**Impact of Biofertilizers on yield and Economics of *Rabi* sorghum (*Sorghum bicolor*L.) under rainfed condition.**

**Abstract**: A field experiment was conducted at All India Coordinated Research Project on sorghum, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad-580050, Karnataka for two consecutive *rabi* season (2018 and 2019) to study the" Impact of Biofertilizers on growth, yield and Economics of *Rabi* sorghum (*Sorghum bicolor* L.) under rainfed condition in northern transition tract of Karnataka. The pooled results of the experiment indicated that, application of RDF (50:25:0 kg N:$P_2O_5$:$K_2O$/ha) +seed treatment with *Azospirillum* @4ml +PSB @ 4ml /kg seeds recorded significantly higher grain ( 42.3 q/ha) and fodder yield (8.4 t/ha) of *rabi* sorghum compared to rest of the treatments.The higher grain yield was due to significantly higher values of yield components viz., grain yield g/plant ( 40.0 ) and 1000-grain weight (33.3 g). Further, significantly higher gross returns (Rs.102133 /ha),net returns ( Rs.68232/ha) and BC ratio (3.0) were recorded due to application of RDF (50:25:0 kg N:$P_2O_5$ :$K_2O$/ha) +seed treatment with *Azospirillum* @4ml +PSB @ 4ml /kg seeds compared to rest of the treatments.

Key words: Biofertilizers, seed treatment, *rabi* sorghum, Economics.

## Introduction

Sorghum(*Sorghum bicolor* L. Moench) is one of the most important cereal crop in the world, popularly known as king of millets and great millet as an account of its large grain size among millet and vast area under it. It is grown in tropics and subtropics climates. Sorghum is called as camel crop because of drought, water logging and saline- alkaline tolerance. It is one of the most efficient $C_4$ plant in terms of photosynthesis. It is gaining importance as health food now a days because of its higher dietary fiber (2.56%). Apart from grains it provides valuable fodder which is one of the principle roughage feed in India.

Biofertilizer: The need of the hour in agriculture at present times, there is a growing concern about environmental hazards and threats to sustainable agriculture. In view of the above stated facts, the long term use of bio-fertilizers proves to be economical, ecofriendly, more efficient, productive and accessible to marginal and small farmers over chemical fertilizers. Biofertilizers have an advantage over chemical fertilizers, as they provide nutrients

in addition to plant growth promoting substances like hormones, vitamins, amino acids etc. (Shivankar *et. al*, 2000)

**Material and methods**

A field experiment was conducted at All India Coordinated Research Project on sorghum, Main Agricultural Research Station, University of Agricultural Sciences, Dharwad-580005, Karnataka, for two consecutive *rabi* season (2018 and 2019) to study the" Impact of Biofertilizers on growth, yield and Economics of *Rabi* sorghum (*Sorghum bicolor* L. ) under rainfed condition in northern transition tract of Karnataka.The soil of the experimental site was clayey soils. The experiment consisted of six treatments viz. $T_1$: Recommended dose of fertilizer (RDF) alone (Control), $T_2$: RDF + Seed treatment with Azospirillum @ 50g+PSB @ 50g/kg seed, $T_3$: RDF + Seed treatment with Azospirillum @ 2ml+PSB @ 2ml/kg seed, $T_4$: RDF + Seed treatment with Azospirillum @ 2ml+PSB @ 4ml/kg seed, $T_5$: RDF + Seed treatment with Azospirillum @ 4ml+PSB @ 2ml/kg seed and $T_6$ : RDF + Seed treatment with Azospirillum @ 4ml+PSB @ 4ml/kg seed. The treatments were evaluated in Randomized Block Design (RBD) with four replications. The seeds of *rabi* sorghum (var. CSV-29R) was sown with a row spacing of 45 cm x 15 cm and recommended dose of fertilizers was applied to soil in each treatmentand seeds were treated with both powder and liquid form of biofertilizers (*Azospirillum* and PSB) at the time of sowing. Sorghum yield attributes, grain and stover yields were recorded and economics were worked. The data obtained on *rabi* sorghum was subjected to statistical analysis by using MSTAT-programme according to Gomez and Gomez (1984 ).

