

Stem cutting: A novel technique for the production of quality seed in Spine gourd

The major issue related to spine gourd (*Momordica dioica* Roxb.) is the availability of seed of desired varieties to be grown. Only two Varieties (Indira Kankoda-1 and Indira Kankoda-2) were identified by CVRC till date and these varieties are not in seed chain because of lack of seed production technique. True-to-type plant production methods are scanty and not available to the farmers. Every year, area under this potential crop is increasing and farmers are facing problem of quality planting material. The new technology of vegetative propagation in spine gourd through stem cuttings can be the best alternative to growers. RMD College of Agriculture and Research Station, IGKV-Ambikapur, is pioneer in developing a stem cutting propagation technology in spine gourd which can be easily adopted by farmers for multiplication of promising planting material.

SPINE gourd (*Momordica dioica* Roxb.) is a perennial climber of family Cucurbitaceae. Conventional commercial propagation of spine gourd largely depends on tuberous roots followed by seeds. Tubers are not multiplied and only one tuber is obtained in one generation from a single plant. Further, due to dioecious nature of spine gourd, male plant has heterozygous (XY) and female has homozygous (XX) sex type. So, after fertilization in a single fruit both male and female seeds are present in 1:1 ratio. Due to these major constraints in propagation of spine gourd, asexual propagation through

stem cutting will show its significance. Plants developed from stem cutting, on the other hand are inexpensive and can be planted in the field within few days. Plants raised from cutting produce early flowers, by reducing the transformation period from vegetative to reproduction phase, hence producing early crop. From a single plant, a number of rooted cuttings can be produced. It is easy to raise healthy planting materials of true to type plants.

Technology

Stem cutting in spine gourd is limited due to



Planting material propagated through stem cutting shows good rooting in root trainers

unavailability of standard propagation method; as a result, it has not been commercially exploited. Normally, rooting in stem cuttings is difficult without treatment with any growth regulator. The successful establishment from stem cuttings depends upon many factors, such as stem portion, stem diameter, seasonal and age variation, moisture level, growing media, temperature and nutrient status. Plant growth regulatory hormones particularly 'auxin' plays a vital role in adventitious root formation in plants. Propagation by seed is limited by 4 major problems, viz. high seed dormancy, unidentified sex of seeds, difficulty to grow in nursery tray and low germination rate, it takes 20-45 days for germination and in case of tuber as propagating material tuber multiplication rate is only 1, whereas cuttings are ready in about 15 days for planting. Cuttings produce true-to-type plants; tuber multiplication is 1:5 and plants have identified sex. About 12-15 cm long stem cuttings are taken from spine gourd to clone varieties or to regenerate several more plants from a mother plant. Two set of true leaves and two growing nodes are retained. Whole spine gourd vine is used for cutting but upper growing part responds better than older one. Due to its indeterminate nature, it grows continuously.

Pre-treatment of nodal cuttings

The nodal cuttings were put in 2 litre glass beaker containing 1.5 litre double distilled water after gentle washing to clean field soil and for maintaining turgor

pressure of cutting till it is planted in soil after treatment. Fungicide Bavestine (2 g/litre) were used as disinfectant in cutting node. The cuttings were treated with different concentrations of 1500 ppm IBA in combination with 5 second dipping time duration.

Rooting medium and growth conditions (Cutting propagation)

Pre-treated nodal cuttings were immediately inserted into the potting trays containing FYM: Soil: Sand (2:1:1) substrate mixture. After 7 days, cuttings planted start root initiation in the soil. After 15 days, rooted cutting become ready for transplanting in the field. The air temperatures in the net house differed strongly during the day (up to 25-35°C during the day time and between 15 and 20°C during the night). Fogging was regulated manually to obtain 90-95% relative humidity. Fogging intervals lasted approx. 5 minutes, with a 3 hour pause and switched off during the night.

