



## RESEARCH PAPER

# Effect of micronutrient on quality seed production of soybean

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**Abstract :** A high quality seed that provides adequate plant stand is the basis for profitable production of soybean crop. Soybean is an energy rich crop and hence the requirement of macro and micro nutrients is high for soybean. The use of micronutrients in soybean is one of the ways to boost up the productivity and to improve the seed quality parameters. Therefore, the field experiment was carried out at Seed Technology Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola to study the effect of micronutrient on quality seed production of soybean var. JS-335 during *Kharif* 2010 and 2011. The experiment consisted of 9 treatment combinations of soil application and foliar spray of  $ZnSO_4$  as the experimental field was deficit in Zn. Among all the treatments, significantly highest number of pods per plant (39.50), 100seed wt. (11g.), seed yield (24.60q/ha), highest vigour index (39.48) and seed recovery (91 %) were obtained from the plot treated with  $ZnSO_4$  @ 30 kg /ha soil application and  $ZnSO_4$  @ 0.5 per cent foliar spray. Hence, soil application of  $ZnSO_4$  @ 30 kg /ha along with foliar spray of  $ZnSO_4$  @ 0.5 per cent found most effective for seed yield and yield contributing characters as well as seed quality parameters.

**Key Words :** Quality, Seed production, Micronutrient, Soybean

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## INTRODUCTION

Soybean production has been increased 36 per cent since 2000 in the world. In India, the cultivation is increasing day by day due to its high nutritive value. Soybean seed quality affects during its pre and post harvest periods. The germination potential is very short lived in soybean as compared to other oilseed crops and is often reduce prior to planting time.

Deteriorated seed is one of the basic reasons for low productivity in soybean. A high quality seed that provides adequate plant stand is the basis for profitable production of soybean crop. Soybean is an energy rich crop and hence, the requirement of major nutrients including secondary and micronutrients is high for soybean (Singh *et al.*, 2006). The

availability of nutrients also differs as it is related to physical and chemical fertilizers leads to deficiency of secondary and micronutrients.

One of the most important roles of micronutrients is keeping balanced crop physiology. The use of micronutrient in soybean is one of the ways to boost up the productivity and to improve the seed quality parameters.

It was reported that growth limitation, symbiosis, nodulation, photosynthesis, dry matter production and plant nutrient disorder were caused by the lack of zinc (Kobrace *et al.*, 2011). Lack of zinc in crop plants is due to the fact that this element can not able to solve in soils and reduction of cell growth and development is one of the symptoms of Zn deficiency (Ghasemian *et al.*, 2010).

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pH	EC (ds/m)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Fe (ppm)	Zn (ppm)	Cu (ppm)	Mn (ppm)
7.43	0.21	229	31.10	403	13.37	0.4	4.39	1.58

(Critical limit for Zn-0.6 ppm)

Soil application and foliar spray of Zn are the most extensively used. Foliar spraying of micronutrients is very useful when the roots can not provide necessary nutrients (Kinaci and Gulmezoglu, 2007).

## MATERIAL AND METHODS

The field experiment was laid out in Randomized Block Design with three replication during *Kharif* season of 2010-2011, 2011-12 at experimental field of Seed Technology Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The soil sample of the respective selected plots were collected and analyzed for micronutrient status (Table A). Based on the micronutrient status of experimental field was found deficient only in Zn. Accordingly following treatments were formed for field experiment.

- T<sub>0</sub> - Control
- T<sub>1</sub> - ZnSO<sub>4</sub> 20 kg/h soil application
- T<sub>2</sub> - ZnSO<sub>4</sub> 30 kg/h soil application
- T<sub>3</sub> - ZnSO<sub>4</sub> 0.5 per cent foliar spray at 45 and 52 DAS *i.e.* one week interval after deficiency symptoms.
- T<sub>4</sub> - ZnSO<sub>4</sub> 1 per cent foliar spray at 45 and 52 DAS *i.e.* one week interval after deficiency symptoms.
- T<sub>5</sub> - T<sub>1</sub> + T<sub>3</sub>
- T<sub>6</sub> - T<sub>1</sub> + T<sub>4</sub>
- T<sub>7</sub> - T<sub>2</sub> + T<sub>3</sub>
- T<sub>8</sub> - T<sub>2</sub> + T<sub>4</sub>

The crop soybean (JS-335) was grown with above treatment. Irrigation and plant protection measures were given as per requirement / need. Standard germination test was conducted by between towel paper method in four replications of 100 seeds for each treatment. Normal seedlings were considered for germination percentage as described in the ISTA rules for seed testing (ISTA, 1999). For seedling dry weight (g) from the germination test, ten normal seedlings

were selected randomly in each treatment from all the replications were kept on butter paper and dried in hot air oven at 70 ± 1°C (AOSA, 1983). Seed vigour index was calculated, vigour index = germination (%) × seedling dry weight (g) (Reddy and Khan, 2001). All observations were recorded.

