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RESEARCH ARTICLE

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Effect of integrated nutrient management and *in situ* moisture conservation studies in *Kharif* sorghum

B.A. SHINDE, J.P. DESHMUKH, R.R. NIMBALKAR AND S.M. EKATPURE

ABSTRACT

Field trials were carried out to study the effect of integrated nutrient management and moisture conservation studies in *Kharif* sorghum. The result revealed during 2007-08 years 50% RDF+2.5 t FYM ha^{-1}+ *Azotobacter* + P.S.B. and Sowing at 45 cm and opening furrow (3WAS) were found efficient to achieve significantly maximum grain and fodder yield as that of other fertilizer combinations and moisture conservation techniques. It has been also observed that sorghum attained more height, no. of leaves, leaf area and dry matter produced.

KEY WORDS : Sorghum, integrated nutrient management and moisture conservation techniques

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INTRODUCTION

Sorghum is one of the major crops of semi-arid tropic as well as in several parts of the world. In Maharashtra it is predominant crop occupying 60% of the total area and productivity in the country. However yield is low *i.e.* 500 kg ha^{-1}. Constraints for low productivity are identified as lack of improved high yielding cultivars, delayed sowing, low fertilizers use and improper adoption of management techniques. The cultivation of sorghum is mostly confined to vertisols of Maharashtra and Karnataka which are poor in nitrogen. Therefore present objectives of this study was to know the effect of integrated nutrient management and moisture conservation techniques.

The large scale production through the application of chemical fertilizer is the base of green revolution. But applications of higher quality of fertilizer without considering the crop requirement adversely affect the microbial population and soil health (Das *et al.,* 1997). About 27 per cent of India's population and 20 per cent of world population consume this millet as their principal food (Bhalerao, 1999).

Correspondence to:
B.A. SHINDE, Department of Agronomy, Ratnai College of Agriculture, AKLUJ (M.S.) INDIA

Authors' affiliations:
J.P. DESHMUKH, Dr. Panjabrao Deshmukh Agriculture University, AKOLA (M.S.) INDIA

R.R. NIMBALKAR, Department of Agronomy, Ratnai College of Agriculture, AKLUJ (M.S.) INDIA

S.M. EKATPURE, Department of Agriculture Extension, Ratnai College of Agriculture, AKLUJ (M.S.) INDIA

MATERIALS AND METHODS

The investigation was conducted at the sorghum research unit, Dr. P.D.K.V. Akola, adopting Factorial Randomized Block Design with three replications during rainy (*Kharif*) season of 2007. The trials consisted two factors *viz., in situ* moisture conservation practices consisted (L_1) flat bed sowing, (L_2) sowing at 45cm and opening furrow (3WAS) (L_3), paired planting at 30-60 cm and opening furrow (3WAS) and (L_4) paired planting at30-60 cm with one row of green gram.

Nutrient management practices consisted (N_1)100% RDF (80:40:40 kg NPK ha^{-1}) , (N_2) FYM @ 5.0 t ha^{-1} + *Azotobacter* + PSB and (N_3) 50% RDF + 2.5 t FYM ha^{-1} + *Azotobacter* + PSB. The sorghum hybrid variety CSH-14 was sown in rows as per treatment by using seed rate 7 kg ha^{-1} and recommended dose was given as per treatment to the plots. The soil was clay loam having p^H 7.4, medium for organic carbon (0.50 %), available N (250kg ha^{-1}), Phosphorus (24 kg P_2O_5 ha^{-1}) and high available potassium (267 kg K_2O ha^{-1}).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as well as relevant discussion have been presented under following heads :

Effect on growth parameters:

The application of 50% RDF + 2.5 t FYM ha^{-1} + *Azotobacter* + PSB and moisture conservation practices (L_2) sowing at 45cm and opening furrow (3WAS) showed best performance for no. of leaves, plant height, leaf area and dry matter accumulation. These treatments proved superior because integration of all suitable fertilizers like chemical, organic and biofertilizers as well as suitable moisture conservation practices improves the soil physical properties, hydraulic conductivity of soil, availability of NPK which increase the plant growth. The superiority of these treatments over the rest of combination of fertilizers and moisture conservation practices might also be due to higher availability of NO_3, N and production of growth

Table 1 : Effect of integrated nutrient management and *in situ* moisture conservation on growth parameters of *Kharif* sorghum

