

Original Research Article

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## Response of *Rabi Sorghum* Genotypes (*Sorghum bicolor* (L) Moench) to Different Fertility Levels under Rainfed Conditions

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### ABSTRACT

A field experiment was conducted to study the response of *rabi* sorghum genotypes (*Sorghum bicolor* (L) Moench) to different fertility levels under rainfed conditions at AICRP on Sorghum, Main Agricultural Research Station, Dharwad (Karnataka) during *rabi*, 2017. The experiment was laid out in split plot design with twenty four treatment combinations and three replications. The treatments consisted of eight genotypes in main plots and three fertility levels in sub plots. Application of 100% RDF recorded significantly higher plant height (175.0 cm), 100-seed weight (3.94 g), ear weight (95.8 g), grain yield/plant (49.5 g), grain yield (50.2 q/ha), fodder yield (7.83 t/ha), gross returns (Rs. 1,11,468/ha), net returns (Rs. 76,413/ha) and B: C ratio (3.18) compared to other fertility levels. Both the test hybrids, SPH-1835 and SPH-1836 produced higher grain yield compared to check hybrids (CSH-13R and CSH-15R). Test variety SPV-2405 also recorded higher grain yield (50.4 q/ha), fodder yield (8.07 t/ha) and net returns (Rs. 78,238/ha) compared to test variety (SPV-2348) and check variety (CSV-29R).

#### Keywords

Genotypes, *rabi* sorghum, Fertility levels, Rainfed, Economics

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### Introduction

Sorghum (*Sorghum bicolor* (L) Moench) is an important grain and fodder crop of rainfed and or dry land areas, providing food for human beings, fodder for cattle and feed for birds. It is regarded as 'King of millets' and stands in IV<sup>th</sup> position in staple food crops after rice, wheat and maize. In Karnataka, the area under *rabi* sorghum is more than *kharif* sorghum which is mainly due to its preference as sources of food and fodder particularly is North Karnataka. It is grown over an area of 9.99 lakh hectares with a production and productivity of 8.36 lakh tones and 837 kg/ha respectively (Anon, 2015). Sorghum responds

well to the applied inputs. The yield potential of any crop in general and sorghum in particular can be exploited only under favorable production management practices viz, recommended doze of fertilizer, irrigation, weeding, plant protection etc.

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 (Tandon and Narayan, 1990).

Therefore the present investigation is planned to study the response of *rabi* sorghum genotypes to different fertility levels.

## Materials and Methods

The experiment was conducted on medium deep black soil at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad (Karnataka) during *rabi*, 2017 under rainfed condition. The soil of the experimental site had pH 7.2 medium organic carbon (0.59 %), low available N (247 kg ha<sup>-1</sup>), low available P<sub>2</sub>O<sub>5</sub> (17.33 kg ha<sup>-1</sup>) and high available K<sub>2</sub>O (403 kg ha<sup>-1</sup>). The experiment was laid out in split plot design with twenty four treatment combinations and three replications. The treatments consisted of eight genotypes (SPH-1835, SPH-1836, SPV-2348, SPV-2405, CSH-13R, CSH-15R, CSV-22R and CSV-29R) as main plots and three fertility levels (50% RDF, 75% RDF and 100% RDF @ 50:25 kg N and P<sub>2</sub>O<sub>5</sub>/ha) as sub plots. All the sorghum genotypes were sown on 24<sup>th</sup> September, 2017 at the spacing of 45 X 15 cm. The different fertility levels as per the treatments in the form of urea, single super phosphate and muriate of potash were applied to crop at sowing. The crop was raised by following the recommended practices. The total rainfall received during the cropping period was 287.0 mm in 21 rainy days and the crop growth and expression was satisfactory. The Furadon granules @12 kg/ha were applied to whorls of crop followed by Cymbush (10 EC) spraying @ 10 ml/16 liters of water to control shoot fly and stem borer. The crop was harvested on 15<sup>th</sup> February, 2018. The various growth and yield parameters (Radford, 1967) and yield were calculated as per the standard procedure. The data collected on different parameters were

subjected to statistical analysis as described by Gomez and Gomez (1984) for better interpretation of results.

## Results and Discussion

### Fertility levels

The data presented in Table 1 revealed the linear increase in yield parameters, grain and fodder yield and also gross returns, net returns and B: C ratio. Application of 100% RDF recorded significantly higher grain (50.2 q/ha) and fodder yield (7.83 t/ha) over 50% RDF and it was on par with 75% RDF. The increase in grain and fodder yield was to an extent of 11.1, 4.8% and 12.1, 9.1% higher over 50% and 75% RDF respectively. Significant improvement in higher grain and fodder yield could be attributed to profound influence of N and P fertilization on vegetative and reproductive growth of the crop due to increase in nutrient accumulation and their translocation to sink. Similar results were reported by Singh *et al.*, (2005) in sorghum. The higher grain yield at 100% RDF can be related to higher values of yield parameters viz., 100-seed weight (3.94 g), ear weight (95.8 g/plant) and grain yield /plant (49.5 g). The better performance of these yield parameters may be attributed to mineral nutrition especially nitrogen which plays an important regulative functional role in plant system through synthesis and translocation of growth hormones which help in better growth and development of plant (Bringer *et al.*, 1980). Further, the same treatment realized the maximum gross returns, net returns and B: C ratio compared to 75 and 50% RDF (Mali *et al.*, 2000).

