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Effect of nitrogen management on growth and yield of parching sorghum genotypes (*Sorghum bicolor* L. Moench)

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Abstract
An experiment was conducted to study the effect of nitrogen management on growth and yield of parching sorghum genotypes (*Sorghum bicolour* L. Moench) during 2017-18. The results revealed that among the parching sorghum genotypes, Gulbhendi Local-1 showed significantly higher plant height, dry matter plant^{-1} and stem diameter as compared to genotype Phule madhur at harvest. However, the parching sorghum genotype Phule madhur showed significantly more number of leaves, leaf area plant^{-1} and leaf : stem ratio over genotype Gulbhendi Local-1. The parching sorghum genotype Phule madhur recorded higher grain recovery cob^{-1} and green *hurda* yield over the genotype Gulbhendi Local-1 and found significantly superior of parching sorghum found maximum in the genotype Gulbhendi Local-1. However, the genotype Gulbhendi Local-1 recorded maximum green fodder yield and found significantly superior over the genotype Phule Madhur. The highest benefit: cost ratio was observed in Phule Madhur (4.63:1) as compared to Gulbhendi Local-1 genotype. With regards to nitrogen management, application of 125% RDN ha^{-1} recorded maximum plant height, number of leaves, leaf area plant^{-1}, leaf : stem ratio, dry matter plant^{-1} and stem diameter and was found significantly superior over 50 per cent RDN ha^{-1} through urea + 50 per cent RDN ha^{-1} through vermicompost, 100 per cent RDN ha^{-1} and 100 percent RDN ha^{-1} through vermicompost at harvest, respectively. Similarly, grain recovery panicle^{-1}, green *hurda* yield and green fodder yield was maximum with application of 125% RDN ha^{-1} and found significantly superior over remaining nitrogen management treatments. Similarly, application of nitrogen 125% RDN ha^{-1} through urea recorded highest B:C ratio found significantly superior over different nitrogen management treatments *i.e* application of 50% RDN ha^{-1} through urea + 50% RDN ha^{-1} through vermicompost, 100% RDN ha^{-1} through urea and 100% RDN ha^{-1} through vermicompost, respectively.

Keywords: Parching sorghum, genotypes, nitrogen management, hurda yield, fodder yield and economics

Introduction
Hurda is referred to tender jowar available during late winter. The period in early January when jowar grain is juicy and very tender which is roasted over cakes of dried cow
dung then roasted hurda hold in bare palms, vigorous rubbing to separate roasted hurda from the chaff. *Hurda* could be another reason to do a winter trip to Maharashtra and head out into its fields where enterprising farmers now advertise hurda parties. Far from America's food trends, this is wheresweet sorghum has always been celebrated at its seasonal best.
Increasing urban population demand the *hurda* as increased many folds. This would be opportunity for farmers to fulfil the demand for supplying *hurda* and improve their farm earning. It was therefore felt to develop and identify the genotype for tender sweet sorghum (*hurda*) purpose which will give benefit to thefarmers and consumers too. Now a day's agro-tourism business is increasingin the rural areas and in the contest of supplying sorghum *hurda* as a niche product get the more profit to the farmers and producers (Taylor *et al.,* 2006) [13].
Nutrient management includes the intelligent use of organic, inorganic, and on-line biological resources so as to sustain optimum yields, improve or maintain the soil physical and chemical properties and provide crop nutrition packages which are technically sound, economically attractive, practically feasible and environmentally safe (Tandon, 1995) [12]. Application of organic material along with inorganic fertilizers leads increase in productivity and also sustained the soil health for longer period. Parching sorghum is eaten in milk stage of grain and it gives 2-3 times more rates as compare to the grain sorghum. It can develop a small entrepreneurship for farmers.