Transplanting of cuttings

The variety used for the standardization was Indira Kankoda-2. Pits of 50 × 50 × 50 cm³ should be prepared in each hill with a spacing of 2 m × 2 m. These pits should be filled with a mixture of soil, sand and well decomposed FYM (2:1:1) along with initial dose of fertilizer. After 25-30 days, first fruit picking can be done and growing vines are also used as mother plant for generation of more cuttings.



a: Plant generated from cutting 15 days old, **b:** Basal- and nodal- derived fibrous roots emerging from a stem cutting, **c:** Brown colouring, stiffening, and first signs of root swelling, **d:** Progressive tuberous root filling from the proximal cells, **e:** Enlarging storage roots with fully established secondary growth anatomy

Planting conditions for stem cuttings and root tuber formation

In spine gourd planted from stem cuttings, the development of spine gourd tuberous roots starts from stem nodal derived adventitious roots that enlarge and form starch containing storage roots. It is characterized by a central vascular cylinder containing star-shaped xylem, with alternating phloem and parenchyma cells, and the vascular cylinder is confined by an endodermis. Spine gourd cuttings of cultivar Indira Kankoda-2 were established singly in pot tray which have 24 blocks. After 15 days plants were shifted to field containing a mixture of garden top soil and sand in the ratio 3:1, using stem cuttings (20-25 cm in length), taken 10-15 cm from the base of the primary stem of the mother plant. The adventitious roots which

formed underground developed from nodal points on the mother cutting and later at the nodal positions of the underground swollen stem. The resulting tuberous stems are those emanating directly from the base of the mother stem. Tuberous roots developed from the swollen stem as a result of swelling of adventitious roots present on the stems.

Tuber production technique

Cuttings were taken from healthy and disease free mother plant and treat with 1500 ppm IBA for induction of root. Once rooted, the cuttings were transplanted in the field to produce tubers. Tuber development takes 90-100 days and after 8 months dormancy it can be used as planting material. Spine gourd with such modified roots, have become a good example of plant with a high efficient mechanism for the storage of energy in form of tuber. In addition to this, it functions as organ of vegetative propagation. The provision of two reproductive mechanisms enables this plant to survive in difficult environments.

Performance

The results obtained from the two year field performance reveals that spine gourd raised through cutting produce the same yield performance as recorded from plants raised through seeds. Significant observation recorded was early flowering, fruiting and tuber multiplication rate in the cuttings. For transfer of technology training were demonstrated to farmers about this innovative technique of plant propagation and solve the problem of unavailability of quality planting material and procedure of seed multiplication technique to growers. The technology will ensure disease free, early, uniform and elite planting material and produce in spine gourd.



Plants developed from cutting produced five tubers in a plant within 90 days

Training and facilities

Farmers can get hands-on training and visits to spine gourd cutting production unit at the Department of Genetics and Plant Breeding, Raj Mohini Devi College of Agriculture and Research Station, IGKV, Ambikapur during the month of June-July. Training and other capacity building programme were organized at the village level and the farmers were guided in spine gourd seed production for alternate income generation and nutritional security. Plants were also distributed under All India Coordinated Research Network on Potential Crops, TSP (Tribal sub plan) programme every year. Farmers can approach to different NHM (National Horticulture Mission) schemes available with state government to get fund for new establishment.



Standardization of seed production techniques in Spine gourd

Economic gain

By utilizing this protocol, RMD College of Agriculture and Research Station, Ambikapur (Chhattisgarh) earned ₹ 2,40,000 within two months (July and August, 2020).

Prospects

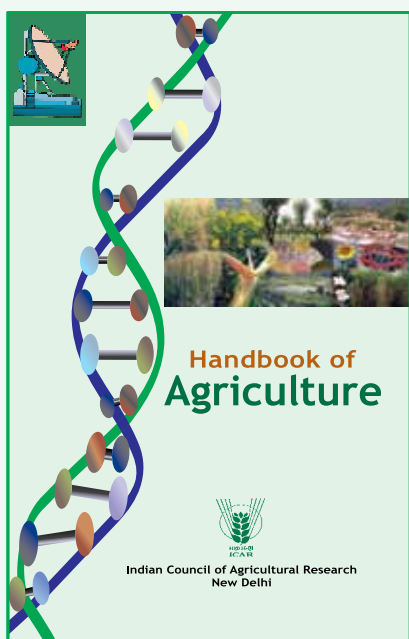
With the development of different varieties of spine gourd for cultivation, the major bottlenecks in popularization of spine gourd cultivation is the lack of true-to-type planting materials, seed multiplication technique and their availability in the market. It has been observed that many times farmers collect tubers from forest or hills and grow in backyard but mostly they collect female plants only. So the yield is less as well as due to this

practice, diversity of spine gourd may also be decreased in forest areas. Quality planting material and multiplication method will solve the problem. For this purpose, more number of trainings can be provided to farmers so that the innovative technique of plant propagation can be demonstrated to them and problem of unavailability of quality planting material to growers can be addressed.

For further interaction, please write to:

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TECHNICAL SPECIFICATIONS

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