

Recommended package of practices

FINGER MILLET (*Eleusine coracana* Gaertn.)

Varieties

A number of high yielding varieties have been evolved and released for cultivation in different states. The list of latest and popular varieties recommended for different states are given below.

Finger millet		
Sl. No.	State	Varieties
1.	Karnataka	GPU 28, GPU-45, GPU-48, PR 202, MR 1, MR 6, Indaf 7, ML-365, GPU 67, GPU 66, KMR 204, KMR 301, KMR 340
2.	Tamil Nadu	GPU 28, CO 13, TNAU 946 (CO 14), CO 9, CO 12, CO 15
3.	Andhrapradesh	VR 847, PR 202, VR 708, VR 762, VR 900, VR 936
4.	Jharkhand	A 404, BM 2
5.	Orissa	OEB 10, OUAT 2, BM 9-1, OEB 526, OEB-532
6.	Uttarakhand	PRM-2, VL 315, VL 324, VL-352, VL 149, VL 146, VL-348, VL-376, PES 400
7.	Chhattisgarh	Chhattisgarh-2, BR-7, GPU 28, PR 202, VR 708 and VL 149, VL 315, VL 324, VL 352, VL 376
8.	Maharashtra	Dapoli 1, PhuleNachani, KOPN 235, KoPLM 83
9.	Gujarat	GN 4, GN 5, GNN 6
10.	Bihar	RAU 8

Season

Finger millet is grown in all the cropping seasons in different parts of the country. More than 90 per cent of the area is under rainfed conditions, grown during *Kharif* season

Name of the State	Season
Andhra Pradesh	Early <i>kharif</i> (May-August)
	Late <i>kharif</i> (July-November)
	Late Rabi (November-March)
Bihar	<i>Kharif</i> (June-September)
Chhattisgarh	<i>Kharif</i> (June-Sept)
Jarkhand	<i>Kharif</i> (June-September)
Gujarat	<i>Kharif</i> (June-September)
Himachal Pradesh	<i>Kharif</i> (April-September)

Karnataka	Kar or Early <i>Kharif</i> (April-August)
	<i>Kharif</i> (July-November)
	Late <i>kharif</i> (August-November)
	Rabi (October-September)
	Summer (January-May)
Maharashtra	<i>Kharif</i> (May-September)
Madhya Pradesh	<i>Kharif</i> (June-October)
Orissa	<i>Kharif</i> (June - September)
Tamil Nadu	Maghazipattam(December-April)
	Chitharaipattam (April-August)
	Adipattam (June-September)
	Purattasipattam (September.-December)
Uttar Pradesh	<i>Kharif</i> (June-September)
Uttaranchal	<i>Kharif</i> (June-October)

Tillage

Fall ploughing is advantageous for moisture conservation.

In the month of April or May, one deep ploughing with mould board plough

Followed by ploughing with wooden plough twice is necessary.

Before sowing secondary tillage with cultivator and multiple tooth hoe to prepare smooth seed bed is necessary.

Minor land smoothing before sowing helps in better in-situ moisture conservation. Seeds are very small and take 5-7 days to germinate. Hence good seeds, land preparation helps in better germination, minimize weeds problem and effective soil moisture conservation.

In Uttaranchal where frequent ploughing operations are difficult to carry out effective digging and turning of soil, removing perennial weeds, land smoothing, providing inward slope with a shallow drain helps in taking out excess rain water.

Seed rate:

A seed rate of 10 kg ha⁻¹ is found to be optimum for drill sowing and 5 kg ha⁻¹ for raising seedlings for transplanted condition.

Sowing/Planting

Line sowing is beneficial helps in inter cultivation and control of weeds effectively. Maintenance of optimum plant population of 4-5 lakh plants ha⁻¹ this is attained by line sowing using seed drill giving a spacing of 22.5-30 cm between rows and 7.5-10 cm between plants

