Yield enhancement in sorghum through frontline demonstrations

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ABSTRACT

Frontline demonstrations were conducted to demonstrate the yield enhancement through improved variety of sorghum with integrated crop management practices in the fields of ten farmers of Dharmapuri district, Tamil Nadu during Kharif season of 2015-16. The improved sorghum variety CO 30 was grown with recommended package of practices and compared with the farmers' practice. The results indicated that the higher grain yield (2380 kg/ha) was recorded in the demonstrations compared to 1950 kg/ha in farmers' practice. Thus there was an increase of 22.6 per cent in demonstrations over farmers' practice. The higher net income (Rs 14745/ha) was realised in demonstrations as compared to farmers' practice (Rs 9228/ha). Adoption of improved package of practices in sorghum cultivation under demonstration plots also recorded higher benefit-cost ratio (1.65) as compared to farmers' practice (1.44).

Keywords: Sorghum; frontline demonstration; grain yield; farmers' practice

INTRODUCTION

Sorghum, *Sorghum bicolor* (L) Moench is one of the important food and fodder cereal crops cultivated in India. It is the fifth most important cereal crop in the world after rice, wheat, maize and barley. It is an important alternative for human and animal food especially in regions of low water availability (Carvalho et al 2000). It is a high energy, drought tolerant and climate resilient crop. Sorghum grain is rich in calcium, iron, potassium, phosphorus, protein and fibre (Ashok Kumar et al 2013). Stem is highly nutritious and can be used as green fodder, dry fodder, hay or silage. Sorghum is also used for ethanol production, producing grain alcohol, starch production, biscuits preparation and production of adhesives and papers.

In India sorghum is cultivated on 5.82 Mha with 5.39 MT of production and 926 kg/ha of average productivity (Anon 2014a). In Tamil Nadu sorghum is grown both under rainfed as well as irrigated conditions. It is cultivated on 3.47 lakh hectare with production of 5.13 lakh tonnes and productivity of 1113 kg/ha (Anon 2014b). Coimbatore, Dindigul, Trichirapalli, Namakkal, Karur, Salem, Theni, Dharmapuri, Madurai and Vellore are the major sorghum growing districts in Tamil Nadu.

In Dharmapuri district sorghum crop is cultivated in an area of about 12900 ha with a production of 10853 tonnes and productivity of 1070 kg/ha (Anon 2014b). About 80 per cent of the area is sown under rainfed condition during Kharif season. Under rainfed condition the uncertainty and absence of uniform distribution of rainfall lead to the low productivity in sorghum. The other possible reasons for low productivity are non-availability of high yielding varieties, poor agronomic practices such as higher seed rate, adoption of narrow spacing, partial or less use of chemical fertilizers, improper pest and disease management practices etc. Hence frontline demonstrations on integrated crop management with improved sorghum variety were conducted under irrigated condition to enhance the productivity and economic returns and also for convincing the farmers to adopt the improved production technologies in sorghum.

MATERIAL and METHODS

Frontline demonstrations on integrated crop management in sorghum were conducted by Krishi Vigyan Kendra, Dharmapuri during the Kharif season of 2015-16 on the fields of ten farmers of selected villages viz Bathalahalli, Kovilur, Jadayampatty and Bikkampatty located in Pennagaram, Palacode and Morappur blocks of Dharmapuri district. Each frontline demonstration was laid out in 0.2 ha area and in adjacent 0.2 ha area the crop was cultivated with farmers' practice for comparison. The integrated crop management practices comprised the introduction of dual purpose sorghum variety CO 30, seed treatment with thiamethoxam @ 5 g/kg and bio-inoculant *Pseudomonas fluorescens* @ 10 g/kg, maintenance of optimum plant stand, integrated nutrient management including micronutrient mixture application and integrated pest and disease management strategies especially for stem borer. The beneficiary farmers were trained in all the integrated crop management practices followed in the demonstrations. The technological practices followed in farmers' practice and demonstrations are given in Table 1. Demonstration fields were periodically observed by the scientists of Krishi Vigyan Kendra and advisory recommendations were followed. During the time of harvest yield data were collected from both the demonstration and farmers' practice plots. Cost of cultivation, net income and cost-benefit ratio were worked out.

