

Pusa Hybrid-4: First gynoecious based high yielding hybrid of bitter melon for commercial cultivation

Bitter melon is an economically important multipurpose vegetable and highly valuable for its nutritional contents like carbohydrate, proteins, vitamins, minerals (mainly high concentrations of ascorbic acid and iron) and numerous medicinal uses including treatment for diabetes and also possess anti-microbial, anti-oxidant, and anti-viral activities. Pusa Hybrid-4, the first gynoecious based early and high yielding hybrid, has been released and recommended by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Horticultural Crops for cultivation in National Capital Region of Delhi including Delhi and its adjoining areas of Haryana, Rajasthan and Uttar Pradesh.

PUSA Hybrid-4 has been developed by using gynoecious as female parent and monoecious line as male parent. It is highly suitable for growing during spring summer under north Indian plains. It is a predominately gynoecious hybrid with high female:male flower ratio (2:1) compared to commercial variety, Pusa Do Mausami (1:9). Fruits are dark green, medium long (average fruit length 16 cm and fruit diameter 5.5-6.5 cm) and medium thick. Fruits have 5-6 discontinuous narrow ridges and first harvest after 45-50 days of sowing. The average fruit weight is 60 g. Its average yield is 22.26 t/ha at 5 centres (4 in northern zone) of All Indian Coordinated Research Project on Vegetable Crops which is 25.7% higher than the national check Private Hybrid 'Vivek'. The fruits have high iron content (18.20 mg/100 g) as compared to Vivek (6.77 mg/100 g).

The hybrid will be highly accepted by the farmers since there is no hybrid in bitter melon available with higher female:male ratio available for commercial cultivation under north Indian plains.

Cultivation practices

Pusa Hybrid-4 can be grown in all

types of soil ranging from sandy loam to clay soil. However, well drained, fertile, rich in organic matter, silt or clay loam soils with a pH of 6-7 are ideal for successful cultivation. It requires a long and warm growing season with an average temperature ranging between 24-30°C for better growth, flowering and higher production. Production of female flowers, fruit set and growth of plant are affected above 40°C temperature. About 4 to 5 kg seed is sufficient for sowing of 1 hectare of land. Seed should be treated with Thiram (2.5 g/kg of seed). Sowing is done during February-March for summer crop. The crop is sown in a channel of 1.5 m apart with spacing of 60 cm between the plants. Generally 2-3 seeds are sown in

a hill at 2.5 to 3.0 cm depth. The channels should be kept weed-free by frequent hand weeding, hoeing and light earthing up along with application of fertilizers.

Irrigation

The crop cannot tolerate drought or water stagnation. Irrigate the channels two days before dibbling the seeds. Frequent irrigation at 3-5 days interval especially at flowering stage and at alternate days



Fruits of Pusa Hybrid-4



Field view of Pusa Hybrid-4



Machaan system

during fruiting is necessary. Regularly shallow inter-cultivation is done after 4-5 days of irrigation to remove weeds and to facilitate soil aeration for proper root development.

Manures and fertilizer management

About 20-25 t/ha of farmyard manure, 70 kg N, 40 kg P_2O_5 and 30 kg K_2O /ha is sufficient for 1 hectare of land. The farmyard manure should be mixed in soil at the time of field preparation. Apply $1/3^{rd}$ N and full dose of P and half dose of K just before sowing. The additional dose of N (Urea 40 kg), P and K can be applied in several split doses (5-6) at fortnightly intervals. Since bitter melon is harvested frequently, fertilizer also should be applied in several split doses.

Plant protection

Sulphur fungicides are cheaper to use for powdery mildew control. Wettable sulphur has been used for many years for powdery mildew control. Myclobutanil, tebuconazole, and chlorothalonil, are registered for use on bitter melon for powdery mildew disease. Chlorothalonil can also be used for gummy stem blight. *Fusarium* wilt can be managed by long crop rotations of 4-5 years or more with non-host crops. Drenching root zone with Carbendazim 12% + Mancozeb 63% WP is also effective in management of this disease. Downy mildew can be managed by spraying Ridomil @ 2g/litre of water. Plants affected with complex viruses should be uprooted in the early stages as well as spraying with acetamiprid 20% SP @ 100 g/ha for controlling the vectors like aphid and white fly. Fruit fly is the most harmful pest of bitter melon which can be managed by collection and destruction of dropped fruits and infested fruits on plants, raking the soil around the plants to expose fruit fly pupae for natural enemies and placing of cue-lure traps helps in both monitoring and management of fruit fly. Spraying of spinosad @ 5 ml/10 litre of water is also effective. Collection and destruction of beetles in early stage of infestation controls red pumpkin beetle in bitter melon.

Harvesting and yield

Fruits are ready for first harvesting after 45-50 days of sowing when they become dark green, medium long (16 cm) and attains fruit diameter of 5.5-6.5 cm. The average yield is 22.26 tonnes/ha.

Seed production

Seed production of Pusa Hybrid-4 can be done both under protected structures and open field condition. Generally, spring summer season is preferred for open field hybrid seed production whereas under protected structures, it can be done both during summer and *kharif* season. It is a highly cross pollinated crop, therefore, under open field, the proper isolation distance should be maintained from other varieties. If it is difficult to maintain the isolation distance, the female and male buds should be protected by covering with butter paper bag and cotton one day prior to anthesis and hand pollination is done during early morning (7:30 to 9:00 AM). Gynoecious as female parent in Pusa Hybrid-4 allows the natural crossing between gynoecious line (Female parent) and monoecious line (Male parent). The planting ratio of 4:1 for female and male parent is ideal for proper pollination. Under protected structures, hand pollination is done for hybrid seed production. Silver thiosulphate (400 ppm) is used for the maintenance of gynoecious bitter melon lines (Female parent) which induces hermaphrodite flowers for selfing and sieving. The diseased and infected plants should be removed from the seed production field. The fully matured and ripened fruits should be harvested when the fruit colour has turned orange yellow. The fruits are crushed to separate seeds from the pulp followed by sun drying for 2-3 days till the moisture content of the seeds reaches 8% or below. The average seed yield is 2.5-3.0 q/ha. The seeds should be stored in moisture proof bags.

For further information, please write to:

T K Behera (Director and Principal Scientist), ICAR-Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh 231 304.
*Corresponding author's email: tusar@rediffmail.com