters as earliness, long and thick fruits and good flesh :-

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|--------------------------------|-----|---|
| 1. M. C. 2 (Salem)             | ... | Climbing type with dark green, long (above 8 inches) and slender fruits, moderately bitter.                   |
| 2. M. C. 4 (Pattambi White)    | ... | Climbing type with dull white, long and thick fruits, less bitter.  |
| 3. M. C. 6 (Pattambi Green)    | ... | Climbing type with light green and thick fruits of medium length (5 to 8 inches), more bitter than the white. |
| 4. M. C. 12 (Aduturai)         | ... | Climbing type with light green, thick, smooth ribbed fruits of medium length, more bitter.                    |
| 5. M. C. 16 (Nandyal)          | ... | Climbing type with green, long and thick fruits, moderately bitter, late bearer.                              |
| 6. M. C. 20 (Kasargod)         | ... | Climbing type, early and profuse yielder with dull white and medium sized fruits, moderately bitter.          |
| 7. M. C. 24 (Kumbakonam)       | ... | Climbing type with whitish green and thick fruits of medium length, more bitter.                              |
| 8. M. C. 26 (Coimbatore short) | ... | Climbing type with green, short, (below 5 inches), thick and smooth ribbed fruits, early bearer, less bitter. |
| 9. M. C. 30 (Bangalore)        | ... | Climbing type with dull white, long and thick fruits, with smooth ribs, moderately bitter.                    |

These types were found to breed true for the economic characters when grown in isolated blocks.

Of the above types, M. C. 4, M. C. 12, M. C. 16 and M. C. 20 were found suitable for growing during summer under irrigated conditions. To obtain good yields the plants have to be watered liberally at regular intervals.

(b) *Flowering and fruiting*: The plants commenced flowering in 30 to 35 days from the date of sowing. The peak of flowering was noted from the 50th day onwards and lasted for about a fortnight. In the early stages, the ratio of female flowers to male flowers produced was one to ten and in the later stages one to fifteen or even twenty. As the number of male flowers is large, the fertilisation and setting of fruits was found to be nearly cent per cent. Fruits for cooking purposes can be gathered after the 15th to 20th day after flowering. The fruits get fully mature by the 20th day from flowering and then begin to ripen. Ripe fruits for seed collection can be picked on the 25th day.

(c) *Pests and diseases*: Epilachna beetles were found to cause serious damage to bitter-gourd plants. The pest is found to be active during the months of September and October. The grubs scrape the green matter from the leaves and young fruits and the affected vines present a ragged appearance. Both the grubs and adults cause much damage to the immature fruits, as a result of which a number of young fruits fail to grow normally and in some cases they become rotten.

To control the pest, dusting calcium arsenate in the proportion of one part of calcium arsenate to six parts of slaked lime or spraying calcium arsenate at a concentration of half to one ounce mixed with an equal quantity of slaked lime in one gallon of water is recommended. Healthy fruits collected from treated plants will have to be washed well in fresh water before they are used for consumption.

No disease was observed to attack the bitter gourd crop when raised both during the rainfed and summer seasons at Tindivanam.

4. **Hybridisation**: About 20 crosses were attempted with selected parents. Some of the hybrids were found to yield large-sized fruits with thick flesh, showing hybrid vigour. Detailed observations regarding the yielding capacity and bitterness of fruits are in progress. There is indication to show that the hybrid vigour can be utilised to produce more and better quality fruits.

The following technique of crossing was adopted :-

The female flower bud which was expected to open the following morning was covered with a thin paper bag (of about 2" x 3") and tied with a thread in the evening. Next morning at about 7 O'clock the male flower was brought for pollination. The paper bag was removed and the pollen dusted four or five times to ensure proper pollination. The paper bag was then replaced and removed the next day so that the fruit may develop normally.

From the study of the crosses, types M. C. 6 (Pattambi Green), M. C. 16 (Nandyal), M. C. 20 (Kasargod) and M. C. 26 (Coimbatore short) appeared suitable for producing useful hybrids. Crosses in which the first two were used as female parents and the other two as male parents were found to be more promising than the others. The hybrids were compared with the selfed progenies of the parents and they were observed to have longer and thicker fruits than the parents.

5. **Conclusions:** The preliminary observations have shown the possibility of evolving new and better yield types of bitter gourd by careful selection and hybridisation. These aspects will have to be studied in more detail to find out the extent to which improvement in this vegetable crop can be effected.

#### REFERENCES

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## Seed Viability Test with 2, 3, 5 Tri-Phenyl Tetrazolium Chloride

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In 1941 Kuhn and Jerchel (6) drew attention to the properties of colourless tetrazolium salts which get reduced by some phytochemical process to stable red formosans on contact with the tissues of embryos of viable seeds and suggested their use as reduction indicators of living tissues. Since then, the test has been in use in German Breeding Stations for testing viability in oats.

Lakon (7) gave up his erstwhile 'topographical method' of determining seed viability with selenium salts in preference to 2, 3, 5 triphenyl tetrazolium chloride. Cottrell (2) Porter and his colleagues (8) have confirmed the reliability of these tests with several cereals; but do not recommend their use with minute seeds, as the staining is not clearly

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