RESULTS and DISCUSSION

Growth and yield attributes

The data on the growth and yield attributes of sorghum are presented in Table 2. Results indicate that the demonstrations on sorghum dual purpose variety CO 30 with integrated crop management practices recorded higher plant height (195 cm) and panicle length (24.2 cm). The lower plant height (168 cm) and panicle length (16.2 cm) were recorded in local variety used in farmers' practice.

The damage incidence of shoot fly was lower in demonstration (2%) and higher in farmers' practice (16.2%). The lower shoot fly damage in demonstrations might be due to the adoption of integrated pest management strategies especially seed treatment with thiamethoxam. Similar results of reduction in shoot fly incidence in sorghum due to adoption of integrated pest management practices were reported by Balikai and Bhagwat (2009).

The results indicate that the higher grain yield (2380 kg/ha) was recorded in the demonstrations compared to 1950 kg/ha in farmers' practice. Thus there was an increase of 22.6 per cent in demonstrations over farmers' practice. The yield improvement in the demonstrations might be due to the combined effect of high yielding variety, its moderate resistantce to pests and diseases and adoption

Table 1. Technological practices followed under farmers' practice and demonstrations

Parameter	Farmers' practice	Demonstration (recommended improved practice)
Farming situation	Irrigated	Irrigated
Variety	Local (grain type)	CO 30 (grain and fodder type)
Time of sowing	June-July	June-July
Seed treatment	No seed treatment	Seed treatment with thiamethoxam @ 5 g/kg and *Pseudomonas fluorescens* @ 10 g/kg
Method of sowing	Broadcasting of seed	Hand dibbling on ridges by following a spacing of 45 x 15 cm
Fertilizer application	-Irrational use of nitrogenous fertilizers and neglected use of phosphate and potash fertilizers -No addition of micronutrient mixtures	-Recommended INM practices -Soil application of recommended dose of NPK ie 90:45:45 kg/ha -Basal application of millet micronutrient mixture @ 12.5 kg/ha
Weed management	Not practiced	One hand weeding on 20-25 days after sowing
Plant protection	No prophylactic or control measures for managing pests and diseases	-Need-based usage of plant protection chemicals -Seed treatment with thiamethoxam as prophylactic measure for the management of fly

of integrated nutrient, pest and disease management practices. Similar results have been reported earlier by Meena et al (2014) in maize and Govardhan Rao and Venkata Ramana (2017) in sorghum.

Economics

The data on economic indicators indicate that the higher cost of cultivation of Rs 22575/ha was involved in demonstrations as compared to Rs 21181/ ha under farmers' practice (Table 2). The frontline demonstration plots fetched higher gross income of Rs 37320/ha as compared to Rs 30409/ha in farmers' practice. The results also reveal that the net income from the demonstrations was substantially higher than farmers' practice. An average net income of Rs 14745/ ha was observed in demonstrations as compared to Rs 9228/ha in farmers' practice. On an average Rs 5517/ha as additional income was attributed to the higher yield obtained in demonstrations. Similar results on increase in net income due to adoption of improved technologies were reported by Gurumukh and Mishra (2003) in sorghum, Dhaka et al (2010) in maize and Sharma et al (2016) in wheat.

The higher benefit-cost ratio (1.65) was realized in demonstrations compared to farmers' practice (1.44). It might be due to the higher grain yield recorded in demonstrations compared to farmers' practice.

Table 2. Yield and economics of frontline demonstrations on sorghum

Parameter	Farmers' practice (FP)	Demonstration (recommended improved practice)
Plant height (cm)	168	195
Shoot fly incidence (%)	16.2	2.0
Panicle length (cm)	21.6	24.2
Grain yield (kg/ha)	1950	2380
Stover yield (kg/ha)	4130	5210
% increase in grain yield over FP	-	22.6
Gross cost (Rs/ha)	21181	22575
Gross income (Rs/ha)	30409	37320
Net income (Rs/ha)	9228	14745
B-C ratio	1.44	1.65

CONCLUSION

Based on the results obtained in the present investigations it can be concluded that the demonstrations on sorghum improved variety CO 30 with integrated crop management practices substantially increased the yield and income of the farmers. The farmers were convinced with the technological interventions demonstrated under frontline demonstration programme and they also motivated the other farmers of the district to adopt the integrated crop management practices in sorghum cultivation.

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