

FRENCHBEAN

French bean (*Phaseolus vulgaris* L.) being a traditional vegetable crop of North Eastern region, its cultivation under organic farming would be a profitable enterprise. Among different vegetables, French bean responds well to organic management practices and most potential crop for organic production in the NEH hills. It is an added advantage that this crop is relatively less prone to pest and disease problems. Appropriate technological backstopping for production of French bean will encourage the farmers to go for organic cultivation. French bean being a self-pollinated crop, its seed production and maintenance of its purity is much easier than other vegetable crops. Its dry seeds contain 22% proteins, 1.7% fat, 70% carbohydrates, 381 mg calcium, 425 mg phosphorus, and 12.4 mg iron per 100 gram of edible portions. The green pods are rich sources of vitamins. Its increased production and consumption will help in supplementing the major portion of the protein requirements of vegetarian population of the country.

French bean is cultivated mostly for vegetable purpose round the year except winter months (October - January). It is grown in foothills, mid and high altitude in all the north-eastern states including Sikkim. Tender pods are used as vegetable and mature seeds are consumed as dal. However, at present its average green pod yield is low in farmers field (4-5 t/ha) compared to its potential yield (10-12 t/ha).



Photo – French bean crop

Climatic requirements

Most of the French bean varieties are day neutral and sensitive to high temperature and frost. The French bean seeds do not germinate in cold weather. In order to obtain a good pod/ seed set, the mean day temperature should not exceed 30°C

Soil

Well-drained, loamy and light alluvial soils with pH 6.0 to 7.0 are ideal for proper growth and development of French bean.

Land preparation

For preparation of field, 2-3 ploughing followed by planking is done to make the land weed free and getting good tilth of soil.

Varieties

French bean varieties are classified in two groups Viz., bush or dwarf type and pole or climbing type. Some varieties suitable for the region are listed below-

Bush type – Arka Komal, Contender

Pole Type- Meghlaya Local Selection, Naga Local & Manipuri

Duration

75 – 90 days depending upon varieties and sowing time

Seed rate

Seed rate depends mainly on methods of sowing, size of seed and nature of the crop growth. However, the general seed rates of French bean are as follows:

- Bush type: 50 - 60 kg/ha
- Pole type: 25 - 30 kg/ha

Sowing time

Green pod (vegetable) purpose

- Low land: February- March
- Upland: August- 1st week of September

Highest green pod yield was recorded in the crop sown in last week of July (123.4 q/ha), which was followed by crop sown in the 1st week of August (110.9 q/ha). Further delay in sowing significantly reduced green pod yield irrespective of the variety.

Seed purpose

Middle of August to middle of September (upland) found to be optimum period for sowing of French bean for seed purpose in upland condition.

No significant reduction in seed yield was noticed when crop was sown up to second week of August but thereafter a significant reduction in seed yield was recorded when sowing was delayed beyond the last week of August. Although, seed yield was found higher in early sown crops, but seed quality was poor when sowing was done in the first week of August or prior to this due to heavy rain at maturity.

Sowing Method**(a) Flat bed sowing**

Seed should be sown at a row spacing of 30-40 cm keeping 15-20 cm distance from plant to plant.

(b) Bun sowing (Raised bed)

Seed should be sown on bun (raised bed) having 60-80 cm width and 20-30 cm height at a row spacing of 30-40 cm keeping 15-20 cm distance from plant to plant.

Thinning

Thinning should be done at 3-4 leaf stage i.e. 12-15 days after sowing to maintain optimum plant population (2.22 lakh /ha).

Earthing up

Earthing up of the crop is done immediately after thinning to avoid water logging.

Staking of pole type French bean

Plant should be supported by bamboo/wooden sticks (1.5- 2.0 m height) 15-20 days after sowing. Staking increases pod yield as well as seed quality. The same staking materials may be used for two to three times.

Weed management

Management of weed through cultural practices is safe and involves low inputs. When weeds are controlled by hoeing and hand weeding in the first half of the season, the increased canopy cover suppress the weeds.