Treatments details	Plant height (cm)	No. of leaves $plant^{-1}$	Leaf area $plant^{-1}$	Dry matter $plant^{-1}$ (g)
Moisture conservation techniques				
L_1 :Flat bed sowing	166.25	8.67	39.63	118.64
L_2 :Sowing at 45cm and opening furrow(3WAS)	172.23	10.36	42.35	141.48
L_3 :Paired planting at 30-60 cm and opening furrow (3WAS)	169.23	9.39	41.08	122.29
L_4: Paired planting at30-60 cm with one row of green gram	164.21	10.07	40.06	122.18
S.E.(m)±	1.97	0.44	0.647	1.38
C.D. (P=0.05)	5.78	NS	1.89	4.05
Nutrient management				
N1:100% RDF (80:40:40 kg NPK ha^{-1})	173.94	11.27	43.66	155.18
N_2: FYM @ 5.0 t ha^{-1} + *Azotobacter* + PSB	158.77	7.00	37.55	67.71
N_3 : 50% RDF + 2.5 t FYM ha^{-1} + *Azotobacter* + PSB	171.66	10.61	41.51	155.16
S.E.(m)±	1.70	0.38	0.560	1.19
C.D. (P=0.05)	5.01	1.13	1.64	3.50
Interaction				
S.E.(m)±	3.40	0.77	1.12	2.50
C.D. (P=0.05)	NS	NS	NS	NS
GM	168.12	9.62	40.91	126.15

NS=Non-significant

Table 2 : Effect of integrated nutrient management and *in situ* moisture conservation on yield attributes and yields of *Kharif* sorghum

Treatments details	Test weight (g)	Grain weight cob^{-1}(g)	Grain yield ha^{-1}	Fodder yield ha^{-1}
Moisture conservation techniques				
L_1 :Flat bed sowing	29.17	18.13	40.67	81.34
L_2 :Sowing at 45cm and opening furrow(3WAS)	30.32	19.30	43.01	86.03
L_3 :Paired planting at 30-60 cm and opening furrow (3WAS)	30.02	19.06	42.78	85.57
L_4 :Paired planting at30-60 cm with one row of green gram.	29.84	18.81	41.95	83.91
S.E. (m)±	0.09	0.23	0.53	1.06
C.D. (P=0.05)	0.28	0.69	1.55	3.11
Nutrient management				
N_1:100% RDF (80:40:40 kg NPK ha^{-1})	31.45	20.37	45.59	91.19
N_2: FYM @ 5.0 t ha^{-1} + *Azotobacter* + PSB	27.82	16.26	36.25	72.50
N_3 : 50% RDF + 2.5 t FYM ha^{-1} + *Azotobacter* + PSB	30.26	19.84	44.48	88.96
S.E. (m)±	0.08	0.20	0.45	0.91
C.D. (P=0.05)	0.24	0.59	1.34	2.69
Interaction				
S.E. (m)±	0.16	0.40	0.91	1.83
C.D. (P=0.05)	NS	NS	NS	NS
GM	29.84	18.82	42.10	84.21

NS=Non-significant

promoting substances by biofertilizers (Kolekar *et al.*, 1998) (Table 1).

Effects on yield attributes and yield of sorghum:

The moisture conservation practices *i.e.* sowing at 45cm and opening furrow(3WAS) and nutrient combinations of 50% RDF + 2.5 t FYM ha^{-1} + *Azotobacter* + PSB produced significantly higher test weight (g) and grain yield per cob over the other treatments combinations (Tripathi and Bhan, 1995).

Grain and fodder yield increased significantly due to various combinations of chemical fertilizers, FYM and biofertilizers in the year of experimentation. The 50% RDF + 2.5 t FYM ha^{-1} + *Azotobacter* + PSB and moisture conservation practices sowing at 45cm and opening furrow(3WAS) recorded significantly higher grain and fodder yield over the other treatments (Table 2). The supply of N is related with carbohydrates utilization when nitrogen supply is sufficient fewer carbohydrates are deposited in vegetative parts and source- sink relationship becomes proper. The increased grain and fodder yield by FYM application with chemical and biofertilizer might be due to effect of FYM on improvement of physical properties of soil and availability of nutrients to the plants. (Sood and Sharma, 1992)

Nagre *et al.* (1990) and Algawadi and Gaur (1992) reported that the use of biofertilizer leads to higher availability of N and P which promoted growth and development and ultimately resulting in higher yield of fodder as well as grain yield.

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