Transplanting in irrigated condition

Spacing and Manuring

State	Spacing (cm)	Fertilizers (NP ₂ O ₅ K ₂ O Kg/ha)	
		Rainfed	Irrigated
Andhra Pradesh	22.5 x 10.0	40:20:20	60:30:30
Bihar	22.5 x 10.0	40:20:20	40:20:20
Jarkhand	22.0 x 10.0	40:20:20	40:20:20
Gujarat	30.0 x 7.5	40:20:10	
Himachal Pradesh	25.0 x 10.0	40:20:0	
Karnataka	22.5 to 30 x 7.5 to 10 (Rainfed) 22.5 x 10 (Irrigated)	50:40:25	100:50:50
Maharashtra	22.5 x 10.0	25:20:0	50:25:0
Chhattisgarh	25.0 x 15.0	60:30:20	
Madhya Pradesh	22.5 x 10.0	40:40:0	
Orissa	22.5 x 10	40:20:20	60:20:20
Tamil Nadu	22.5 x 15.0	40:20:20	90:45:45
Uttaranchal	25.0 x 15.0	60:30:20	

Entire P₂O₅ and K₂O are to be applied at sowing, whereas nitrogen is to be applied in two or three split doses depending upon moisture availability.

In areas of good rainfall and moisture availability: 50% of recommended nitrogen is to be applied at sowing and the remaining 50% in two equal splits at 25-30 and 40-45 days after sowing.

In areas of uncertain rainfall: 50% at sowing and the remaining 50% around 35 days after sowing is recommended.

Adequate application of FYM, 7.5 to 10 tonnes per hectare help in better development of root growth.

Bio-fertilizers:

Treating seeds with *Azospirillum brasilense* (N fixing bacterium) and *Aspergillus awamori* (P Solubilizing fungus) @ 25 g/kg seed is beneficial. In case seeds are to be treated with seed dressing chemicals, treat the seeds first with seed dressing chemicals and then with bio-fertilizers at the time of sowing.

Procedure for inoculating seeds with bio-fertilizers

1. Bio-fertilizer culture specific to the crop is to be used @ 25g per kg of seed.
2. Sticker solution is necessary for effective seed inoculation. This can be prepared by dissolving 25 g jaggery or sugar in 250 ml water and boiling for 5 minutes. The solution thus prepared is cooled.
3. Smear the seeds well using the required quantity of sticker solution. Then add culture to the seeds and mix thoroughly so as to get a fine coating of culture on the seed.
4. The culture-coated seed is to be dried well in shade to avoid clumping of seeds.
5. Use the inoculated seeds for sowing.

Soil and moisture conservation practices

- Summer ploughing or ploughing after the harvest of previous crop
- Ploughing across the slope
- Erection of small section bunds at an interval of 10-12m depending up on the slope and levelling the depressions
- Opening a dead furrow at 3.3 to 4.0 m interval.

Nursery management

An area of 150 m² is required to raise seedlings to suffice 1 ha. 35-38 beds of 4 feet wide and 25 feet long and 4 inches height fine seed bed is required.

Apply 2-3 baskets of well decomposed FYM along with 1 kg super phosphate, half kg muriate of potash and half kg ammonium phosphate and 750 g zinc sulphate per bed. Sow the seeds by opening rows at every 3 inch uniformly. Cover the seed with well decomposed FYM and soil/sand/water every bed. Top dress with urea 500 g per bed when the seedlings are 12-14 days old.

Seedlings of 21-25 days old are ideal for transplanting in rows of 22.5-25 cm with 2 seedlings /hill with 10 cm between hills.

Treating seeds with *Azospirillum brasilense* (nitrogen fixing bacterium) and *Aspergillus awamouri* (phosphate solubilizing fungus) @ 25 g kg⁻¹ is beneficial.

Cropping Systems: Inter cropping, crop rotation and cropping sequence

Inter cropping

State	System
Karnataka, Tamil nadu and Andhra pradesh	Finger millet + Pigeon pea 8-10:2
	Finger millet + Filed bean 8:1
	Finger millet + Soybean 4:1
Bihar	Finger millet + Pigeon pea 6:2
Uttaranchal	Finger millet and Soybean mixed together in 90:10 per cent proportion by weight basis
North hilly areas	Finger millet + Soybean in <i>Kharif</i> and oats in rabi is an ideal remunerative sequence
Maharashtra (Kolhapur)	Finger millet + black gram / moong bean 6-8 : 1 (Sub montane regions)

Crop Rotation

Northern states: Rotation with legumes like green gram/black gram/rice bean/soybean

Southern states: a. Horse gram, pigeon pea, field bean or ground nut
b. This practice will minimize inorganic fertilizer application and also sustain higher yields.
c. Finger millet-finger millet rotation must be discouraged as it affects sustainability of soil as well as crop yield.