## RESULTS AND DISCUSSION

The Zn status in straw and seed was recorded after harvesting and is presented in Table 1. It was observed that the Zn content in straw and seed was increased in the treatment and highest Zn content was recorded in treatment T<sub>7</sub> *i.e.* ZnSO<sub>4</sub> 30 kg soil application + ZnSO<sub>4</sub> 0.5 per cent foliar spray.

The observations on number of pods, seed yield and yield quality parameters were recorded and are presented in Table 2. The results showed that all micronutrient treatments were significantly superior over control. The significantly highest number of pods per plant (39.50) was recorded in the plants obtained from the plot treated by 30 kg ZnSO<sub>4</sub>/ha soil application along with foliar spray of 0.5 per cent ZnSO<sub>4</sub> and minimum (29.0) was produced by control. Kobrace *et al.* (2011) and Elballa *et al.* (2004) revealed that micronutrient application enhanced the number of pods per plant.

With regard to seed yield and 100 seed weight, significant differences were noticed due to application of different treatments. Significantly higher seed yield (24.60 q/ha) and 100 seed weight (11g) were recorded in 30 kg ZnSO<sub>4</sub>/ha soil application + 0.5 per cent foliar spray of ZnSO<sub>4</sub> which was at par with T<sub>2</sub>. *i.e.* ZnSO<sub>4</sub> 30 kg soil application (24.25 q/ha). Similarly these results are in conformity with the findings of earlier reports of Gerwing *et al.* (2003) who have reported that zinc foliar spraying did not increase soybean yield. The increase in seed yield may be due to higher number of pods per plant and 100 seed weight. Increase in these parameters may be attributed to improve yield components which

Table 1 : Zinc content in straw and seed

Treatments	Zn content in straw (mg/kg)	Zn content in seed (mg/kg)
T <sub>0</sub>	29.60	60.40
T <sub>1</sub>	30.10	62.40
T <sub>2</sub>	30.60	61.33
T <sub>3</sub>	31.40	61.66
T <sub>4</sub>	31.90	62.20
T <sub>5</sub>	31.60	63.40
T <sub>6</sub>	30.90	61.60
T <sub>7</sub>	32.10	66.70
T <sub>8</sub>	30.30	62.70

**Table 2 : Effect of different micronutrient treatments on seed yield and seed quality parameters of soybean**

Treatments	No. of pods/plant	Seed yield (kg/plot)	Seed yield (q/ha)	100 seed wt (g)	Germination (%)	Seedling dry wt (g)	Vigour index	Seed recovery (%)
T <sub>0</sub>	29.0	4.08	20.40	10.41	91.0	0.37	33.67	84
T <sub>1</sub>	33.20	4.73	23.66	10.79	94.1	0.39	36.65	88
T <sub>2</sub>	36.00	4.85	24.25	10.74	92.0	0.40	36.81	88
T <sub>3</sub>	30.30	4.26	21.28	10.66	92.0	0.38	34.95	87
T <sub>4</sub>	30.10	4.12	20.61	10.44	91.0	0.38	34.57	86
T <sub>5</sub>	33.90	4.79	23.46	10.86	96.0	0.41	39.35	90
T <sub>6</sub>	31.00	4.68	23.43	10.51	95.0	0.39	37.06	89
T <sub>7</sub>	39.50	4.92	24.60	11.00	94.0	0.42	39.48	91
T <sub>8</sub>	31.60	4.72	23.62	10.69	93.0	0.39	36.28	89
S.E. ±	0.912	0.047	0.45	0.064	0.72	0.008	0.82	0.52
C.D.(P=0.05)	2.73	0.14	1.36	0.19	2.16	0.02	3.9	1.55

ultimately resulted in higher yield.

Almost all the micronutrient treatment except control showed significantly increased the seed quality parameters. The highest seed vigour index (39.48) and seed recovery (91 %) were recorded in the seeds obtained from the plots which was treated with 30 kg ZnSO<sub>4</sub>/ha soil application and 0.5 per cent ZnSO<sub>4</sub> foliar spray. These results are in agreement with earlier scientists who found that micronutrient treatments in soybean significantly increased seed germination and vigour index over control (Jadhav *et al.*, 2009). The improvement in seed quality parameters may be attributed to the fact that nutrition to mother plant which reflected on seed quality due to accumulation of higher qualities of protein and carbohydrates. These results are in accordance with the findings of Chawale *et al.* (1995).

### Conclusion :

The soil application of 30 kg ZnSO<sub>4</sub>/ha with foliar application of 0.5 per cent ZnSO<sub>4</sub>/ha was found effective to increase the seed yield and quality attributes in soybean.

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