

Scientific crop production techniques for foxtail millet in Bihar

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Foxtail millet (Setaria italic L.) is an annual cereal that is mainly cultivated as a rainfed crop in India. It is one of the ancient domesticated annual crops having diploid chromosome number and C₄ photosynthesis. In India, the cultivation is mainly confined to Andhra Pradesh, Karnataka and Tamil Nadu, and to some extent grown in Bihar, Madhya Pradesh and Rajasthan. It is extensively used as grain or flour for meal purpose while straw for fodder. Foxtail millet is mainly grown as rainfed crop in Bihar on upland condition. At present its cultivation is practiced on a limited area for household consumption due to low productivity and lack of marketing. Therefore, there is a need to expand the area of cultivation besides increasing its productivity with improved agronomic practices.

Keywords: Bihar, Crop management, Foxtail millet, Varieties

FOXTAIL millet (*Setaria italic* L.) is a C₄ annual cereal crop with slender, erect, leafy stems capable of growing up to a height of 90–180 cm, good as food for human consumption and fodder for cattle. Eastern Asia is considered to be the centre of origin of foxtail millet. It is recognized as a nutri-cereal and each 100 g of grains contain 6-8 g fibre, 12.3 g protein, 60.9 g carbohydrate, 4.3 g fat, 31 mg calcium, 2.8 mg iron and can provide 331 KCal energy.

It can be grown in tropical as well as in temperate regions. But in India, it is confined to dry-lands of tropics in marginal lands as it has the tolerance to drought condition. It is considered as a remarkably drought tolerant crop and its water use efficiency is also been found to be higher than maize, wheat and sorghum. Generally, small and marginal farmers of Bihar cultivate local varieties of foxtail millet with sub-optimum level of management practices. Crop production is greatly affected by climatic factors (rainfall and temperature), soil factors and

cultural practices, viz. sowing date, seed rate, spacing, sowing technique, weed management and harvesting methods. Among the various management factors, non-monetary inputs like time of sowing, spacing and variety selection plays a vital role in increasing its productivity.

Climate and edaphic requirement

Foxtail millet is well grown in Jamui, Samastipur, Sitamarhi, Seohar, Muzaffarpur and Kaimur districts of Bihar. It is grown during *kharif* season. The average annual rainfall is 1200 mm and therefore, it is generally grown in upland condition. Although the crop is grown in wide range of soil types but it responds well in sandy loam soil with good drainage facilities. Soil pH varies from 7.5 to 8.3 for its cultivation in Bihar.



Plant stand of foxtail millet
Source: RPCAU, Pusa, Bihar

Suitable varieties recommended for Bihar

A list of foxtail varieties recommended for Bihar are given in Table 1.

Land preparation and sowing

Foxtail millet should be sown in line with well prepared seedbed free from weeds. Land should be prepared with one ploughing followed by one to two harrowing with blade harrow. Thereafter planking should be done

Table 1. Recommended varieties of foxtail millet for Bihar

Variety	Year of release	Duration (days)	Average yield (q/ha)	Salient features, if any
Rajendra Kauni 1	2017	80-85	20-25	Highly resistant to leaf blast, brown spot and leaf blight
Suryanandi (Sia 3088)	2012	70-75	20-25	Early maturity, suitable for double cropping
Sia 3156	2012	85-90	20-25	Highly responsive to nitrogenous fertilizer
Sia 3085	2011	90-95	20-30	Resistant to leaf blast and downy mildew
Pant Setaria 4	1998	80-85	18-20	Adapted to varied locations



Field preparation
Source: RPCAU, Pusa, Bihar

to break the clods as well as to level the fields.

Optimum time of sowing

Middle of June to middle of July.

Seed rate and spacing

For line sowing, a seed rate of 8 to 10 kg/ha is optimum. The optimum spacing of 25 cm × 10 cm is ideal with 2-3 cm depth of sowing.

Nutrient management

Foxtail millet is well responsive to fertilizer application especially to nitrogen and phosphorus but not to potassium. Soil test based fertilizer application is recommended. Apply farmyard manure @ 6 tonnes/ha about 30 days before sowing. Application of 40:20:20 N:P₂O₅:K₂O kg/ha is recommended to get a profitable yield in this region. Full dose of phosphorus, potassium and half dose of nitrogen should be applied at the time of sowing and remaining 50% of nitrogen should be applied in two equal splits, viz., 25% at tillering stage and rest 25% at flowering stage. Nitrogen should be applied after the receipt of rain.

Irrigation and weed management

Foxtail millet crop generally requires no irrigation. It is predominantly grown as rainfed

kharif crop. However, if dry spell occurs for longer period, then one life saving irrigation may be given to boost the yield.

The critical period for crop weed competition is initial 25-30 days after sowing. Generally, all types of weed are observed in foxtail millet field. Two manual weeding at 15-20 days after sowing and 30-35 days after sowing are sufficient to control the weeds. Isoproturon @ 0.5 kg a.i./ha as pre-emergence application or post-emergence spray with 2,4-D sodium salt @ 0.75 kg a.i./ha efficiently controls the broad leaved weeds and gives higher yield.

Cropping system

Inter-cropping system in foxtail millet cultivation suits better during *kharif* season and are more profitable than mono-cropping. The popular inter-cropping system for the state of Bihar comprise of foxtail millet + green gram, foxtail millet + soybean, foxtail millet + red gram with 4:2 row proportion. It facilitates soil fertility improvement when small millets are intercropped with legumes and enables to enrich the beneficial microbes in the soil.

Disease and pest management

Though the crop is less prone to any disease and pests in this region, some infestation by pests or causal organisms may appear in a very negligible percentage. The major diseases and pest are enlisted below.

Blast: Diamond shaped lesions appear on the leaves with grayish centre and this condition attack peduncles, leaves and grains. Spray of fungicide like mancozeb @ 0.2% is found to be effective if the disease appears at early stage.

Rust: Numerous pustules appear on both side of the leaf. Initially, pustules are generally brown that later turn black. Foliar spray of wettable sulphur @ 0.3% reduces the intensity of disease.

Green ear disease: Floral bract turns into leaf like appendages of variable size giving green ear like appearance. Seed treatment with Ridomil MZ 72 WP @ 2 g/kg seed followed by one foliar spray with mancozeb @ 0.2% is effective in reducing disease incidence.

Shoot fly: Damage of the pest generally appears in the seedling stage upto six weeks old crop. The central shoot starts drying up and shows typical symptoms of 'dead heart'. Early sowing can reduce shoot fly incidence. Seed treatment with Imidacloprid @ 10 ml/kg seeds or Thiamethoxam 70 WS @ 3 g/kg seed may be used.

Harvesting and yield potential

Harvesting should be done when the ear head colour starts fading or grains at lower portion of ear head matures. Normally, it is ready to harvest in 80-90 days after sowing. The separation of grains is usually done manually due to unavailability of thresher at present.

Grain yield of 20-25 quintals under ideal condition may be obtained with green fodder of 40-50 quintal.

SUMMARY

Location specific improved varieties and agronomic practices can enhance the productivity and profitability of foxtail millet in Bihar. It is more suited in foxtail millet –mustard – greengram or foxtail millet – maize + potato – greengram cropping system due to its shorter lifecycle. Extension activities need to be focused like awareness programme and demonstration at the farmer's field to disseminate the importance of foxtail millet. Furthermore, processing based interventions may promote the marketing of foxtail millet in Bihar which also gives better profitability in foxtail millet cultivation.

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