

## Cultivation practices of an underutilized, yet wholesome and remunerative vegetable: Spine gourd

**Spine gourd (*Momordica dioica* Roxb.) is a perennial climber of family Cucurbitaceae. This medicinally important and nutritionally rich vegetable is known by different names in local dialects like kankoda, meetha karela, kakrol, kartoli, kantola, bhatkarela, kaksa, ban karola etc. in different parts of India. Though spine gourd is closely related to bitter gourd, it is not as much popular as bitter gourd largely due to lack of awareness among consumers. The tuberous vegetable is mainly cultivated in West Bengal, Gujarat, Madhya Pradesh, Maharashtra and Karnataka. Besides, this vegetable grows naturally in the forest areas of Chhattisgarh, Jharkhand and Odisha where it is regularly consumed by the native tribals.**

**S**PINE gourd fruit is shortly beaked, densely echinate with soft spines, green in colour which becomes yellow at maturity. This climbing creeper is also found in Pakistan, Bangladesh and Ceylon. The fruits contain high amounts of protein, calcium, phosphorous, iron, and highest amount of carotene amongst the cucurbitaceous vegetables. This vegetable has high demand in localized markets but remain underutilized and under-exploited firstly due to its vegetative mode of propagation and secondly because of its dioecious nature. Spine gourd, owing to its proven nutritional and medicinal value, high keeping quality, ability to withstand long distance transportation and high market price, has potential to become major vegetable commodity like bitter gourd, and increase the farmer's income considerably. The farmers need to be sensitized about the scientific cultivation of

spine gourd by adopting improved cultivation practices including maintenance of desired male:female ratio in the field to ensure maximum fruit set and use of quality planting materials of improved, notified varieties.

### Food values

Spine gourd is quite palatable, rather sweet and entirely free from bitterness, good source of antioxidants and other nutrients, viz.  $\beta$ -carotene, vitamin C, folic acid, magnesium, phosphorus and potassium, and is often used in folk medicine. In general, the fresh fruit has about 84.1-87% moisture content.

### Medicinal uses

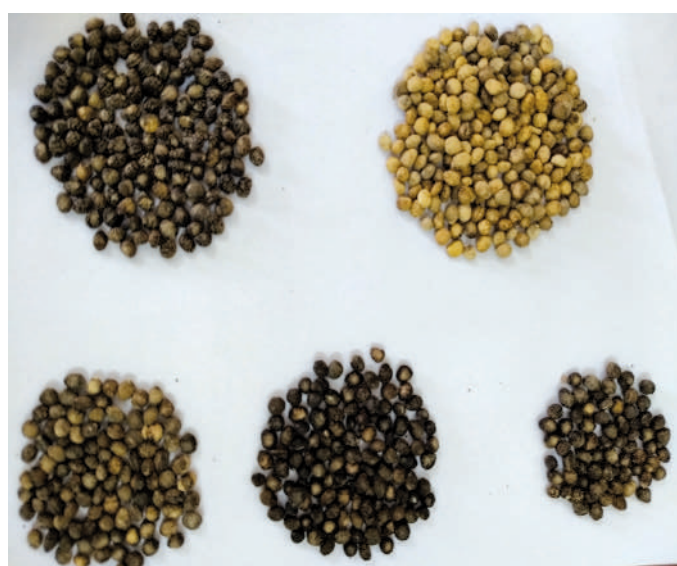
Spine gourd's medicinal and curative properties are known since ages and are passed on generation after



Plant through stem cutting



Tubers of spine gourd



Seeds of spine gourd

**Table 1.** Nutritional composition of fruits of *Momordica dioica* (per 100 g edible fruit on dry weight basis)

Parameter	Nutrient composition	Parameter	Nutrient composition
Crude protein (g)	19.38	Calcium (mg)	33.00
Crude lipid (g)	4.70	Phosphorus (mg)	42.00
Carbohydrates (g)	47.92	Iron (mg)	4.60
Crude fibre (g)	21.30	Riboflavin (mg)	0.18
Ash (g)	6.70	Thiamine (mg)	0.05
Calorific value (kcal)	311.50		

generation as traditional knowledge. Decoction of leaves reduces fever; tuberous roots help in relieving headache, excess sweating, stone formation and migraine while fruit is quite helpful in controlling diabetes and blood pressure. Tuberous roots are used for curing diarrhea, fever and rheumatism by tribal's of Chhattisgarh, seeds are used against chest problems and to stimulate urinary discharge.

### Varieties

Three varieties of spine gourd were developed at RMD College of Agriculture and Research Station (Indira Gandhi Agriculture University), Ambikapur (Chhattisgarh) and released for cultivation by the SVRC/CVRC.

