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# EFFECT OF BIOFERTILIZER AND SULPHUR ON GROWTH, YIELD ATTRIBUTES AND YIELD OF KHARIF MAIZE (*ZEA MAYS* L.) IN EASTERN U.P.

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## ABSTRACT

**A field experiment was carried out during Kharif 2009 and 2010 at college research farm, B R D P G College, Deoria. The experiment comprising treatment combinations of Azospirilium, Azotobactor, PSB along with three levels of sulphur and control plot were tested in factorial randomized block design with three replications. Result revealed that seed inoculation with biofertilizers (Azotobactor + PSB) along with sulphur recorded highest plant height, better yield attributes and net monitory return. Among bio-fertilizer Azotobactor responded significantly superior to all other sources of bio-fertilizer when applied alone or in combination with PSB. In sulphur treated plot higher response was with 30 kg sulphur/ha. When bio-fertilizer (Azotobactor ) applied in combination with PSB and highest level of sulphur responded maximum yield (45.96 q/ha) and net return ( Rs. 25192/ha) as well as B:C ratio (1.75) in comparison to low level of sulphur.**

***Key words :*** *Bio-fertilizer, Maize and sulphur.*

Maize is a most versatile and very high potential crop of graminae family. Maize is ranked second to wheat among the world cereal crops. The word maize means “one that sustains the life” and an Indian legend says that maize was the food of the Gods that created on the earth. Maize area, production and productivity in India have seen a phenomenal growth over the last five decades as India has emerged from being a net imported to self sufficiency. During the year 2007-2008 the area under maize with country was 15.9 mha with total production of 81.7 mt having average productivity of 51.25 q/ha (Anonymous, 2008). In India, over 85 percent of the maize production is used as food nutritionally, it contain 60-68 percent starch and 7 to 10 per cent protein. Yellow maize is the richest source of vitamin A, it contain more riboflavin than rice and wheat as well as rich sources of phosphorus and potash. Since maize is heavy feeder and fertilizer requirement is high, it enhance the cost of cultivation considerably as well as deteriorate soil fertility. Bio-fertilizers are cheapest source of nutrition as well as easily available in the market. Azotobactor, Azospirillium fixes atmospheric nitrogen in cereals as the rhizobium dose in legumes. Keeping in view as experiment was designed to use of bio-fertilizer along with sulphur to active maximum profit as well as maintain sustainability of the soil.

## MATERIALS AND METHODS

A field experiment was conducted during kharif season of 2009 and 2010 at college research farm, B R D P G College, Deoria. The soil was sandy loam in texture and Gangetic alluvial type low in available organic carbon (0.32%) and in available nitrogen (180 kg/ha), medium in available phosphorus (12.0 kg/ha) and in potash (210.0 kg/ha). The experiment was laid out in factorial randomized block design with three replications. Three sources of bio fertilizers (Azotobactor, Azospirillium and PSB) were tried alone or in combination with three levels of sulphur ie. 15, 25 and 35 kg S/ha and a control plot was compared. Maize crop were sown on 25th July 2009 and 2010 at a distance of 45 cm (row to row) and 20 cm (plant to plant). A common dose of 120 kg N, 60 kg $P_2O_5$, 40 kg $K_2O$ applied to all treatments including control plots. Thinning and weeding was done as per recommendation, the variety was used Azad Uttam with a seed rate of 25 kg/ha. Data pertaining to plant height, cob length, no. of cobs/plant, weight of cob, weight of grain/cob, grain row/cob, grain/row, biological yield and economics was recorded prior to statistical analysis.

## RESULTS AND DISCUSSION

**Plant height :** Plant height at 30 DAS and at harvest. Amongst bio fertilizer Azotobactor perform superior results over other bio- fertilizer when used alone or in combination with higher level of sulphur. The minimum was recorded with control plots. Increase in plant height of maize under application of bio-fertilizer with combination of higher level of sulphur might be

