

Precision Farming of Brinjal

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Introduction

Brinjal or eggplant (*Solanum melongena*) is one of the most popular vegetable crops grown in about 5 lac ha area in India with an average productivity of 16.23 t/ha. In Rajasthan, the average productivity of brinjal is 4.38 t/ha. The low productivity in the state calls upon a well-defined precise package of practices which can improve the yield many folds. PFDC Bikaner made efforts in this direction and précised the existing package of practices of brinjal cultivation. The concept of micro irrigation and fertigation has been included in the package so as to guide the farmers regarding irrigation and fertilizer scheduling. The other precision farming components like nursery raising, selection of suitable varieties, in-situ moisture conservation and weed control by mulching, plant protection measures and protection from frost etc. have also been included in the package.

Suitable Varieties

Long fruits – Pusa Purple Long, Pusa Purple Cluster, Pusa Kranti

Round fruits - Pusa Purple Round, H-4, P-8, Pusa Anmol, Pant Rituraj, T-3

Hybrid varieties - Arka Navneet, Pusa Hybrid -6, F-1 Navkiran

Soil And Climate - Brinjal can be grown on all types of soils even having high pH from light sandy to heavy clay. Light soils are good for an early yield, while clay loam is well suited for higher yield. Brinjal requires a long warm growing season. Low temperature during cool season cause deformation of fruits. Daily mean temperature of 13 to 21°C is most favorable for optimum growth and yield. The brinjal seed germinate well at 25°C.

Soil Sterilization – The sterilization of soil can be achieved by both physical and chemical means. Physical control can also be done by solar energy. Chemical methods include treatments with herbicides and fumigants. For soil sterilization UV stabilized 150-micron transparent plastic mulch is appropriate to kill hibernating and soil born organism including plant pathogen and pests. During soil solarization, the incoming solar radiation penetrates the transparent plastic film and it is absorbed in the soil.

Raising of Nursery – Raised beds of 3 m length, 1 m width and 0.15 m height are prepared. Add 15 kg well rotten farm yard manure and 150 gm of single super phosphate. Drench the nursery beds with Captan (3 g/lit water) two days before sowing and level it. Treat the seeds with thiram or captan (2g/kg of seed) if not treated already. Sow the seeds one cm deep in rows, 5 cm apart. Cover the seed with mixture of well rotten manure and fine soil and press it well. Irrigate with micro sprinkler or fine rose - can in morning and evening.

Geometry- Plant to plant and row to row spacing depends upon the type of soil, variety and climatic condition. In general, 60x60 cm spacing is kept for non-spreading type varieties and 80 x 60 cm for spreading type varieties.

In drip irrigation system a lateral spacing of 120 cm and dripper spacing of 80 cm for paired row planting at 60 x 80 cm using 4 lph 16 mm lateral is economical. In sandy soil, single row planting at 80 x 40 cm may also be considered using 16 mm inline of 40 cm, 2 lph at lateral spacing of 80 cm. While, selecting lateral and dripper spacing its suitability to the next crop must also be considered

Transplanting – The seedlings get ready in 4 weeks for transplanting, it must have attained a height of about 12-15 cm with 4-5 leaves. Harden the seedlings by withholding irrigation for 4-6 days prior to transplanting. Irrigate the nursery lightly before lifting of seedlings. Uproot the seedlings without injury to the roots. Transplanting should be done during evening hours followed by irrigation. Firmly press the soil around the seedlings.

Irrigation- Irrigate the field as per the need of the crop. Timely and sufficient irrigation is essential for good growth, flowering, fruit setting and development of fruit. Is surface irrigation method irrigation should be applied on every third or fourth day during hot weather and every 7 to 12 days during winter. The brinjal field should be kept moist during frosty days.

The irrigation is applied on the basis of crop evapotranspiration ($ET_c = PE \times K_p \times K_c$) considering crop duration (140 days) and K_c value 0.55, 0.8, 1.2, and 0.85 for initial (20 days), crop development (40 days), mid-season (55 days) and late season stage (25 days), respectively.

Drip irrigation in Brinjal

Drip irrigation not only saves water but also found suitable for fertigation. By applying optimum water and fertilizer quantities at right time, yield can be increased

appreciably. The cost of drip system at 120 cm lateral spacing and 80 cm dripper spacing using 4 lph on line npc dripper is about 1.62 lac.



The cost of drip system for 80 cm lateral spacing using 16 mm, 40 cm, 2 lph drip line is about Rs 2.14 lac for which a subsidy of Rs 98840 is permissible to the growers. The list of drip system components for the crop geometry of 80 x 40 cm using in line drip of 16 mm is given below.