Nutrient management

Application of lime @ 500 kg/ha in furrow/pits 2 weeks before sowing every year improves the growth and yield of French bean in the acid soils of north east India. Well decomposed FYM @ 15 t/ha + Rock phosphate 150 kg/ha or FYM @ 10 t/ha +

vermicompost 2.5 t/ha + Rock phosphate 150 kg/ha + neem cake 150 kg/ha meets the nutrient demand for optimum productivity. Full dose of organic manure and Rock Phosphate should be placed in furrows/pits below the seed at sowing. The entire crop residue and weed biomass should be incorporated in the field, which improves the fertility of soil.

Water management

In NEH Region, French bean is generally grown as rainfed crop during pre-rabi season (August- September) in upland conditions. However, under longer dry spell one irrigation may be given at flowering stage to get higher yield. In Pre-*kharif* season (Feb-March), French bean grown in lowland or medium upland requires assured irrigation because of very low rainfall during this period. 2-3 irrigations are sufficient to get higher yield. First irrigation may be given at 2-3 leaf stage and 2nd and 3rd irrigation may be given at branching and flowering stages, respectively.

Cropping systems

Under upland conditions, French bean is grown after maize. After maize harvest, the maize stalks should be used for mulching purpose in between the two rows of the French bean. In lowland, cropping sequence of rice- French bean is recommended. French bean helps in increasing cropping intensity because of its shorter growth duration.

Crop rotation

Paddy – French bean (Low land)
Maize –French bean (Upland)
Maize - Carrot – French bean (Upland)
Maize - French bean-Tomato (Upland)
Maize – French bean -Toria (Upland)
French bean-bhindi-black gram (raised beds)
French bean-bhindi-French bean (raised beds)

Pest Management

Insect pests

1. Blister beetle (*Mylabris phalerata*)

Symptoms – Adults are black in colour with a round orange spot and two transverse wavy orange bands across the wings. Adults feed voraciously on flowers, young pods and affect pod formation.

Management

Cultural - Sowing of French bean after second week of August helps in avoiding infestation of blister beetle. Manual collection and killing of blister beetle from the flowers during forenoon and collection of beetle aggregates from the grasses grown on bunds where they rest. It is most effective and economical.

Control measures – Installation of pheromone traps for *Helicoverpa armigera* 12/ha. Foliar spray of Azadirachtin 0.03%WSP 2500-5000 g/ha or foliar spray of *Bacillus thuringiensis* serovar kurstaki (3a,3b,3c) 5%WP 1000-1250 g/ha. Spray of Ha NPV 3 x10¹² POB/ha in 0.1% teepol is also very effective.

2. Mites

Symptoms – Mite affected leaves may appear bronzed; webbing covering the leaves; mites may be visible (using a hand lens) as tiny moving dots on the webs or underside of leaves, usually not spotted until there are visible symptoms on the plant; leaves turn yellow and may drop from plant. Plant become etiolated and starts dying due to sucking of sap from tender parts.

Management – Foliar spray of soft liquid soap is effective if initiated as soon as the infestation is noticed. Spray Neem oil (3%) or Karanjin (3%) or Derisome- 0.2% after germination at 10 days interval.

3. Aphid

Symptoms - Small soft bodied insects on underside of leaves and/or stems of plant; usually green or yellow in color, but may be pink, brown, red or black depending on species and host plant; if aphid infestation is heavy it may cause leaves to yellow and/or distorted, necrotic spots on leaves and/or stunted shoots; aphids secrete a sticky, sugary substance called honeydew which encourages the growth of sooty mould on the plants. Under severe attack developing pods are also damaged. Leaves, inflorescence stalk and young pods covered with dark coloured aphids

Management - Foliar spray of soft liquid soap is effective if initiated as soon as the infestation is noticed. Spray Neem oil (3%) or Karanjin (3%) after germination at 10 days interval.

