

Recommended package of practices: Rabi sorghum

1. Crop based cropping system

Rabi sorghum is sown after a fallow period (*kharif*) in certain medium to deep soil areas where the rainfall frequency is high. However, double cropping of black gram/ green gram/ cowpea (fodder) and rabi sorghum is recommended wherever found operationally feasible. Soybean – rabi sorghum sequential cropping found feasible and profitable in irrigated conditions. Intercropping of sorghum + safflower in 4:2 or 6:3 ratio is recommended on deep soils.

2. Preparation of land

One deep ploughing with mould board plough in summer followed by 3 to 4 harrowing is recommended to attain good seed bed and maintain weed free conditions. To improve the water retention compartmental bunds of 10m × 10m in the month of August is being recommended.

3. Selection of high yielding varieties and hybrids

The rabi sorghum varieties and hybrids recommended for different states are as follows.

State	Area of adptation	Hybrids	Varieties
Maharashtra	Rain fed areas (Medium to deep soils)	CSH 15R,CSH-19R	Swati, M35-1, CSV-14R, CSV-216R, Parbhani Moti, Mauli, CSV-22, CSV 29 R
	Irrigated areas	CSH 15R,CSH-19R	Swati, CSV-216R, CSV-18, PKV Kranti, CSV-22, Phule Vasudha
	Shallow soil		Sel.3, Phule Anuradha, Phule Chitra, CSV 26 R
Karnataka	Dry zones	CSH 15R	M 35-1, DSV 4, CSV 26 R
	Transitional zones	CSH 15R	CSV 14R, DSV 5
	Irrigated zone	CSH-15R, CSH-19R	DSV 5, CSV-216R, CSV 18, CSV 22, CSV 29 R
Andhra Pradesh	Early rabi of Rayalaseema	CSH 15R	CSV 14R

	Normal rabi areas	CSH 15R	M 35-1, CSV 14R, CSV 216 R, CSV 18, CSV 22
Tamil Nadu	Entire rabi area	CSH-15R	CSV 14R, CSV 216 R, CSV 18, CSV 22
	Summer irrigated areas	CSH-15R	CO 26, CO 24, CO 25, CSV 14R
Gujarat	Entire rabi zone	CSH 15R	CSV 14R, CSV 216 R, CSV 18, CSV 22

4. Method and time of sowing

The crop is sown by bullock drawn seed drills with 2 or 3 coulters at 7 cm depth in the soil. The seeds are covered by one harrowing after sowing by seed drill. It is also sown by tractor drawn seed drill with 4 coulters with simultaneous covering of seeds by blade attached to the seed drill.

Time of sowing: The optimum sowing time for rabi sorghum is 2nd fortnight of September to 1st fortnight of October. In double cropping practice sowing is extended up to 2nd fortnight of October.

5. Seed rate spacing and plant population

- Seed rate* : 8-10 kg/ha
- Spacing* : Row to row 45 cm and plant to plant 15 cm
- Plant population* : In rainfed conditions - 1.35 lakh per ha.
In irrigated conditions - 1.50 to 1.80 lakh per ha.

6. Nutrient management

- Rainfed (shallow to medium soil)* : 40:20:00 Kg NPK ha⁻¹ as basal
- Rainfed (deep soil)* : 60:30:00 Kg NPK ha⁻¹ as basal
- Irrigated* : 80:40:40 Kg NPK ha⁻¹ (N in two equal splits
50% as basal and 50% at 30-35 days after sowing)

7. Inter-cultivation and weed control

Inter-cultivation 2 or 3 time at 3, 5 and 7 weeks after sowing to check the weed growth and also helps conserve soil moisture by providing top soil mulch.

Weed management: Application of Atrazine @ 0.5 kg a.l./ha is recommended for spraying on the soil as pre-emergence application immediately after sowing.

8. Water management

Under irrigated conditions in medium deep to deep soils, three irrigations first at germination, next panicle initiation and third at grain filling stage are desirable. Optimum irrigation schedule consist of five irrigations each at 35, 55, 75, 85 and 105 days after sowing which coincides with physiological stages of panicle primordial initiation, boot leaf, flowering, milky and dough stages respectively. In case of limited availability of irrigation water, it can be restricted to one irrigation and it should be at flower primordial stage or boot leaf stage depending on the soil moisture situation.

9. Insect pests and disease management

Insect-pests

a) Shoot fly

Damage symptoms: It is a seedling pest and normally occurs in the 1st- 4th week after germination. Maggot feeds on the growing tip causing wilting of leaf and later drying of central leaf giving a typical appearance of 'dead heart' symptoms.

Cultural control: Planting towards the September end to October first week is ideal to escape shoot fly damage. Another important practice is to increase the seed rate and destroy the 'deadheart' seedlings after removal, to maintain the optimum plant stand.

