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Original Research Article

Response of Sorghum Genotypes to different Fertility Levels on Growth and Yield Attributes of Sorghum

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A B S T R A C T

The experiment was conducted during *Kharif*, 2015 at AICSIP, Sorghum Research Station, VNMKV, Parbhani (MS). To Response of sorghum (*Sorghum bicolor* (L.) Moench) genotypes to different fertility levels i.e. 50% RDF (40:20:20 NPK Kg ha^{-1}), 75% RDF (60:30:30 NPK Kg ha^{-1}) 100% RDF (80:40:40 NPK Kg ha^{-1}) and 125% RDF (100:50:50 NPK Kg ha^{-1}) and 4 elite sorghum genotypes (SPV 2250, : CSH 20: CSH 27, SPH 1641) were compared in a Split plot design. The soils are slightly alkaline in pH with low in nitrogen content, medium in phosphorus and high in potassium. The results reveled that among the genotypes the higher plant height, number of functional leaves, leaf area, dry matter accumulation, circumference of stem, length of node and number of internodes is observed in SPH-1641. In respect of fertilizer levels, application of 125% RDF (100:50:50 NPK Kg ha^{-1}) recorded higher higher plant height, number of functional leaves, leaf area, dry matter accumulation, circumference of stem, length of node and number of internodes. Yield attributes *i.e.*, number of panicles m^{-2}, weight of panicle, length of panicle, number of grains panicle^{-1}, Wt. of grain plant^{-1} and grain yield were more with the application of 125%RDF (100:50:50 NPK Kg ha^{-1}) and genotype SPH-1641 over rest fertilizer levels and genotypes. All the treatments did not significantly influenced on test weight.

Keywords

Fertility levels, Genotypes, RDF SPH 1641 and NPK

Introduction

Sorghum [*Sorghum bicolor* (L.) Moench] is an important cereal crop in India popularly known as ‘Jawar’ and large size of among other grain millets is called ‘Great millet’. It is probably originated in East Central Africa and it was introduced to India from East Africa in the year 1500 BC. It is observed that area of *Kharif* sorghum is decreasing day by day while the production and productivity is in increasing trend. Increase in productivity is only due to high yielding genotypes and advanced technology. The area of *Kharif* jowar was decreasing because of labour problem for harvesting, market price, livestock population etc. If sorghum based industries and livestock population increased in the state again a day will come for sorghum. Identification of good quality sorghum genotypes and development of location specific production technology offer an excellent opportunity to provide fodder for better nutrition to bovine population (Pushpendra and Sumeriya, 2012).

Among these production factors, fertilizer plays a vital role in deciding the yield of sorghum. The nutrient requirement further increases with the use of high yielding cultivars and also soil moisture availability. The newly released varieties and hybrids respond differently to different fertility levels depending upon the type of root system and their root density. Hence, there is need to optimize the fertilizer quantity required to obtain highest productivity.

Materials and Methods

The experiment was conducted during *Kharif*, 2015 at AICSIP, Sorghum Research Station, V.N.M.K.V. Parbhani (MS) The site has semi-arid and sub-tropical climate with hot dry summer and cold winter. It is situated at 409 m mean sea level altitude 19°16' North latitude and 76°47' E longitude. The winter rains are low and uncertain. Most of the rainfall is received from South-West monsoon. The total rainfall during the experimental period was 320 mm which was spread over 21 rainy days.

In general, the climatic conditions were favorable for the *Kharif* sorghum growth. The soil of the experimental field was clayey in texture, slightly alkaline in reaction (pH 8.3), low in available nitrogen (126.2 kg/ha), medium in available phosphorus (16.9 kg/ha) and high in potassium (468.5 kg/ha) with moderate water holding capacity.

The experiment consisted of 16 treatment combinations comprising four sorghum genotypes (Hybrid SPH-1641, CSH 27, CSH 20 and Variety SPV 2250) and four fertilizer levels 50% RDF (40:20:20 NPK Kg ha^{-1}), 75% RDF (60:30:30 NPK Kg ha^{-1}), 100% RDF (80:40:40 NPK Kg ha^{-1}) and 125% RDF (100:50:50 NPK Kg ha^{-1}).