Drip system components for one hectare (Crop spacing 0.8 m x 0.4 m)

S.No.	Item description	Unit	Quantity
(A)	Head Control Unit		
A.1	Gravel filter 2" with B/W assembly	Nos	1
A.2	Disc filter 2"	Nos	1
A.3	Ventury injector 3/4"	Nos	1

A.4	Air release valve 1”	Nos	1
A.5	Pressure gauge	Nos	2
A.6	Non-return valve 2” (metallic)	Nos	1
A.7	By pass assembly 2”	Nos	1
(B)	PVC Manifold		
B.1	Main line 90 mm 4 kgf/cm ²	Mtrs	102
B.2	Main line 75 mm 4 kgf/cm ²	Mtrs	102
B.3	Sub main line 63 mm 4 kgf/cm ²	Mtrs	102
B.4	PPB valve 63 mm	Nos	4
B.5	Flush valve 63 mm	Nos	4
B.6	PVC fitting and accessories	L/S	
(C)	Drip Manifold		
C.1	Lateral 16 mm	Mtrs	250
C.2	Inline 16 mm 0.4 m 2 LPH	Mtrs	12500
C.3	Take off 16 mm	Nos	250
C.4	Rubber grommet	Nos	250
C.5	Line end 16 mm	Nos	250
C.6	Nipple 17 mm	Nos	50
C.7	Nipple 16 x17 mm	Nos	250

Irrigation schedule for brinjal cultivation under drip irrigation:

Crop Stage	Water applied (lit./ plant)
Establishment (20 days)	1 lit on alternate day
Emergence of new leaf to first flowering	2.8 lit on alternate day
Flowering and fruiting (55 days)	3.00 lit daily
Late season (till last picking)	2.00 lit daily

Manure and Fertilizer

Brinjal is heavy feeder crop, therefore, a balanced application of manure and fertilizer is of much importance for successful crop production. Further, the brinjal being a long duration crop requires a good amount of manure and fertilizer. 15 tonne well rotten FYM should be

incorporated at the time of field preparation. The crop should be supplemented with 80 kg nitrogen (N), 80 kg phosphorous (P_2O_5) and 60 kg potassium (K_2O). Half dose of N and full dose of P and K should be applied as basal dose and remaining half dose should be applied in two equal splits, at 20 DAS and at the time of flowering. For fertigation, the fertilizer should be applied in ten split doses at an interval of 10 days by suitable water-soluble fertilizers (19-19-19, 12-61-00) and urea.

Inter –Culture and Weed Control

The weeds should be controlled as soon as they are seen, during aggressive growth of crop by chemical or mechanical method. Hand weeding is the most effective and economical method for weed control. Pre-plant soil incorporation of fluchloralin (1-1.5 kg/ha) and pre-planting surface spraying of alachlor (1-1.5 kg/ha) has been found effective in controlling weeds. Use of 25-micron black plastic mulch in brinjal inhibits the germination and growth of weeds and also conserves the soil moisture. It also helps in maintaining soil temperature.



Plant Protection

(A) Insects

Shoot and fruit borer (*Leucinoides orbanalis*). The small larva enters into the plant tissues. At initial stage, it attacks on the terminal shoots and later on young fruits. Young shoots and leaf show sign of wilting and dropping due to insect attack.

Management

1. Rouge out the affected plants and destroy them.
2. Spray carbaryl (0.1%) or endosulfan (0.05%) as soon as attack is seen and repeat the spray after 15 days.

3. Apply carbofuran 3G or phorate 10 G @ 1.5 kg a.i. / ha in the soil before sowing and transplanting.

Jassids. They suck the cell sap from the lower surface of the leaves. Affected plants become pale yellow in colour. The jassids also transmit virus causing little leaf in brinjal.

Management

Spray carbaryl (0.1%) or endosulfan (0.05%) or malathion (0.1 %) as soon as attack is seen and repeat the spray after 10 days.

(B) Diseases

Damping off. (*Pythium spp.*, *Phytophthora spp.*, *Rhizoctonia spp.*). The fungus attacks at both pre and post- emergence stage of seedlings. The affected seedlings collapse at collar region and finally die.

Management

1. Avoid over watering.
2. Drench the nursery bed with thiram or captan @0.4 % at 5-7 days after germination.
3. Drench the soil with formalin (7%) upto 15 cm depth.
4. Treat the seed with captan or thiram @ 3 g/kg of seed.

Viral Disease

Mosaic. Leaves of affected plants exhibits mottling with raised dark green areas. Blisters are formed on the leaves and size of leaves is reduced. The virus is transmitted by aphids.

Management

1. Collect the seeds from virus free plants.
2. Rogue out the infected plants from the field.
3. Spray dimethoate (0.05%) or malathion (0.05%) at 10 days interval.

Harvesting and Yield

Harvesting should be done when fruits attain full size and colour but before start of ripening. Tenderness, bright colour and glossy appearance of fruits is the optimum stage of harvesting of fruits. A yield level of 300 qt/ha or more can be achieved by applying the precision farming package of practices.