### Genotypes

In the experiment, both varieties and hybrids were evaluated and compared with checks (Table 1).

**Table.1** Growth and yield of advanced *rabi* sorghum genotypes as influenced by fertility levels

Treatments	Plant height (cm)	100-Seed weight (g)	Ear weight (g/plant)	Grain yield / plant (g)	Grain yield (q/ha)	Fodder yield (t/ha)	Hi (%)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B: C
<i>Fertility levels :</i>										
1. 50% RDF	166.6	3.57	79.6	43.2	44.6	6.88	41.4	106706	71658	3.04
2. 75% RDF	171.2	3.72	86.7	47.6	47.8'	7.12	40.8	107924	72873	3.08
3. 100% RDF	175.0	3.94	95.8	49.5	50.2	7.83	38.7	111468	76413	3.18
S.Em+	1.1	0.035	2.1	0.9	1.4	0.17	0.8	3081	3081	0.03
CD (5%)	3.3	0.071	6.0	2.7	4.2	0.51	NS	9143	9143	0.09
<i>Genotypes :</i>										
SPH-1835	178.2	4.08	90.6	51.5	52.8	6.71	40.2	100024	64933	2.85
SPH-1836	179.6	4.06	85.3	49.5	51.8	8.25	38.0	114421	79329	3.26
SPV-2348	130.0	2.83	85.4	51.3	35.9	8.00	39.1	84000	49669	2.42
SPV-2405	186.7	4.03	82.9	45.2	49.2	8.07	39.1	113250	78238	3.22
CSH-13R	145.7	3.35	92.1	50.1	45.7	6.95	42.7	114274	79183	3.25
CSH-15R	170.8	4.00	56.0	47.9	45.9	7.36	39.6	107852	78760	3.07
CSV-22R	186.8	3.81	88.4	47.3	48.4	6.15	43.1	101174	66162	2.88
CSV-29R	189.7	3.79	88.2	45.4	44.7	6.73	40.6	99938	64926	2.85
S.Em+	1.8	0.057	2.3	1.7	1.8	0.28	1.3	4032	4032	0.04
CD (5%)	5.4	0.176	6.6	5.1	5.4	0.83	NS	12076	12076	0.12
<i>Interaction :</i>										
S.Em+	3.2	2.2	5.8	3.7	2.1	0.48	2.3	8715	8715	0.24
CD (5%)	9.4	NS	17.1	11.1	6.2	1.43	6.8	25562	25562	0.73

**Table.2** Interaction effects of advanced *rabi* sorghum genotypes and Fertility levels on grain yield

<i>Fertility levels</i>	<i>Genotypes</i>								Mean
	SPH-1835	SPH-1836	SPV-2348	SPV-2405	CSH-13R	CSH-15R	CSV-22R	CSV-29R	
1. 50% RDF	49.1	49.9	31.9	46.5	43.5	44.9	47.8	43.5	44.6
2. 75% RDF	53.5	51.8	37.0	50.8	46.8	46.1	49.3	45.1	47.8
3. 100% RDF	55.7	53.8	38.7	50.4	46.8	46.9	50.2	45.6	50.2
Mean	52.8	51.8	35.9	49.2	45.7	45.9	48.4	44.7	
	S.Em±			2.1					
	CD (5%)			6.2					

Among the hybrids, SPH-1835 recorded significantly higher grain yield (52.8 q/ha) compared to check hybrids and it was on par with SPH-1836. The increase in yield was to the tune of 1.9, 13.4 and 13.1% over SPH - 1836, CSH-13R and CSH-15R respectively. Similarly among the varieties, SPV-2405 produced significantly higher grain yield (49.2 q/ ha) over SPV-2348 and check variety CSV-29R but on par with check variety CSV-22R. The increase in grain yield was 27.0, 1.6 and 9.1% over SPV-2348, CSV-22R and CSV-29R respectively. The higher grain yield was mainly due to higher 100-seed weight and grain yield/plant. While the fodder yield was significantly higher with hybrid SPH-1836(8.25t/ha) over SPH-1835, check hybrids and varieties but was on par with new varieties SPV-2348 and SPV-2405.

The fodder yield was 18.7, 15.8, 10.7, 25.5 and 18.4% higher over SPH-1835, CSH-13R, CSH-15R, CSV-22R and CSV-29R respectively. The better performance of the new varieties and hybrids was due to influence of nutrients on protein synthesis, involvement in several physiological and metabolic processes in the plant system (Tisdale *et al.*, 1990). Sumeriya *et al.*, (2005) reported the similar results in *kharif* sorghum.

### **Interaction effect**

The data on interaction effect of fertility levels and genotypes on grain yield revealed that the new hybrid SPH-1835 produced significantly higher grain yield of 55.7 q/ha at 100% RDF as compared to rest of the treatment combinations except SPH-1836, SPV-2405, CSV-22R both at 100 % RDF and 75% RDF (Table 2). These results were in conformity with the findings of Dashora *et al.*, (2014) in *kharif* sorghum.

Thus based on the results, it may be inferred that application of 100% recommended dose

of fertilizer of 50:25 kg N and P<sub>2</sub>O<sub>5</sub>/ha found optimum for both test hybrids and varieties of *rabi* sorghum for getting maximum yield and net returns.

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