

Effect of Integrated Nutrient Management on Yield and Quality of Parching Sorghum Varieties

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ABSTRACT

To identify an ideal combination of Zinc, organic and inorganic nutrient sources for getting maximum yield of kharif parching sorghum a field experiment was carried out on Effect of integrated nutrient management on yield and quality of parching sorghum at Sorghum Research Unit, Dr. PDKV, Akola, during Kharif season of 2016-17 on clayey loam soil. The experiment was laid out in Factorial randomized block design in three replications. There were twelve treatments combination comprising of three different varieties viz., i.e., V1-PKV Ashwini, V2-Malkapurwani (Local), V3-PDKV Kartiki and four nutrient management treatments viz., T₁-10 t FYM ha⁻¹, T₂-100% RDF (80:40:40) kg N, P₂O₅, and K₂O ha⁻¹, T₃-75% RDF + 5 t FYM ha⁻¹ + ZnSO₄ 25 kg ha⁻¹, T₄-100% RDF + ZnSO₄ 25 kg ha⁻¹. Among the varieties PDKV Kartiki (V₃) recorded significantly higher green hurda yield (q ha⁻¹), dry grain yield (q ha⁻¹), grain weight per panicle (g plant⁻¹), aroma and taste. However, Malkapur wani (Local) (V₂) recorded significantly higher plant height, dry matter accumulation (g plant⁻¹), and fodder yield (q ha⁻¹). Growth character, yield contributing characters, green hurda yield and fodder yield were significantly maximum with application of 75% RDF + 5 t FYM ha⁻¹+ZnSO₄ 25 kg (T₃).

Keywords

INM, Parching Sorghum, Green hurda yield.

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Introduction

Sorghum is gaining importance as 'health food' now a days, because of its higher dietary fiber (7.6% to 9.2%). It contains 72.6 per cent carbohydrate, 10 to 12 per cent protein, 1.6 per cent mineral matter and 1.9 per cent fat. It is rich source of amino acids mainly lysine, thiamine, riboflavin and folic acid along with vitamin-B complex specially niacin (vitamin B₆). It contains nitrogen (212 mg), starch (5.6 % to 7.3 %) in high quantity along with copper, zinc and molybdenum. Its protein in bran, germ fractions contains four times the lysine and two times arginine and glycine than endosperm protein. About 27 per cent of

India's population and 20 per cent of world population consume this millet as their principle food (Bhalerao, 1999).

In several parts of India there is a practice of roasting sorghum heads at the dough stage and eating the threshed grain as a delicacy. The cultivars most suitable for roasting have a sweet endosperm that is dimpled at maturity. Vani sorghum (durra group) of India are especially popular in this respect. However the traditional wani sorghum types are very tall and late due to which they are highly susceptible to attack of midge with the result

that availability of hurda has almost vanished. It is better to choose an early parching sorghum genotype for getting more yield at soft dough stage and to fetch more market price for its good quality. Similarly, increased removal of micronutrients as a consequence of adoption of HYVs (high yielding variety's) and intensive cropping together with shift towards high analysis NPK fertilizers has caused decline in the level of micronutrients in the soil to below normal at which productivity of crops cannot be sustained. Zinc is essential for several enzymes that regulate various metabolic activities in plants. Therefore, it is better to choose integrated use of all potential sources of plant nutrients seems to be the only option to maintain soil fertility and crop productivity. A comprehensive literature search revealed that INM enhances crop yields by 8–150% compared with conventional practices. It also increases water-use efficiency, and the economic returns to farmers, while improving grain quality, soil health and sustainability. It is well known that the organic sources cannot meet the total nutrients need to modern agriculture, integrated use of nutrients seems to be more appropriate. Incorporation of organic sources and later on its decomposition determines the availability of the nutrients. The parching sorghum is eaten at soft dough stage as table purpose and zinc is an essential nutrient for human health Importance of application of zinc with INM can be highlighted for maintaining soil health and also for improving productivity of the sorghum at soft dough stage and getting this nutrient in to the crop. Therefore, the present study was undertaken with a view to find out the efficient combination of organic and inorganic fertilizers and zinc

