

# Multipurpose sweet-stalked sorghum hybrid - ‘MADHURA’

Developed by [Nimbkar Agricultural Research Institute \(NARI\)](#)

Sweet-stalked sorghum [*Sorghum bicolor* (L.) Moench] is a multipurpose crop, which stores sugar in its stem. It can produce grain from its earhead and the stem can produce sugary juice, which can be used for syrup or jaggery production or can be fermented to produce ethanol for energy purpose. The bagasse and the stripped leaves make an excellent fodder for animals.

The Nimbkar Agricultural Research Institute (NARI) has been working on this crop for last more than 25 years and has developed a hybrid called “MADHURA”. Hybrid “Madhura” is not only suitable for preparation of ethanol and good quality syrup and jaggery, but it also produces high grain and fodder yields. NARI has developed the technology for chemical-free syrup production from sweet sorghum stalk juice.

## Salient features of hybrid “Madhura”:

- Hybrid “Madhura” is suitable for year round production and it matures in **115-125 days**.
- It gives **high grain** yield in rabi season and produces **high stalk** yield in both kharif and summer seasons.
- Yield performance of “Madhura” from one hectare.

Produce	Weight (Tons)
Green fodder	60-80
Stripped stalk	40-55
Green leaves	3.5-4.0
Grain	1.5-2.0
Syrup	3.0-5.5 (Brix : 74–75%)
Jaggery	2.0-3.0



‘Madhura’ A sweet-stalked sorghum hybrid (Field view)

- Quality and quantity parameters of hybrid “Madhura” for syrup.

Juice extractability : 40-50%  
Brix of juice : 17-23.5%  
Syrup recovery : 8-11.5% (on stripped stalk weight basis).

- If syrup or jaggery production is not possible, stalks can be used as fodder for cattle. **Increase in milk yield upto 20%** in milch cattle has been seen after feeding them fodder from hybrid ‘Madhura’.
- A **ratoon crop** can be taken for grain and/or fodder.
- Syrup prepared from the hybrid is **rich in** calcium, proteins, vitamin C and nicotinic acid. Due to its **lower production cost**, it may become a good alternative to honey.

## Package of practices :

1) **Climate** : ‘**Madhura**’ hybrid can be grown under diverse climatic conditions. The mean maximum and mean minimum temperatures under which it can be grown range from 30 to 36<sup>0</sup>C and 15 to 20<sup>0</sup>C, respectively. The range of average temperatures for its satisfactory growth is 27 to 30<sup>0</sup>C.

2) **Soil and preparatory tillage operations** : Well-drained **heavy to medium soil** is suitable for this crop. The soil should be ploughed followed by two to three harrowings. Before last harrowing, 10-15 cartloads of well-decomposed manure per hectare should be mixed in the soil.

3) **Season** : Kharif and summer are the ideal seasons for growing “**Madhura**”. It can also be grown during winter (rabi) season with 20% reduction in stalk yield, but with more grain yield.

### 4) **Sowing method** :

a) **For syrup** : The sowing should preferably be done on **ridges and furrows** under irrigated condition, but under rainfed condition **normal drilling** can be followed. The distance should be **45 to 60 cm** between two rows and **15 to 20 cm** between two plants within a row. Average **plant population** should be **1.0 to 1.5 lakh/ha**.

b) **For fodder** : For fodder purpose the inter and intra row spacings should be 45 cm and 10 to 15 cm respectively. Average **plant population** should be **2.0 to 2.5 lakh/ha**.

5) **Seed rate** : For syrup and grain : **7.5 kg/ha** and for fodder : **15 kg/ha**.

### 6) **Sowing time** :

Kharif (Monsoon) : First fortnight of June

Rabi (Winter) : From last week of September to second week of October.

Summer : From January to February end.

7) **Fertilizers** : A fertilizer dose of **80:40:40 kg, N:P:K/ha** at the time of sowing is optimum under rainfed condition. A fertilizer dose of **100:50:50 kg N:P:K/ha** is recommended for sowing under irrigated conditions. Half of the total nitrogen and full dose of phosphorus and potassium should be given at the time of sowing, while the remaining half of nitrogen should be given in **two equal doses either at 30-35 and 65-70 days** after sowing or at one time, 35 days after sowing followed by irrigation.

8) **Intercultivation** : Thinning should be done at **20-30 days after sowing**. In case of excessive tillering caused due to shootfly damage, tillers should be removed for getting uniform stalk size. Weeding two to three times at 3, 5 and 7 weeks after sowing not only helps to check weed growth but also conserve soil moisture by providing top soil mulch.