These treatments were tested in Split plot design with three replications. As per treatment, full dose of phosphorus and half of the nitrogen was applied at the time of sowing and rest half of the nitrogen was applied 30 days after sowing.

The P_2O_5 and N nutrients were supplied through DAP and urea fertilizers as per treatments. The sorghum genotypes as per treatment were sown manually on 20 june 2015 by drilling method at 45 x 15 cm apart using seed rate of 15 kg/ha. All the other standard agronomic practices for the cultivation of forage sorghum were followed uniformly in all the treatments.

Results and Discussion

Effect of fertility level on growth and yield attributes of sorghum

The data presented in Table no. 1 and table no. 2 revealed the linear increase in growth and yield parameters, is due to the Application of 125% RDF (100:50:50 NPK Kg ha^{-1} recorded significantly higher growth attributes *i.e.*, plant height, number of functional leaves, leaf area, dry matter, Circumference of stem, Length of node and Number of internodes this could be attributed due to soil enrichment with higher level of nutrients which owing to provide sufficient nutrients that are essentially required to various metabolic processes and finally resulting in plant growth.

These results are in agreement with those obtained by Patidar and Mali (2001), Singh *et al.,* (2012), Sami *et al.,* (2014) and Sujathamma *et al.,* (2015). Yield attributes *i.e.*, Weight of panicle (g), length of panicle (cm), number of grains $panicle^{-1}$, and Wt. of grain $plant^{-1}$ (g) and Grain yield which are the important character deciding the yield were higher under application of 125% RDF (100:50:50 NPK Kg ha^{-1}) followed by 100% RDF (80:40:40 NPK Kg ha^{-1}) as compared to other fertilizer levels.

Table.1 An extract of data on the important growth, development, attributing characters, of sorghum Genotypes as affected by the different levels of fertilizer

Treatment	*Plant height (cm)*	*Number of functional leaves plant^{-1}*	*Leaf area per plant (dm^2)*	*Total dry matter (g)*	*Circumference of stem (cm)*	*Length of node (cm)*	*Number of internodes*
Fertilizer level							
F_1-50% RDF (40:20:20 NPK Kg ha^{-1})	219.74	6.31	30.61	66.67	6.08	18.98	8.68
F_2-75% RDF (60:30:30 NPK Kg ha^{-1})	237.35	7.36	31.68	71.92	7.01	19.99	10.44
F_3-100% RDF (80:40:40 NPK Kg ha^{-1})	248.36	8.08	32.49	78.75	7.71	20.05	10.95
F_4-125% RDF (100:50:50 NPK Kg ha^{-1})	254.23	8.39	32.97	81.00	7.89	21.08	11.63
S.E. $\pm$	5.63	0.15	0.556	2.05	0.11	0.46	0.32
C.D. at 5 %	16.21	0.42	0.16	5.92	0.32	1.32	0.91
Genotypes							
G_1: SPV 2250	223.40	6.96	31.03	70.42	6.75	18.74	9.77
G_2: CSH 20	235.72	7.24	31.14	73.33	7.08	18.82	9.91
G_3: CSH 27	246.22	7.85	32.49	75.67	7.30	20.97	10.65
G_4: SPH 1641	254.33	8.09	33.11	78.92	7.56	21.57	11.38
S.E. $\pm$	5.63	0.15	0.56	2.05	0.11	0.46	0.32
C.D. at 5 %	16.21	0.42	1.60	5.92	0.32	1.32	0.91
Interaction (F x G)							
S.E. $\pm$		0.29	1.11	4.10	0.22	0.91	0.63
C.D. at 5 %		NS	NS	NS	NS	NS	NS
G. Mean		7.53	31.94	74.58	7.17	20.02	10.43

Table.2 An extract of data on the important, yield attributing characters of sorghum Genotypes as affected by the different levels of fertilizer

