

Quality seed production of ridge gourd in hot-arid region

The arid region holds significant potential for cucurbit cultivation, offering both economic and nutritional benefits. The availability of land provides a valuable opportunity for producing high-quality cucurbit seeds, which is continuously in demand. The ridge gourd variety Thar Karni, known for its climate resilience, is particularly well-suited for arid regions and presents a promising opportunity for quality seed production. Seed production of ridge gourd can generate a net income of ₹ 1.80-2.0 lakh per ha. Moreover, seed production technology also enhances environmental sustainability by reducing the carbon footprint associated with long-distance seed procurement. It promotes sustainable farming practices and empowers local farmers, contributing to resilience and growth in the agricultural sector.

QUALITY seed production of new improved varieties in adequate quantity is important for adoption and spread of technology among stockholders. Modern scientific intervention has enabled the development of crop varieties with desired traits at a much higher pace than ever before, addressing the challenges of food and nutritional security. A large number of new crop varieties are being developed continuously to address specific needs, viz. productivity, quality, tolerance against abiotic and biotic stresses, etc.

The north-western part of India is distinct for the promotion of arid horticulture owing to the vast land resources and scope for cultivation of vegetable crops. ICAR-Central Institute of Arid Horticulture (CIAH) has developed and recommended the cultivation of Thar Karni variety of ridge gourd for Rajasthan state. However, to the farmers, all these scientific achievements would be of little use unless they have access to seeds of these varieties, which are genetically pure, physiologically sound (germination, vigour), and free from physical impurities and disease's pests. The pace of progress in vegetable

production largely depends upon the speed with which a stockholder is able to multiply quality seeds of high-yielding varieties. This successful seed production requires identification of variety, maintenance of varietal purity, application of Good Agricultural Practices (GAP) on field as well as for maintaining seed standards.

Salient features of Thar Karni

Existing ridge gourd varieties have not performed well under high-temperature and arid conditions. In response, ICAR CIAH, Bikaner, developed early maturing variety, with the first harvest occurring 51-55 days after sowing. The fruits are 20-25 cm long, weigh 90-110 g, and are cylindrical with 10 longitudinal shallow ridges. The plants have short internodes and are profusely branched. The variety has a yield potential of 180-200 q/ha, depending on the sowing season and climatic conditions. It is suitable for cultivation during the spring-summer season in February and the rainy season in June-July. This variety is tolerant to mosaic disease under field conditions and can be grown in both summer and rainy seasons. It has been notified and released for commercial cultivation in the state of Rajasthan.

Climatic conditions

The Thar Karni variety can be successfully cultivated in both the autumn-spring and rainy seasons. Optimal germination and growth occur at temperatures between 25-30°C. While excessive heat or rain during flowering and fruiting can adversely affect the yield, Thar Karni is notably tolerant to high temperatures. Previously, ridge gourd was not widely grown in hot, dry areas like Western Rajasthan. However, since the release of Thar Karni, the crop has gained popularity among farmers in arid and



Field view of ridge gourd variety Thar Karni



Crop stand and plant population for ridge gourd

semi-arid regions.

Maintenance breeding for seed production

Maintenance breeding has a profound role in varietal spread, popularization and life of a variety. Keeping in mind the original characteristics of a variety, minute deviations or poor-performing plants are discarded and seeds only from the uniform 'true-to-type' plants are pooled to form the basic seed bank. Every year the seed of Thar Karni is maintained at ICAR-CIAH. The marginal strip is important in the production of genetically pure seeds. The seeds from a five-meter-wide strip around the perimeter of the plot are harvested separately and these can either be destroyed or placed in a lower seed category. The bulk of the seed harvest comes from the inner area of the plot.

Good Agricultural Practices (GAPs)

The selected field should be free from unwanted plants. The soil should be rich in organic matter. Sandy loam to clay loam soil with a pH of 6.5-7.5 is ideal. First ploughing should be done with soil turning plough followed by 2-3 ploughings with cultivator. Application of N, P₂O₅ and K₂O @ 80:60:60 kg along with well decomposed FYM @ 15-20 t/ha is recommended. FYM should be applied at the time of last ploughing. The full dose of phosphorus, potassium and half of nitrogen should be applied before sowing along the drip lateral lines. The remaining half quantity of nitrogen should be split in two equal parts and applied at two times (at vine development and flowering stages) just after hoeing. Excessive application of nitrogenous fertilizers should be avoided as it results in greater number of staminate flowers, which adversely affects fruit yield. While application of fertilizers, care must be taken to avoid damage to roots.

In order to achieve higher genetic purity of Thar Karni, the seed should be purchased from ICAR-CIAH, Bikaner. For sowing of ridge gourd under drip, 2.0-2.5 kg seeds per ha is sufficient. The best time of sowing is autumn-summer season to get the quality seed. During

summer season, there is less incidence of diseases and pests in arid region. Therefore, the sowing is recommended between 20th February to first week of March with drip irrigation system. The Thar Karni can also be grown during rainy season (mid-July to mid-August) for seed production purpose. It is recommended to cultivate the Thar Karni with drip irrigation system maintaining 2.0 m row-to-row distance. The single lateral lines with 16 mm size with in-line dripper spaced at 60 cm with 4 litres per hour discharge capacity are used. It is advocated to operate the drip system for 2-3 h at an interval of 2-3 days depending upon the season. During April-May months there is high heat waves in arid ecology therefore, irrigation by mini sprinkler is applied to protect the crop. Healthy seeds (2-3) are sown at a depth of 1-2 cm near a dripper.