Materials and Methods

A field experiment was carried out on Effect of integrated nutrient management on yield

and quality of parching sorghum at Sorghum Research Unit, Dr. PDKV, Akola, during Kharif season of 2016-17 on clayey loam soil. Experiment was laid out in the factorial randomized block design with four treatments replicated three times. The soil of the experimental field was clay loam in texture, low in nitrogen, organic carbon, phosphorus and rich in potash content. The soil reaction was found to be slightly alkaline.

The experiment was conducted with three parching sorghum varieties viz. PKV Ashwini (V₁), Malkapur wani (V₂) and PDKV Kartiki (V₃) and four Nutrient management treatments viz. 10 t FYM (T₁), 100% RDF (T₂), 75% RDF + 5 t FYM ha⁻¹ + ZnSo₄ 25 kg ha⁻¹ (T₃) and 100% RDF + ZnSo₄ 25 kg ha⁻¹ (T₄)

The Sorghum crop was sown in first week of July 2016 and harvested in October 2016 at its dough stage. Total rainfall of 595.3 mm in 32 rainy days was recorded during the crop growing season. Overall the weather during crop growing season was quite satisfactory. Recommended doses of inorganic fertilizers consisting of 80 kg N and 40 kg each of P₂O₅ and K₂O/ha were applied to sorghum. For sorghum N was applied in 2 splits, half at sowing along with entire quantity of P₂O₅ and K₂O and remaining N was applied 30 days after sowing. Nitrogen, phosphorus and potassium were applied through urea, single superphosphate and muriate of potash, respectively. Sorghum was sown using 7.5-10 kg ha⁻¹ with a spacing of 45 cm x 15 cm.

Results and Discussion

Effect of different parching sorghum varieties

Growth characters viz. plant height (cm), and dry matter (g plant⁻¹) was significantly higher of Malkapur wani (V₂). It might be due to the

varietal character of Malkapur wani variety. Yield attributes viz. grain weight per panicle, grain yield at soft dough stage (hurda) ($q\ ha^{-1}$), dry grain yield ($q\ ha^{-1}$) were significantly higher of PDKV Kartiki (V_3) followed by PKV Ashwini (V_1). Malkapur wani recorded lowest grain yield at soft dough stage as well as dry grain yield. Among the varieties PDKV Kartiki variety and PKV Ashwini were good in aroma with very sweet taste than the local Malkapur wani variety. Threshability of PKV Ashwini and PDKV Kartiki was free than the local Malkapur wani variety.

Effect of nutrient management

Application of nutrient management treatment significantly influenced the different growth

and yield attributing characters and yield of *kharif* parching sorghum. Growth characters viz. plant height, and dry matter plant⁻¹ was significantly higher with the application of 75% RDF + 5 t FYM ha^{-1} +ZnSo₄ 25 kg ha^{-1} (T_3) which was closely followed by application 100% RDF +ZnSo₄ 25 kg ha^{-1} (T_4). This might be due to higher availability of the nutrients as an effect of combine effect of inorganic, organic and zinc under T_3 .

The plant height was mainly influenced by fertility status of soil and it directly influenced the growth parameter. Thus ample availability of nutrients during the crop growth resulted in optimum cell division and stem elongation and ultimately the height of the plant and dry matter.