### Cultivation

**Soil and climatic requirements:** Spine gourd can be grown in variety of soils, however, it grows well on sandy loam soils with pH ranging from 5.5 to 7.0. Well-drained soils having good organic matter are best for its cultivation. Hot and humid climate is ideal for the cultivation of spine gourd. It thrives well under temperature range of 25-35°C and annual rainfall 600-4500 mm.

**Time of sowing:** Normally, the crop duration of spine gourd is 115-125 days and sowing of spine gourd is started with the onset of monsoon in June-July. First marketable fruit can be picked in last week of August and after taking four picking, crop matures in the month September-October. From second year, no need to sow any planting

materials, as the tuber sprouting starts in second fortnight of May to first fortnight of June and first picking is done in first fortnight of July. Same tuber works as planting material for 4-5 years.

### Planting materials and seed rate

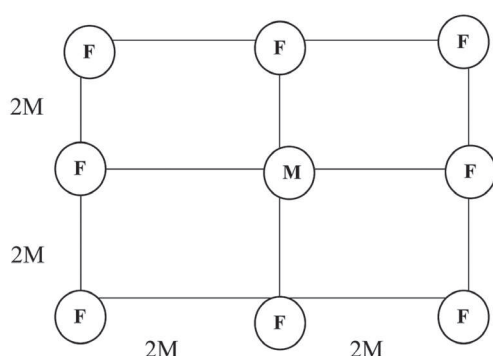
Spine gourd can be cultivated through seeds, but the population will segregate. However, the crop grown vegetatively through tubers and stem cutting will result in uniform, true to type plants. The seed requirement to cultivate a commercial crop in one hectare area will be 2.5-5.0 kg owing to difficulties in seed germination and maintenance of male/female ratio for a healthy fruit set. However, if the vegetative mode of propagation through tubers or plants generated from stem cuttings is used where the male and female plants or tubers are already known, a total of 2500-2650 tubers or plants having 2200-2300 female and 300-350 male plants will be sufficient to cultivate 1 ha area.

### Land preparation and sowing

Land should be leveled and well prepared by ploughing and planking. Before last ploughing, addition of 15 to 20 tonnes of FYM is advised to increase the fruit yield. Pits of 50 × 50 × 50 cm<sup>3</sup> 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. A model

**Table 2.** Improved varieties of spine gourd

Name of variety	Release year	Yield (q/ha)	Recommended area of cultivation
Indira Kankoda 1	2007/CVRC	30-35	Chhattisgarh, Uttar Pradesh, Maharashtra
Indira Kankoda 2	2020/CVRC	35-45	Chhattisgarh, Uttar Pradesh, Maharashtra, Jharkhand
Chhattisgarh Kankoda-2	2019/SVRC	30-32	Chhattisgarh



Female(F) and Male(M) ratio= 8:1(F:M)



Male Plant



Female Plant



Field view of Spine gourd at College of Agriculture, Ambikapur

for planting of spine gourd is depicted in figure.

**Organic fertilizer:** Incorporate 15-20 t/ha of well rotten FYM at the time of soil /land preparation.

**Inorganic fertilizer:** NPK @100:60:40 kg/ha should be applied. Full dose of Phosphorous and Potash should be applied before planting, however, ½ dose of Nitrogen should be applied at the time of vine growth and remaining ½ dose of N before flower initiation.

#### Weed control of spine guard

The weeding should be carried out regularly depending on the appearance of weeds. Hand weeding and hand hoeing weeding methods are preferred as the crop has shallow root system.

#### Irrigation in spine guard

Irrigation should be applied immediately after sowing the seed or tubers on the raised beds in the field. Thereafter, need based irrigations are applied. In dry spell weather conditions, one or two irrigations should be applied on weekly intervals. Irrigations are not needed in case of rainy season crop as soil has enough moisture. Precautions should be taken to drain excess rainwater as flooding will lead to rotting of vines.

#### Staking in spine guard

Since, spine gourd vine is climber in nature, it requires proper support for vegetative growth. Hence, staking is advised for better vine growth and fruit yield. Wood, bamboo or wire can be used for staking in single stake or bower or knifing system as per the availability of resources and staking material.

#### Pests and diseases

The incidence of pests and diseases will be different in different regions, however, major insects-pests and diseases attacking spine gourd are epilachna beetle (*vigintioctopunctata*), fruit fly (*Bactrocera cucurbitae* Coq.), mildews and nematodes.

Spray of Emamectin benzoate 5% SG @ 200 g/ha will effectively control epilachna beetle and fruit flies can be controlled by using any mechanical method of catching flies (insect traps and baits), damaged fruits may be removed and buried in pits. Spray of pesticide Quinalphos 25 E.C. @ 2 ml/litre is recommended to control fruit fly infestation.

To control nematodes, incorporate neem cake in the soil at the time of land preparation. Intercropping with non-host crops like marigold also help in controlling nematodes.