TREATMENT	*Length of panicle (cm)*	*Weight of panicle (g) plant^{-1}*	*Number of panicles /m^{2}*	*Number of grains panicle^{-1}*	*Wt. of grain plant^{-1} (g)*	*Test weight (g)*	**Grain yield (Kg ha^{-1})**
Fertilizer level							
F_1-50% RDF (40:20:20 NPK Kg ha^{-1})	23.93	63.13	12.98	956.33	9.29	23.7	1161
F_2-75% RDF (60:30:30 NPK Kg ha^{-1})	24.62	66.42	13.33	1061.33	10.48	24.1	1373
F_3-100% RDF (80:40:40 NPK Kg ha^{-1})	25.32	67.40	13.45	1203.02	13.28	24.4	1819
F_4-125% RDF (100:50:50 NPK Kg ha^{-1})	25.99	68.58	13.49	1251.75	13.73	24.9	1908
S.E. $\pm$	0.46	1.11	0.17	27.92	0.20	0.6	32.57
C.D. at 5 %	1.32	3.21	NS	80.43	0.59	NS	93.81
Genotypes							
G_1: SPV 2250	23.25	62.72	12.93	609.19	10.91	22.5	1464
G_2: CSH 20	24.15	66.38	13.26	808.92	11.07	23.8	1521
G_3: CSH 27	25.63	67.37	13.49	1498.50	12.14	25.3	1595
G_4: SPH 1641	26.83	69.07	13.56	1555.83	12.66	25.5	1681
S.E. $\pm$	0.46	1.11	0.17	27.92	0.20	0.6	32.57
C.D. at 5 %	1.32	3.21	NS	80.43	0.59	1.7	93.81
Interaction (F x G)							
S.E. $\pm$	0.91	2.22	0.33	55.84	0.41	1.1	65.13
C.D. at 5 %	NS	NS	NS	NS	NS	NS	NS
G. Mean	24.97	66.38	13.31	1118.11	11.69	24.3	1565.21

This might be due to greater availability of nutrients and metabolites for growth and development of reproductive structure, increased photosynthates might have enhanced number of flowers and their fertilization resulting in higher number of grains per panicle, greater assimilating surface at reproductive development resulted in better grain formation and higher sink at higher level of nutrition manifested yield attributes to the maximum. The results are in agreement with those of Silli *et al.,* (2001), Dhonde *et al*., (2004), Gangadhara *et al.*, (2008), Singh *et al.*, (2012) and Sujathamma *et al.*, (2015).

Effect of Genotypes on growth and yield attributes of sorghum

It is evident from the data presented in table no. 2 that a marked variation in growth of sorghum genotypes was observed during entire growth period. Genotype SPH-1641 had significantly better growth parameters such as plant height, number of functional leaves, leaf area, dry matter accumulation, number of internodes, length of node and stem girth as compared to CSH 27, CSH 20, SPV 2250 during all crop growth stages. At harvest the heights attained by SPH-1641, CSH 27, CSH 20 and SPV 2250 were 254.33, 246.22, 235.72 and 223.40 (cm) respectively. The number of functional leaves plant^{-1} (6.86) and leaf area plant^{-1} (dm^2) (26.53 dm^2) of SPH-1641 were significantly more as compared to rest of genotypes. The dry matter per plant produced at harvest by SPH-1641, CSH 27, CSH 20 and SPV 2250 were 78.92, 75.67, 75.67 and 70.42 (g) respectively. Thus, SPH-1641 produced significantly more amount of dry matter over CSH 20 and SPV 2250, followed by CSH 27. In respect of circumference of stem (cm) (7.56 cm), length of node (21.57 cm) and number of internodes (11.38) of SPH-1641 were significantly more over rest of the genotypes, however, this were at par with CSH 27 (7.30 cm and 11.91 respectively). Similar results were also reported by Silli *et al.*, (2001), Dhonde *et al.*, (2004), Gangadhara *et al.*, (2008), (Tisdale *et al.*, 1990). Sumeriya *et al.*, (2005)

An examination of data presented in Table 2 reveals that The grain yield per unit area in sorghum is a function of yield attributes of an individual plant *viz.*, number of panicles m^{-2}, weight of panicle, length of panicle, number of grains panicle^{-1}, Wt. of grain plant^{-1}, grain yield kg ha^{-1} and test weight. The result revealed that SPH-1641 significantly performed better for yield attributes over rest of genotypes.