**Results and discussion**

The data on grain yield (g/plant), 1000-grain weight (g), grain yield (q/ha) and stover yield (t/ha) of *rabi* sorghum were differed significantly due to various treatment .The results of pooled data indicated that, significantly higher grain yield (40 g/plant) , 1000-grain weight (33.3g), grain yield (42.3q/ha), stover yield (8.4 t/ha) were recorded in seed treatment with *Azospirillum*@ 4ml +PSB @ 4ml /kg seeds along with RDF (50:25:0 kg $N:P_2O_5:K_2O$/ha) ($T_6$) as compared to control and powder form of biofertilizers. However, lower levels of liquid form of biofertilizers were on par with each other but significantly superior over control and powder form of biofertilizers. The per cent increase in grain yield of *rabi* sorghum with liquid form of biofertilizers over powder form of biofertilizers was an extent of 3 to 11. Further, The per cent increase in grain yield of *rabi* sorghum was 5.3 and 16.4 with powder and liquid form of biofertilizers respectively over RDF alone.The use of biofertilizers may lead to

higher availability of nitrogen and phosphorus that promoted growth and development and ultimately resulting in higher yields (Raja and Takankharb, 2017) and (Jat *et al*., 2013).

Application of RDF (50:25:0 kg N:$P_2O_5$:$K_2O$/ha) + seed treatment with *Azospirillum*@ 4ml +PSB @ 4ml /kg seeds recorded significantly higher gross returns (Rs.102123/ha) ,net returns (Rs.68232/ha) and BC ratio (3.0) compared to rest of the treatments followed by RDF (50:25:0 kg N:$P_2O_5$:$K_2O$/ha) + seed treatment with *Azospirillum* @ 4ml +PSB @ 2ml /kg seeds.This might be due to higher grain and stover yields of sorghum with these treatments. These results were conformity with the findings of Patel, 2015.

**Conclusion**

Based on the experimental results it could be concluded that, all the yield and yield parameters of *rabi* sorghum were significantly superior with liquid form of biofertilizers over powder form of biofertilizers and gave higher gross and net returns.

**References**

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**Table 1 : Effect of powder Vs. liquid form of biofertilizerson*rabi* sorghum (CSV-29R) (Pooled of 2018 and 2019).**

| Treatments | Grain yield (g/panicle) | Test weight (1000-grain) (g) | Grain yield (q/ha) | Fodder yield (t/ha) | Gross returns (Rs/ha) | Net returns (Rs/ha) | B:C |
|---|---|---|---|---|---|---|---|
| $T_1$: RDF(50:25:0 kg NPK/ha) alone | 29.6 | 29.7 | 35.4 | 7.6 | 86023 | 52123 | 2.5 |
| $T_2$:RDF+ seed treatment withAzospirillum @ 50g+ PSB @ 50g /kg seeds | 33.8 | 29.4 | 37.4 | 8.1 | 90913 | 56983 | 2.7 |
| $T_3$ : RDF+ seed treatment with Azospirillum @ 2 ml+ PSB @ 2ml/kg seed | 36.1 | 31.9 | 38.7 | 8.2 | 93900 | 60019 | 2.8 |
| $T_4$:RDF+ seed treatment with Azospirillum @ 2 ml+ PSB @ 4 ml/kg seed | 36.2 | 31.4 | 38.5 | 8.3 | 93369 | 59984 | 2.8 |
| $T_5$: RDF+ seed treatment with Azospirillum @ 4 ml+ PSB @ 2 ml/kg seed | 31.5 | 31.1 | 40.3 | 7.9 | 96953 | 63066 | 2.9 |
| $T_6$: RDF+ seed treatment with Azospirillum @ 4 ml+ PSB @ 4 ml/kg seed | 40.0 | 33.3 | 42.3 | 8.4 | 102123 | 68232 | 3.0 |
| S.Em+/ | 1.57 | 0.86 | 0.35 | 0.13 | 746 | 739 | 0.02 |
| CD at 5% | 4.73 | 2.60 | 1.07 | 0.40 | 2248 | 2229 | 0.07 |