Cropping sequence

Northern Bihar: Potato-paddy-finger millet cropping sequence is highly remunerative than other cropping sequences for garden land.

Southern Karnataka or Deccan plateau: Finger millet-potato-maize or finger millet-onion-finger millet are highly remunerative cropping sequences.

Assured rainfall areas: raising crop of cowpea or green gram or Sesamum followed by sowing / transplanting of early duration finger millet can be practiced.

Weed control:

Weeds problem in ragi crop can be effectively managed by cultural and mechanical measures

Line sowing: 2-3 inter cultivations and one hand weeding

Broadcast crop: 2 effective hand weeding will minimize weeds

In assured rainfall and irrigated areas: Pre-emergence spray: Isoproturon @ 0.5 kg a.i./ha. (Rainfed areas), Oxyfluorfen @ 0.1 lta.i /ha (Irrigated areas)

Post-emergent spray: 2, 4-D sodium salt @ 0.75 kg a.i./ha Spraying around 20-25 days after sowing effectively control weeds.

Irrigation

Depending on soil type, weather condition and duration of variety, 8-14 irrigations are necessary.

Light soils: Irrigate the crop once in 6-8 days

Heavy soils: once in 12-15 days.

Diseases

Finger millet is affected by a variety of diseases of which blast caused by *Pyricularia grisea* is the major problem. The disease is quite severe in *khari* crop at all the growth stages. The losses caused will be more if the disease appears in the nursery and on the ears affecting the neck and fingers.

Management

- By growing resistant varieties like GPU 28, GPU 26 and GPU 48.
- Treating seeds with fungicides like carbendazim @ 2g/kg a day before sowing
- If necessary spraying the nursery with carbendazim (0.05%) or kitazin (0.1%) or Ediphefos (0.1%) or Saaf (0.2%)
- Spray any of the above fungicides at 50 per cent flowering and repeat 10 days later if Kitazin or Ediphenfos were used to control neck and finger blast.

In recent years, brown spot caused by *Drechsleranodulosa* is gaining importance. Its damage could be severe if the crop is subjected to drought or nutrition deficiency. The disease can be effectively managed by proper nutrition and water management. Need based spraying of Mancozeb or Saaf (0.2%) can be resorted to.

Other diseases affecting the crop are mottle streak & streak virus, foot rot (*Sclerotiumrolfsii*), downy mildew or green ear (*Sclerosporamacrospora*), grain smut (*Melanopsichiumeleusinis*). Besides, at higher altitudes Cercosporaa leaf spot and in the coastal regions sheath blight (*Rhizoctonia* sp.) also appear, but are of minor importance.

Pests

Finger millet attracts several pests of which army worm, cutworm, stemborer, leaf aphid, grasshoppers, grey weevil, shootfly and ear caterpillars are important.

Army worms and cut worms

They appear during the early stages and continue upto harvest. The caterpillars cut seedlings at the base during early stage, which appears as if grazed by domestic animal. They are active during night and hide under stones and clods during the day. In later stages of plant growth, these insects act as defoliators. They are cyclic in nature.

Control

When the symptoms are noticed take up dusting of Malathion 5% @ 24 kg/ha or Endosulfan 4% @ 12 kg/ha or Phasolone 5% @ 24 kg / ha or Quinolfos 1.5% @ 24 kg/ha.

Leaf aphid

It occurs throughout the crop growing period. The nymphs and adults suck the sap from tender leaves and stem. They can cause serious damage in the seedling stage upto 30 days.

Control

Spray Dimethioate (0.05%) or quinolfos (0.05%).

Stemborers

The larva bores into the stem, resulting in dead heart.

Control

Spray the crop with Dimethioate (0.05%) or Phosphamidon (0.05%) or Monocrotophos (0.04%)

Ear caterpillars

Ear caterpillars appear at dough stage on ears and persist till harvest. The caterpillars bite the maturing seeds and make a fine web out of their casting and half eaten grains. This further attracts saprophytic fungi.

Control

Dust Malathion 5% @ 24 kg/ha or Quinolfos 1.5% @ 24 kg/ha or Endosulfan 4% @ 24 kg/ha or Phosalone 4% @ 24 kg/ha.