Germination is delayed due to low temperature in February, hence for quick germination, the seeds should be soaked in water for 24 to 36 h before sowing. The seed are then treated with Thiram or Captan @ 2 g/kg of seed to protect young seedlings from soil-borne fungi. To keep the field weed free, two weedings are required at 25-30 DAS and 45-50 DAS during summer season. In rainy season, 3-4 weedings are required for quality seed production.

As the summer season begins in hot arid regions, the hot wind often raises soil temperatures and causes the



Removal of off type and volunteer plants

Table 1. Minimum seed standard for ridge gourd

Seed standard	Foundation	Certified & TFL
Pure seed (minimum)	98.0%	98.0%
Inert matter (maximum)	2.0%	2.0%
Other crop seeds (maximum)	None	None
Weed seeds (maximum)	None	None
Other distinguishable varieties (maximum)	5/kg	10/kg
Germination (minimum)	60%	60%
Moisture (maximum)	7.0%	7.0%

vines to bunch together, leading to poor pollination and flower drop. To address this issue, *Saccharum (sarkanda)* is placed in the spaces between rows to facilitate proper vine spread and prevent direct contact with the warm soil. Additionally, manually directing the growing vines can improve pollination by bumblebees, honeybees, and other pollinators.

Pests and diseases should be managed timely by adopting Integrated Pest Management (IPM) methods. To control aphids, white fly and leaf miner, Imidacloprid 17.8 SL or Thiomethoxam 70 WS (0.3-0.5 mL/litre water) should be sprayed as per requirement. To prevent fruit rot, Carbendazim (2 g/litre water) should be sprayed in the standing crop. To prevent anthracnose, spraying of Copper oxychloride (2 g/litre water) should be done as per the requirement. Spraying of insecticides should be done in the evening when the activity of bees stops otherwise pollination process is hampered adversely, which may result in very low fruit setting.

Isolation distance and rouging

Ridge gourd being a highly cross-pollinated crop, the isolation distance and timely rouging is mandatory for quality seed production. Isolation distance of 500 m should be maintained for certified and Truthfully labeled (TFL) seed production. Thar Karni should be raised in isolation from other varieties of ridge gourd and also other species of genus *Luffa*, viz. *L. cylindrica* (sponge gourd) and *L. hermaphrodita (satputia)*. After sowing, the intensive and regular monitoring is needed to rouge out unwanted and off type plants. Rouging should be done at vegetative growth stage, flowering stage and fruiting stage. Rouging to be carried out both in seed production plot and surrounding areas of defined isolation distance.

Pollination behaviour of Thar Karni

Ridge gourd, being monoecious, is highly cross-pollinated, with rates ranging from 95% to 99%. Pollination is primarily mediated by bumblebees and honeybees, depending on ambient temperature, pollinator population, and their activity during flowering stage. Under arid conditions, anthesis begins around 4:30 PM, and flowers fully open between 6:00 and 7:00 PM. The peak period of anther dehiscence occurs between 5:30 and 6:30 PM. The flowers remain open overnight and wither the following morning. The pollen remains viable for 2-3 days, while the stigma remains receptive until the



Packaging and proper labeling of seed

evening of the same day.

Seed quality control standards

The Seed Act of 1966 legally regulates seed quality in India, ensuring that farmers receive high-quality seeds for cultivation. Accordingly, the seeds of notified varieties sold to the farmers must meet the minimum seed standards (Table 1).

Harvesting and seed processing

To get quality seed, it is recommended to retain 5-7 fruits per plant. Fruits are harvested at full maturity stage when the outer skin starts to turn brown in colour. This stage is achieved in 45-50 days after the fruits set. The harvested fruits are dried in sunlight for 4-5 days. Seed are extracted manually by breaking the fruit end forming hole and gently shaking. Normally, a fully mature fruit produced 75-110 seeds. Seed index (100 seed weight) varies from 9-10 grams. The chaffy seed are removed, cleaned, graded and packed after drying. An average seed yield of 120-150 kg per hectare can be obtained under favourable climatic conditions. By adopting the above seed production technology of ridge gourd Thar Karni, a net income of about ₹ 1.80-2.0 lakh can be obtained per hectare.

SUMMARY

The Thar Karni variety of ridge gourd is a high-performing cultivar specifically developed for arid and semi-arid regions. Its ability to thrive in hot conditions and its resistance to common diseases make it a popular choice among farmers in these areas. Every year, numerous farmers from neighboring states like Haryana and Punjab travel to ICAR-CIAH, Bikaner to purchase 'Thar Karni' seeds, which results in a high carbon footprint on the environment. By adhering to guidelines and implementing best practices in seed selection, pollination management, field management, harvesting, and storage, producers can ensure the successful production of high-quality seeds while maintaining the genetic integrity of the 'Thar Karni' variety.

For further interaction, please write to:

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