9) **Irrigation management** : Under irrigated conditions in medium to deep soils it is desirable to give **four irrigations** - one each at **panicle initiation, boot, bloom and grain filling stages**. In case of limited availability of irrigation water, it can be restricted even to one irrigation at panicle initiation (35 DAS) or boot stage (60 DAS). In summer season, **8-10 irrigations** are required.

## 10) Plant protection :

### Major pests

- a) **Shootfly (Atherigona soccata)** : It is a seedling pest and normally occurs 1 to 4 weeks after germination. Larvae feed on the growing tip causing wilting of inner leaf whorl and later drying of newest leaf giving a typical 'dead heart' appearance. Shootfly attack can be controlled by suitable adjustment of the sowing time. In kharif, sowing before June 15 and in rabi sowing from September end to first week of October is ideal to escape shootfly damage. **Carbofuran 3% granules @ 20 kg/ha at the time of sowing** as soil application along with seed can furrows can effectively check the pest incidence. In case soil application is not done, damage can be minimised by **spraying the seedlings** at 7 and 14 days' age with **endosulfan 35 EC @ 2 ml/lit** of water.
- b) **Stem borer (Chilo partellus)** : The pest infests the crop from second week after sowing till maturity. The larvae initially feed on the growing point of the plant, which results in dead heart and then they move down the outside of the stem, and bore into it just above an internode. This adversely affects the quality of syrup if prepared from the infested stalks. It can be controlled by **whorl application of endosulfan 4G/4D, carbaryl 3G, malathion 10D or carbofuran 3G @ 8-12 kg/ha** at 30 to 35 days after emergence.

### Sporadic pests

- a) **Shoot bug (Peregrinus maidis)** : Heavy infestation is seen on the crop, especially during rabi season

when rain occurs at seedling stage. The adults and nymphs suck the plant sap causing reduced plant vigor and yellowing. Heavy infestation at vegetative stage may twist the top leaves and prevent either the formation or emergence of panicles. **Application of endosulfan 4G or carbaryl 3G @ 8 kg/ha in the whorls** can effectively check the incidence of the pest.

- b) **Aphids (Rhopalosiphum maidis)** : Attack during boot stage may result in poor panicle exertion. Both the adults and nymphs suck the sap and heavily infested leaves show yellowish blotches. Necrosis may occur on leaf edges. Severe damage is noticed under moisture stress conditions resulting in drying of leaves as well as plant death. **Spraying of oxydemeton-methyl 35 EC @ 1 litre in 500 litre water per hectare** effectively controls aphids.
- c) **Midge (Contarinia sorghicola)** : The adult of the pest deposits eggs in flowers and the larvae feed on the ovaries, causing chaffiness of the earhead. To control the pest, one of the following insecticides should be dusted or sprayed when 1-2 midge adults per earhead are seen.
- i) **Malathion 5% dust, endosulfan 4% dust or quinalphos 1.5% dust @ 20 kg/ha**  
or
- ii) **Malathion 50 WP (100 ml), carbaryl 50 WP (2 kg) or endosulfan 35 EC (700 ml) in 500 litre water/ha.**

## Major diseases

- a) **Leaf blight (Exserohilum turcicum)** : This disease occurs under cloudy and humid conditions. The necrotic areas are more than 2.5 cm long and narrow with a straw-colored center. To control it **spray 1250 g** of either **mancozeb or copper oxychloride** in 500 litre water/ha. **Seed treatment with thiram @ 2.0 g/kg** is also effective.
- b) **Charcoal rot (Macrophomina phaseolina)** : Softening of basal stalk, lodging and poor grain filling are the evident external symptoms. The lower stem regions of the infected plants become soft, discolored and hollow resulting in lodging. Losses in grain yield and reduced seed size occur due to premature drying and lodging. **Soil treatment with thiram @ 4.5 kg/ha** at sowing can reduce the charcoal rot by 15%.

11) **Harvesting** : The crop can be harvested after the grain becomes physiologically mature. First the panicles are harvested and then the stalk can be harvested within 15-20 days for syrup, jaggery or alcohol production.

## Important hints :

- i) For fodder, the crop can be harvested just after flowering (i.e.70-75 days after sowing).
- ii) For syrup, jaggery or alcohol production, the stalks should be harvested within 15-20 days of grain maturity as after that the stalk weight and sugar percentage in juice may be reduced.
- iii) Before extracting the juice, especially for syrup or jaggery production, the stalks should be stripped of leaves.
- iv) The stalks should be crushed as soon as possible after harvest for jaggery production and 12-18 hours after harvest for syrup production. In any case juice extraction should be carried out within 24 hours of harvest.

**Ratooning** : A ratoon of hybrid “Madhura” can be taken for grain and fodder. After harvesting, a **fertilizer dose of 50 kg each of N:P:K per hectare** should be applied and the crop should be irrigated. Ratoon crop is ready for harvest within 90 days.

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