Materials and Methods

A field experiment was conducted at Agromomy Farm, Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *rabi* season of 2017-18. Soil was clay loam in texture with high amount of potash (319.50 kg ha^{-1}) and moderate in phosphorus (17.4 kg ha^{-1}) and low in nitrogen (204.2 kg ha^{-1}) the soil was alkaline in reaction (pH 8.3) with low in electrical conductivity (0.17dSm^{-1}). The experiment was laid out in factorial randomized block design with three replications with two genotypes viz., G_1-Phule Madhur, G_2-Gulbhendi Local-1 and four nitrogen management treatments viz., N_1-125% RDN ha^{-1} through urea (100 kg N ha^{-1}), N_2-100% RDN ha^{-1} through urea (80 kg N ha^{-1}), N_3-50% RDN ha^{-1} through urea + 50% RDN ha^{-1} through vermicompost and N_4-100% RDN ha^{-1} through vermicompost. The nitrogen management carried out as vermicompost was applied to soil before sowing as per treatments. Entire P_2O_5 and K_2O were applied as basal by placement and covered with the soil. Nitrogen was applied as per treatments in two equal splits; as basal at the time of sowing and splits at 30 DAS. The quantity of vermicompost 1335 and 2670 kg ha^{-1} was used to supply 50% and 100% RDN, respectively. The rest of dose of P_2O_5 and K_2O was managed through single super phosphate (SSP) and Murrate of Potash (MOP), respectively.

Results and discussion

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

Effect of genotypes

The parching sorghum genotype Gulbhendi Local-1 (Table 1) showed significantly higher plant height, dry matter $plant^{-1}$ and stem diameter and was significantly superior over genotype Phule Madhur at harvest. However, the parching sorghum genotype Phule Madhur recorded significantly higher number of leaves, leaf area and leaf:stem ratio found superior as compared to genotype Gulbhendi Local-1. This might be due to the robust growth habitats and adaptability of genotypes where it grown.

Significantly higher grain recovery cob^{-1} and green *hurd y*ield of parching sorghum recorded by the genotype Phule Madhur and found significantly superior over the as compared to genotype Gulbhendi Local-1 (Table. 2). The green fodder yield (qha^{-1}) of parching sorghum recorded maximum in the genotype Gulbhendi Local-1 and found significantly superior over the Phule Madhur genotype. This might be due to the growth habitats and adaptability of genotypes where it grown.The results are in conformity with Shinde *et al.* (2016) [10].

Maximum gross monetary returns were obtained from the parching sorghum Phule Madhur genotype (Rs.258519 ha^{-1}) and found significantly superior over the Gulbhendi Local-1 (Table. 3), similarly, the maximum net monetary returns obtained fromthe Phule Madhur (Rs. 210571 ha^{-1})of parching sorghum genotype and found significantly superior over the Gulbhendi Local-1genotype. The highest benefit: cost ratio highest in the Phule Madhurgenotype (4.63:1) over the Gulbhendi Local-1genotype. The higher partitioning of dry matter towards grain yield in genotype Phule Madhur. The genotype Phule Madhur wasv good in threshability which results into maximum *hurda* yield.

Effect of Nitrogen management

Application of 125% RDN ha^{-1} (Table 1) recorded higher plant height, number of leaves, leaf area $plant^{-1}$, leaf:stem ratio, dry matter $plant^{-1}$ and stem diameter found significantly superior over of 50% RDN ha^{-1} through urea + 50% RDN ha^{-1} through vermicompost, 100% RDN ha^{-1} and 100% RDN ha^{-1} through vermicompost at harvest, respectively. The results conformity with Patil *et al.* (2004) [10], Ahmad *et al.* (2007), Arbad *et al.* (2008) [2], Satpal *et al.* (2015) [9], Singh *et al.* (2016) [11], Meena *et al.* (2017) [7].

The data given in Table 2 concluded that the treatment of nitrogen management with application of 125% RDN ha^{-1} though urea recorded higher grain recovery $panicle^{-1}$(g), green *hurda* yield (q ha^{-1}) as well as green fodder yield(q ha^{-1}) found significantly superior over other treatments *i.e* application of 50% RDN ha^{-1} through urea + 50% RDN ha^{-1} through vermicompost, 100% RDN ha^{-1} and 100% RDN ha^{-1} through vermicompost, respectively. The results are in conformity with Patidar (2004) [8].