Chemical control: When planted late, the shootfly can effectively be controlled by seed treatment with Furadan 50 SP @ 100 g/kg seed. Besides, any of the granular formulations of Furadan 3G or Phorate 10 G at the time of sowing as soil application in the seed furrows @ 20 kg ha⁻¹ can also effectively check the pest incidence. In case soil granular application is not done, damage can be minimized by spraying seedling at 7 and 14 days stages with Endosulfan @ 2 ml/liter water.

b) Stem borer

Damage symptoms: It infests the crop from 2nd week till maturity. Initially, the larvae feed on the upper surface of whorl leaves leaving the lower surface intact as transparent windows. As the severity of the feeding increases, blend of punctures and scratches of epidermal feeding appears prominently. Sometimes 'dead heart' symptoms also develop in younger plants due to early attack. Peduncle tunneling results in either breakage or complete or partial chaffy panicles.

Cultural control: The carryover of the pest from one season to another is through stubbles left in the field as well as the stems/stalks kept for use as fodder after harvest. Uprooting and burning of stubbles and chopping of stems prevent its carryover.

Chemical control: The borer can be controlled by application of any of the insecticides in to the whorl such as Endosulfan 4G / 4D, Carbaryl 3G, Malathion 10D or Furadan 3 G @ 8-12 kg ha⁻¹ at 20 and 35 days after emergence.

c) Shoot bug

Damage symptoms: Heavy infestation is seen on the rabi crop, when rain occurs at seedling stage. The nymph as adult suck the plant sap causing reduced plant vigour and yellowing. In severe cases, the younger leaves start drying and gradually extends to older leaves. Sometimes, complete plant death occurs. It is also carrier of str...

Control measures: 1. Alternate host grasses as related should be removed to build up of shoot bug.

Chemical Control: Application of Endosulfan 4G or Carbaryl 3G @ 8 kg ha⁻¹ in the whorls can effectively check the incidence of the pest.

d) Aphids

Damage symptoms: Aphids prefers to feed on older leaves and their younger leaves. It also attacks during boot stage may result in poor panicle exertion. Both the nymphs and adults suck the sap and heavily infested leaves show yellowish blotches and necrosis may occur on leaf edges. They produce abundant honeydew which predisposes the plant to sooty and other sporadic fungal pathogens. Severe damage under moisture stress conditions resulting in drying of leaves as well as plant death.

Control measures: Spraying of Metasystox 35 EC (@ 1 lt ha⁻¹ in 500 lt water) effectively control aphids.

Diseases

a) Charcoal rot

Damage: Losses in grain yield and seed size occur due to premature drying and lodging. Stunted growth and smaller stalks than normal, due to infection result in loss of quality and quantity of fodder.

Control: (1) Minimal doses of nitrogen fertilizer and low plant densities reduce charcoal rot; (2) Crop rotation also reduces the disease. Sorghum as a mixed crop also suffers less damage by charcoal rot than sole crop; (3) Moisture conservation practices like wheat straw mulch will provide marginal advantage in checking the disease symptoms; (4) Growing varieties and hybrids resistant to predisposing stress conditions is of more economical value; (5) Soil treatment with Thiram @ 4.5 kg ha⁻¹ at sowing reduces the charcoal rot by 15%.

10. Technologies recommended during last one year

1. INM of 75% RDF + 2.5 t/ha FYM + Azospirillum seed treatment.
2. Soybean – rabi sorghum sequence and fertilizing rabi sorghum @ 75% RDF.

11. Critical technologies recommended earlier but need special attention

1. For rabi rainfed sorghum with improved varieties and hybrids, the recommendations on spacing, plant population and nitrogen application were: 45 cm × 15 cm, 135000 plants/ha and 60 kg N ha⁻¹.
2. The above practice is not followed by the farmers in majority of rabi areas and the practice has been 30 cm drilling, more than 40 kg N ha⁻¹.
3. Large scale seed production of new cultivars (CSH-15R, CSV-18R, CSV-22R) and their popularization.
4. Deep sowing of seed for better germination.

12. IPM / IRM modules

Disease management

1. October-sowing is recommended to reduce stripe virus disease incidence;
2. Minimal dose of nitrogen fertilizer and low plant densities reduces charcoal rot;
3. Moisture conservation practices like wheat straw mulch is recommended for better management of charcoal rot.

Pest management

1. Deep ploughing to expose the larval and pupal stages of shoot fly;
2. Early sowing between last week of September to first week of October for escaping shoot fly incidence;
3. High seed rate @ 10 to 12 kg ha⁻¹ is recommended in case delay in sowing;
4. Inter cropping of sorghum + safflower (2:1 ratio) in rabi season is recommended;
5. Seed treatment with Imidacloprid @14 ml/kg of seed or alternatively Furadan / Carbofuran 50SP@100 g/kg of seed is recommended;
6. Soil application of Carbofuran 3G granules @ 20 kg ha⁻¹ in furrows at the time of sowing as prophylactic measure to control shoot pest is recommended;
7. Releasing egg parasite, *Trichogramma chilonis* Ishii @ 12.5 lakh ha⁻¹ is recommended to reduce shootfly incidence in rabi sorghum.