Number of panicles m^{-2} (13.56), weight of panicle (69.07 g), length of panicle (26.83 cm), number of grains panicle^{-1} (1555.83), Wt. of grain plant^{-1} (12.66 g),) grain yield (1681) Kg ha^{-1}and test weight (25.5) of SPH-1641 were higher over rest of genotypes, followed by CSH 27 in respect of Number of panicles m^{-2} (13.49), weight of panicle (67.37 g), length of panicle (25.63 cm), number of grains panicle^{-1} (1498.50), Wt. of grain plant^{-1} (12.14 g test weight (25.3 g). This results conformity with findings of Kumar *et al.*, (2010) and Gabir *et al.*, (2014).

Interaction effect (F x G)

Interaction effect of fertilizer levels x genotypes on Growth and yield attributes were non-significant.

The application 125% RDF (100:50:50 NPK Kg ha^{-1}) (F_4) recorded significantly higher Growth, yield attributes and grain yield, as compared to rest of the fertilizer levels. Hence, it can be concluded that there is need to go with 125 % RDF level of fertilizer to sorghum as it responded better to higher dose of fertilizer. Among the genotypes SPH-1614 and CSH 27 produced higher Growth, yield attributes and grain yield as compare to other genotypes**.**

References

Dhonde M. B., Andhale R. P. and Shinde S. H. (2004). Effect on Integrated Nutrient Management on Growth and Yield of Sorghum (*Sorghum bicolor* L. Moench). *J. Maharastra Agric. Univ.*, 29 (2): 130-132.

Gabir Sami I. M. N., Manoj Khanna, Man Singh, Parihar S. S., Mani Indra and Das T. K. (2014). Effect of conservation practices and fertilizer on sorghum (*Sorghum bicolor* L. Moench) yield under rainfed condition of Northern India. *Indian journal of Agronomy,* 59 (1): 49-54.

Gangadhara K. S., Halepyati A. S., Pujari B. T. and Desai B. K. (2008). Effect of genotypes and nutrient levels on Dry matter Partitinoning, Yield, Yield attributes and economics of *rabi* pop sorghum under *rainfed* condition. *Karnataka J. Agric. Sci.,* 22 (1): 108-109.

Kumar S. R., Ramanjuneyulu, A. V. and Krishna, A. (2010). A decadal analysis of improved sorghum (*Sorghum bicolor*) cultivar response to fertilizer application in rainy season and a hypothetical grain production model. *Indian Journal of Agricultural Sciences* 80(9): 786-90

Patidar M. and Mali A. L. (2001). Effect of Farmyard manure, Fertility levels and Bio-fertilizer on Growth, Yield and Quality of Sorghum (*Sorghum bicolor* L. Moench). *Indian journal of Agronomy* 49 (2): 117-120.

Pushpendra Singh, and H. K. Sumeriya. 2012 : Effect of nitrogen on yield, economics and quality of fodder sorghum genotypes. *Ann. Pl. Soil Res*., 14 : 133-135.

Sami I M N, Gabir, Manoj Khanna, Man Singh, Parihar S S, Indra Mani, Das T K (2014). Effect of conservation practices and fertilizer on sorghum (*sorghum bicolor*) yield under rainfed conditions of northern India. *Indian J. Agron*. 59 (2): 301-305

Silli M. V., Hunshal C. S. and Patil R. H. (2001). Performance of Sweet Sorghum Genotypes to Varying Levels of Nitrogen and Phosphorous. GAU Res. *J.* 27 (1&2): 1-4.

Singh P., H. K. Sumeriya, N. S. Solanki and Upadhyay (2012). Yield and economics of sorghum genotypes as affected by fertility levels. *Ann. Pl. Soil Res* 14(1): 65-67.

Sujathamma, P., K. Kavita and V. Suneetha (2015). Response of grain sorghum cultivar to different fertilizer level under rainfed condition. *International Journal of Agricultural Science. ISSN*2167-0447 *Vol*. 5(1), pp 381-385.

Sumeriya, H. K., Singh, P. and Mali, A. L., (2005). Studies on the effect of fertility levels on growth and productivity of sorghum (*Sorghum bicolor* (L.) Moench). *Crop Research,* 30: 6-

Tisdale, S. L., Nelson, W. L. and Beaton, J. D., (1990). Soil Fertility and Fertilizer, 4th Edn. MacMillan Publishing Company, New York.