**Table 1 :** Growth, yield attributes, yield and economics under different treatments in maize crop (Pooled data of 2009 and 2010)

| Treatment | Plant height at maturity (cm) | No. of cobs per plant | Length of cob (cm) | Grain rows per cob | No. of grains per cob | 100-grain weight (gm) | Grain yield (q/ha) | Stover yield (q/ha) | Net return (Rs/ha) | B:C ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| $T_1S_1$ | 179.56 | 1.00 | 12.33 | 12.33 | 383.67 | 86.00 | 37.61 | 87.05 | 17623 | 1:1.83 |
| $T_1S_2$ | 179.97 | 1.00 | 12.67 | 11.00 | 384.00 | 86.33 | 37.97 | 88.62 | 16952 | 1:1.76 |
| $T_1S_3$ | 180.00 | 1.00 | 12.67 | 12.33 | 387.67 | 87.67 | 38.32 | 81.81 | 16167 | 1:1.69 |
| $T_2S_1$ | 181.18 | 1.67 | 13.00 | 12.00 | 387.33 | 85.00 | 39.59 | 84.41 | 18543 | 1:1.88 |
| $T_2S_2$ | 181.00 | 1.00 | 13.33 | 13.00 | 383.67 | 85.67 | 39.88 | 81.48 | 17782 | 1:1.80 |
| $T_2S_3$ | 181.66 | 1.33 | 13.00 | 13.00 | 385.33 | 86.33 | 39.97 | 85.23 | 17139 | 1:1.73 |
| $T_3S_1$ | 180.18 | 1.33 | 12.00 | 11.67 | 386.33 | 83.00 | 38.01 | 87.99 | 16457 | 1:1.78 |
| $T_3S_2$ | 178.01 | 1.00 | 13.00 | 12.00 | 383.00 | 88.33 | 38.32 | 74.84 | 15870 | 1:1.71 |
| $T_3S_3$ | 178.80 | 1.00 | 12.67 | 12.33 | 389.67 | 84.00 | 38.79 | 77.31 | 15393 | 1:1.66 |
| $T_0S_0$ | 175.25 | 1.00 | 10.66 | 11.00 | 379.66 | 78.33 | 34.50 | 74.57 | 15104 | 1:1.75 |
| **SE(d)+** | **0.59** | **0.32** | **0.54** | **0.39** | **2.39** | **1.11** | **1.56** | **3.52** | **742.58** | **0.01** |
| **CD at 5%** | **1.21** | **0.65** | **1.10** | **0.79** | **4.89** | **2.27** | **3.20** | **7.22** | **1520.81** | **0.02** |

**Treatment combinations-** $T_0S_0$= Control, $T_1S_1$=Azotobactor + 15 kg Sulphur, $T_1S_2$= Azotobactor + 25 kg Sulphur, $T_1S_3$= Azotobactor + 35 kg Sulphur, $T_2S_1$= Azospirilum + 15 kg Sulphur, , $T_2S_2$= Azospirilum + 25 kg Sulphur, , $T_2S_3$= Azospirilum + 35 kg Sulphur, , $T_3S_1$= PSB + 15 kg Sulphur, $T_3S_2$= PSB + 25 kg Sulphur and $T_3S_3$= PSB + 35 kg Sulphur

due to better nutrient uptake and higher dose of sulphur,similer result show by Balyan *et.al* (2008).

**Yield attributes :** All the treatments recorded significant result. The maximum no of cobs per plant recorded with treatment where Azotobactor + PSB were applied with higher level of sulphur (2.00), the minimum was recorded with control plot. Maximum length of cobs/plant (14.33 cm) was recorded in treatment where Azotobactor + PSB combined with higher level of sulphur were applied. The minimum was recorded with control plots. The maximum number of grains rows/cob (13.67) was recorded with treatment where Azotobactor + PSB combined with higher level of sulphur. The maize was recorded with control plot.The maximum number of grains/cob was recorded (393.33) in treatment where Azotobactor + PSB combined with higher level of sulphur and minimum with control plot.100 grain weight was recorded (91.00 g) with treatment where Azotobactor + PSB combined with higher level of sulphur and minimum was recorded with control plot. Yield attribute of maize under bio-fertilizer + sulphur increase the bio- metabolism resulting increase the growth and development of plant with better yield attributes result is supported by Aslolfi *et. al.* (2004).

**Yield and economics :** The maximum grain yield (45.96 q/ha) as well as stover yield (118.14 q/ha) was recorded with treatment where Azotobactor + PSB combined with higher level of sulphur and minimum with control plot.The maximum gross return (Rs 48,582/ha), net return (Rs 25,192/ha) and B:C ratio (1.208) was recorded with treatments Azotobactor + PSB along with higher level of sulphur and minimum with control Plot.Yield and economics under bio-fertilizer with sulphur increase due to better use of organic matter and nutrients with high protection and production of maize yield.

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