Table.1 Plant height (cm), Total dry matter (g per plant), Grain weight per panicle (g), Green hurda yield $q\ ha^{-1}$, Dry grain yield $q\ ha^{-1}$, Dry fodder yield $q\ ha^{-1}$ as influenced periodically by different treatments

	Height (cm)	Total dry matter (g per plant)	Grain weight per panicle(g)	Green hurda yield $q\ ha^{-1}$	Dry grain yield $q\ ha^{-1}$	Dry fodder yield $q\ ha^{-1}$
Factor A- Parching Sorghum Varieties						
V_1 - PKV Ashwini	223.26	121.86	107.75	33.15	18.44	123.32
V_2 -Malkapur wani (Local)	254.21	126.43	87.25	30.41	16.97	135.18
V_3 -PDKV Kartiki	192.95	118.95	136.58	35.98	20.40	116.18
SE (m)±	0.77	0.32	3.74	0.75	0.45	2.76
CD at 5 %	2.24	0.94	10.91	2.19	1.33	8.06
Factor B- Nutrient Management						
T_1 -10 t FYM	201.35	120.25	91.67	27.35	14.81	113.73
T_2 -100% RDF	217.16	122.27	100.67	32.47	18.06	121.24
T_3 -75% RDF + 5 t FYM ha^{-1} +ZnSO ₄ 25 $kg\ ha^{-1}$	243.04	124.57	131.78	39.97	21.83	137.71
T_4 -100% RDF +ZnSO ₄ 25 $kg\ ha^{-1}$	232.34	122.58	118.00	35.60	19.73	125.72
SE (m)±	0.88	0.37	4.32	0.87	0.52	3.19
CD at 5 %	2.58	1.08	12.60	2.53	1.53	9.31
Interaction (AXB)						
SE (m)±	1.53	0.64	7.48	1.50	0.91	5.52
CD at 5 %	NS	NS	NS	NS	NS	NS
GM	223.47	122.42	110.53	33.85	18.61	124.89

Table.2 Organoleptic parameter regarding parching sorghum as influenced by various treatments

Treatment	Aroma	Taste	Threshability
V ₁ T ₁	1.3	1.4	1
V ₁ T ₂	1.2	1.3	1
V ₁ T ₃	1.1	1.2	1
V ₁ T ₄	1.2	1.2	1
V ₂ T ₁	1.6	1.8	1.7
V ₂ T ₂	1.5	1.7	1.8
V ₂ T ₃	1.5	1.8	1.9
V ₂ T ₄	1.5	1.6	1.8
V ₃ T ₁	1.2	1.4	1
V ₃ T ₂	1.3	1.3	1
V ₃ T ₃	1.2	1.1	1
V ₃ T ₄	1.2	1.2	1

Rating Scale

Aroma	1	Good	2	Fair	3	No aroma
Taste	1	Very sweet	2	Medium sweet	3	Slightly sweet
Threshability	1	Free	1.5	Medium	2	Hard

Above results are in conformity with Gangwar and Niranjana (1991), Gangwar and Singh (1992) and Seema Nemade *et al.*, (2017).

Yield attributes viz. grain weight per panicle(g), green hurda yield (q ha⁻¹), dry grain yield (q ha⁻¹), dry fodder yield (q ha⁻¹) were significantly higher with the application of 75% RDF+ 5 t FYM ha⁻¹+ZnSO₄ 25 kg ha⁻¹ (T3) followed by application of 100% RDF +ZnSO₄ 25 kg ha⁻¹ (T4) (Table 1 and 2).

The application of chemical fertilizers in conjunction with organic fertilizer increased the use efficiency of added chemical fertilizer which in turn increased the nutrient availability at later growth period ultimately resulted in increased dry matter accumulation. Similarly the Zinc application increased metabolic activities as it is part of many enzymes which also increases availability of nutrients. Above results are in conformity with the results obtained by Kalibhavi *et al.*,

(2001), Balasubramanian and Ramamoorthy (1996). Aroma, taste and threshability were not influenced by the different nutrient management treatments.

Thus it can be concluded from the experimental results that the parching sorghum variety PDKV Kartiki is the best parching sorghum variety and application of 75% RDF+ 5 t FYM ha⁻¹+ZnSO₄ 25 kg ha⁻¹ is the best proposition to achieve the high productivity of parching sorghum.

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