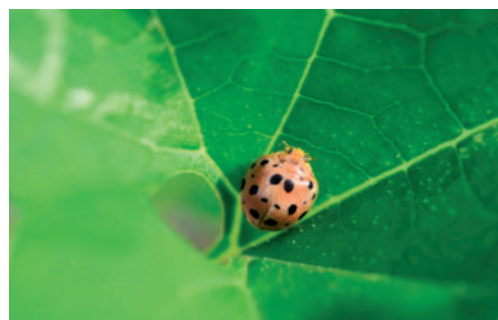
Other minor diseases infecting spine gourd is powdery mildew, anthracnose, downy mildew, leaf spots and mosaic. Using appropriate fungicides like hexaconazol 5EC @ 50-75 g/ha and dithane-m-45 @ 1.5 g/litre can control these diseases. Viral diseases like mosaic can be controlled further by destroying infected plants and controlling vectors like aphids and white flies by spraying insecticides alternatively, i.e. imidachloprid 17.8% S.L @ 4 ml/10 litre and quinalphos 25EC @ 2 ml/litre.

#### Flowering, pollination and fruit set

Since spine gourd is a dioecious crop, the male/female ratio needs to be essentially maintained in the field. This can be easily achieved by cultivating in the advised design mentioned above. The flowering, pollination and



Epilachna beetle (Grub)



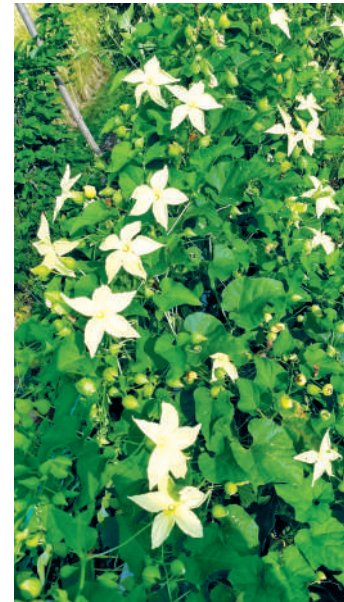
Epilachna beetle (Adult)



Viral infection



Green fruits of Indira Kankoda-2



Male

fruit set are largely affected by the weather conditions as the pollination is entomophilous. Under favourable conditions, flowering starts 50-60 days after transplanting the seedlings and 30-40 days after tubers. Anthesis occurs in evening. Hand pollination significantly increase the fruit set. Lack of pollination often results in lower fruit set and consequently lower marketable yields. Hence, artificial pollination may be done as far as possible to increase fruit yield and profits.

### Harvesting and yield

The vegetable is ready for harvesting after 40 to 50 days when we use tubers as planting material but when stem cuttings are used as planting material, it takes up to 60-70 days for first picking. When we use seeds as planting material it takes 65-75 days for getting seed to fruit. At the time of repeated pickings, the fruit should be tender, green in colour and seed should be soft for use as green vegetable. Harvest the fruits when they attain marketable size by hand picking. The fully ripened fruits develop orange colour with red pulp and matured seeds. An average yield of 40 to 50 q/ha can be obtained by utilizing tuber as planting material with good crop management practices. In case of crop raised from seeds or stem cuttings, the yields will be lower, i.e. 20-25 q/ha because in the first year, total synthesized food materials by the plant will be partitioned in fruits and tuber development. However, in case of crop raised from tubers, the fruit yield will be higher, i.e. 40-50 q/ha.

### SUMMARY

Spine gourd is popular among the local farmers in different pockets across the country due to its easy availability in nature, and nutritional and medicinal values. According to traditional knowledge, its tubers are



Female



used for treatment of diabetes, stomach pain, headache, and lizard bite. However, the nutritional quality along with tropical adaptation makes spine gourd a potential candidate for cultivation in the tropical areas of the world. Spine gourd has the potential to play an important role as a source of income for some resource-poor households living in marginal upland areas. It also offers malnutrition alleviation and dietary supplementation for the upland land owners. This crop can play a crucial role towards food security, income generation and in maintaining food culture of the rural poor. It also supplements daily requirements of micronutrients. Spine gourd can generate high demand in market if the nutritional and medicinal value benefits are conveyed to the consumers through awareness programs including use of print and digital media. The longer keeping quality and ability to withstand long distance transportation assures that the crop can be made available to the consumers throughout the country besides having good export potential. Therefore, it is expected that this crop will become popular among consumers and the increased demand will result in cultivated area expansion and will result in higher profits to the farmers.

For further interaction, please write to:

**Jitendra Kumar Tiwari** (Scientist), Raj Mohini Devi College of Agriculture and Research Station, Ambikapur, Chhattisgarh 497 001.\*Corresponding author's email: tiwarijk5@gmail.com