Diseases

4. Anthracnose [*Colletotrichum lindemuthianum* (*Glomerella lindemuthiana*)]

Symptoms - Brownish to black small lesions appear on cotyledons, leaves and pods. Oval or eye-shaped lesions on stems which turn sunken and brown with purple to red margins; stems may break if cankers weaken stem; pods drying and

shrinking above areas of visible symptoms, reddish brown spots on pods which become circular and sunken with rust colored margin.

Management

Cultural - Use healthy seeds, adopt field sanitation, follow crop rotation. Use of resistant varieties Grow crop on bower system to avoid soil contact. Maintain proper drainage in the field.

Control measures - Hot water treatment of seeds at 57.2 deg. C for 20 min. Seed treatment with *Trichoderma/ Pseudomonas* @ 8-10 g/per kg seed. Soil amendment with *Trichoderma/ Pseudomonas* 5 kg, mixed with 300-400 kg FYM before sowing. If not under control, spray 1% Bordeaux mixture.

5. Rhizoctonia blight (*Rhizoctonia solani*)

Symptoms - Red brown shrunken spots on the stem just near the ground. Extend downwards first and then upwards. Entire plant may fall down and die

Management

Cultural - Use of tolerant and early maturing varieties. Deep summer ploughing and soil solarization, 4 – 5 years crop rotation with Wheat, Bajra and Crucifers. Field sanitation and destruction of all infected plants. Maintain proper drainage and aeration in the field.

Control measures - Seed treatment with *Trichoderma/ Pseudomonas* @ 8-10 g. per kg seed. Soil application of *Trichoderma/ Pseudomonas* @ 5 kg/ha. mixed with 300-400 kg. FYM/ Compost before sowing. Application of Neem cake extract – 10% (100 gm grinded cake powder in 1 lit. water) for the management of Root knot Nematode because nematode provides congenial conditions for the disease build up. Soil application of bio-control agent *Trichoderma harzianum* @ 5 kg/hectare

6. Powdery mildew (*Erysiphe polygoni*)

Symptoms - It is a foliar disease and symptoms are quite distinctive in form of white powdery spots on the leaves and stems of the infected plants. The most affected part in the infected plants is the lower surface of leaves, but the mildew can appear on any above-ground part of the plant. Disease progresses in the form of white spots of asexual spores that get larger and denser and may spread up and down the stem of the plant

Management

Cultural - Use resistant/tolerant cultivars. Adopt 2-3 year crop rotation in the affected areas. Infected crop debris must be burnt after harvesting.

Control measures - Spray 10% cow urine at 10 days interval reduces the infection. Spray wood ash solution (dissolve 10-12 kg ash in 50 lit. water, keep for 2 hours, decant and spray with 100 lit. water) /ha or dust turmeric powder 2 kg + Ash @ 20 kg/ha. Spray of finely ground sulphur @ 3.0 kg/ha with 500 lit water during cool hour of the day.

Harvesting

Green pods

Tender pods becomes ready for harvest at 50-55 days after sowing (DAS) in bush type varieties and 55-60 DAS in pole type varieties. Pods should be harvested at 3-4 days interval when they attain full size to get quality produce.

Seed purpose

August planted crop is very good for seed production as the chance of coinciding with rain during harvest is very meagre. For seed purpose, time of harvesting play a very important role, as premature harvesting results in poor quality seed, while delayed harvesting may cause in-situ germination in case of heavy rainfall. In pole type varieties, mature pods should be harvested twice. First harvesting should be done when two-third pods look dry and the second harvesting when 90 percent of the remaining pods look dry. In bush type varieties, harvesting can be done once due to their determinate growth and synchronisation in pod maturity.

Threshing and storage

The harvested crop should be threshed separately after sufficient sun drying. The seeds, which are shrivelled, unhealthy or broken, should be sorted out and discarded. After threshing, the seed should be dried up to 10-12 percent moisture level. The seed should not be stored in moist and high temperature conditions. Seeds are stored in gunny bags, earthen or steel bins.

Yield : A good crop of French bean yields about 10-15t/ha (green pods) and seed yield of about 1.5t/ha under organic production systems.