With regards to the economics (Table 3), application of 125% RDN ha^{-1} through urea recorded highest gross monetary return, net monetary return and B: C ratio and found significantly superior over application of 50 per cent RDN ha^{-1} through urea + 50 per cent RDN ha^{-1} through vermicompost, 100 per cent RDN ha^{-1} through urea and 100 percent RDN ha^{-1} through vermicompost, respectively.

Table 1: Effect of genotypes and nitrogen management on plant height, number of leaves, leaf area, leaf: stem ratio, dry matter $plant^{-1}$ and stem diameter of Parching Sorghum

Treatments	Plant height (cm)	No. of leaves	Leaf area $plant^{-1}$	Leaf: Stem ratio	Dry matter $plant^{-1}$ (g)	Stem diameter (cm)
Genotypes						
G_1-Phule Madhur	198.02	8.73	36.77	2.46	153.61	1.62
G_2-Gulbhendi Local-1	219.23	7.83	36.00	2.23	165.59	1.82
SE(m)+	1.99	0.09	0.08	-	0.24	0.02
CD at 5%	6.03	0.26	0.24	-	0.72	0.06
Nitrogen management						
N_1-125%RDN ha^{-1}	215.50	8.82	37.21	2.70	162.94	1.85
N_2-100%RDN ha^{-1}	205.70	7.83	35.89	2.18	157.88	1.68
N_3-50% urea +50% VC ha^{-1}	211.63	8.70	37.06	2.45	159.41	1.74
N_4-100% RDN as VC ha^{-1}	201.67	7.77	35.37	2.05	158.16	1.59
SE(m) +	2.81	0.12	0.11	-	0.33	0.03
CD at 5%	8.53	0.37	0.34	-	1.03	0.09

Table 2: Effect of genotypes and nitrogen management on days to 50% flowering, days to soft dough stage, grain recovery cob^{-1}, Green *hurda* yield and green fodder yield of Parching Sorghu

Treatments	Days to 50% Flowering	Days to soft dough stage	Grain recovery cob^{-1} (g)	Hurda yield (qha^{-1})	Green Fodder (qha^{-1})
Genotypes					
G_1-Phule Madhur	76.67	96.67	41.18	61.16	375.18
G_2-Gulbhendi Local-1	76.00	96.00	30.54	45.83	542.05
SE(m)±	0.09	0.09	0.41	1.08	9.35
CD at 5%	0.27	0.27	1.24	3.29	28.36
Nitrogen management					
N_1-125%RDN ha^{-1}	75.33	95.33	38.55	57.82	505.3
N_2-100%RDN ha^{-1}	75.33	95.33	35.14	51.75	443.14
N_3-50% urea +50% VC ha^{-1}	76.33	96.33	36.82	54.86	471.87
N_4-100% RDN as VC ha^{-1}	78.33	98.33	32.94	49.56	414.15
SE(m) ±	0.13	0.13	0.58	1.53	13.22
CD at 5%	0.38	0.38	1.75	4.65	40.11

Table 3: Effect of genotypes and nitrogen management on economics of Parching sorghum

Treatments	GMR(Rs.ha^{-1})	NMR(Rs.ha^{-1})	B:C ratio
Genotypes			
G_1-Phule Madhur	258519	210571	4.6
G_2-Gulbhendi Local-1	245902	198554	4.4
SE(m)±	4042	3867	-
CD at 5%	12261	11730	-
Nitrogen management			
N_1-125%RDN ha^{-1}	274515	235489	6.0
N_2-100%RDN ha^{-1}	243879	205113	5.2
N_3-50% urea +50% VC ha^{-1}	258951	207358	4.0
N_4-100% RDN as VC ha^{-1}	231497	170289	2.7
SE(m) ±	5716	5468	-
CD at 5%	17340	16588	-

Conclusion

Among the genotypes, Phule Madhur exhibited significantly superior yield attributes and *hurda* yield at soft dough stage with higher GMR, NMR and B:C ratio. The nitrogen management treatment with application of 125 per cent RDN ha^{-1} through urea exhibited significantly superior growth and yield attributes of parching sorghum and exhibited higher GMR, NMR and B:C ratio.

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