

## Growth, Yield and Quality of Soybean As Influenced by INM

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### ABSTRACT

A Field experiment was conducted to study the effect of INM on growth, yield a quality of soybean at College of Agriculture, Badnapur in 2017-2018. The result revealed that the significantly highest plant height (51.70 cm) observed in treatment 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) at harvesting stage over the control (T<sub>1</sub>). The higher number of pods per plant (71.05) were recorded with an application of 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>). Maximum nodules per plant (30.40) were observed in the plot which had received 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>). The mean dry matter was found to be highest due to application of 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) (11.35 g plant<sup>-1</sup>) and (1970 kg ha<sup>-1</sup>). Application of 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) was recorded highest seed yield per plant (15.91 g plant<sup>-1</sup>) and (1815 kg ha<sup>-1</sup>). The highest protein content (31.34 %) was recorded With the same treatment.

**Key words:** Biofertilizers, Protein, INM, Rhizobium, PSB

### INTRODUCTION

In recent years, a concept of integrated nutrient supply involving use of organic manures and inorganic fertilizers has been developed to obtain sustained agricultural production<sup>5</sup>. Integration of organic and inorganic sources of nutrients along with biofertilizers is found to give higher productivity and monetary returns in soybean<sup>10,2</sup>. Further the organic sources unlike inorganic ones have substantial residual effect on succeeding crops<sup>4,9</sup>. Integrated nutrient management (INM) involves the use of manures, biofertilizers and chemical fertilizers to achieve sustained crop production and maintain better soil health. INM is best approach for better utilization of resources and to produce crops with less expenditure.

### MATERIAL AND METHODS

The experiment was conducted during 2017-18 at College of Agriculture, Badnapur. in randomized block design with five treatments and four replications Viz.T<sub>1</sub>: Control, T<sub>2</sub>: 100% NPKS, T<sub>3</sub>: 100% NPKS + Biofertilizer (Rhizobium +PSB), T<sub>4</sub>: 100% NPKS + Biofertilizer + Grade I Fertilizer, T<sub>5</sub>: 100% NPKS + Biofertilizer + FYM, each treatment consisted of 10 rows with row to row spacing of 45 cm. The soil was clayey in texture. NPK fertilizer application (30:60:30) and other agronomic practices were carried out uniformly according to the recommendations in all the treatments.

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The physic – chemical properties of experimental site were as, 7.85 pH, 0.28 d sm<sup>-1</sup> EC, 5.4 g kg<sup>-1</sup> Organic carbon, 65 g kg<sup>-1</sup> 220.4 Kg ha<sup>-1</sup> Available Nitrogen, 12.60 Kg ha<sup>-1</sup> Available Phosphorus, 480.60 Kg ha<sup>-1</sup> Available Potassium, 16.45 Kg ha<sup>-1</sup> Available Sulphur. Random 5 Plants were taken from each treatment For counting of number of nodules and number of pods per plant, for noting plant height, drymatter Plant<sup>-1</sup> and economic yield. Protein content was estimated by multiplying N content with 6.25.

## RESULT AND DISCUSSION

**Plant height:** The height of soybean was monitored at harvesting of crop are presented in Table 1. It was observed that there was continuous increase in plant height of crop due to each additional nutrients application. Height was significantly highest noted plant in treatment receiving 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) (51.70 cm) followed by T<sub>4</sub> and T<sub>3</sub>. However, minimum height was observed in control (T<sub>1</sub>) treatment. The highest plant height may be due to the positive effects of application of ha<sup>-1</sup> 5 tons FYM which had accelerated various metabolic processes and resulted in increasing vegetative growth. Similar result were recorded by Mohod *et al.*<sup>6</sup>.

**Number of pods per plant:** The data on effect of INM on number of pod per plant is given in table 1. The presented data shows that the application of 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) recorded the highest number of pods i.e (71.05) at harvesting stages. Improvement of pod bearing capacity of crop could be possibly be because of improved N and P fertilization efficiency in the presence of FYM, Increased rate of photosynthetic and symbiotic activity following balanced application of 5 ton FYM ha<sup>-1</sup> stimulated better vegetative and reproductive growth of the crop resulting in higher pod yield. Pattanashetti *et al.*<sup>8</sup> also recorded significantly higher number of pods plant<sup>-1</sup> with the application of 5 t FYM ha<sup>-1</sup> as compared to control.

### Number of nodules per plant:-

The data presented in Table 1 indicates significant impact of INM on number of nodules per plant.

Maximum number of nodules per plant (30.40) over observed in the plot which was application by 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) followed by the plot which was inoculated by 100% NPKS + Biofertilizer + Grade I Fertilizer (T<sub>4</sub>) (26.53) and 100% NPKS + Biofertilizer (T<sub>3</sub>) (26.00). While, minimum number of nodules per plant (23.25) was observed in the control plot. The maximum number of nodules plant<sup>-1</sup> with regards to organic manures were recorded by application of FYM (10 t ha<sup>-1</sup>). The increase in number of nodules/plant can be due to favourable effects of FYM in improving the soil fertility through positive effects on physical and chemical and biological soil properties. Tomar *et al.*<sup>11</sup> in a field experiment conducted at Gwalior (M.P.) reported that application of 5 ton FYM significantly increased the growth parameters, number of nodules plant<sup>-1</sup> and their length over the control.

### Total biomass production (kg ha<sup>-1</sup>):

The data on dry matter production (kg ha<sup>-1</sup>) at harvesting stage are presented in Table. The results revealed that application various treatment resulted in increase in mean dry matter yield with advancement in crop at harvesting stage. The mean dry matter was found to be highest due to application of 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) and (1970 kg ha<sup>-1</sup>) which followed by the plot application of 100% NPKS + Biofertilizer + Grade I Fertilizer (T<sub>4</sub>) (1772.50 kg ha<sup>-1</sup>) and also 100% NPKS + Biofertilizer (T<sub>3</sub>) (1412.50 kg ha<sup>-1</sup>) respectively. Where as minimum dry weight was found in absolute control treatment (T<sub>1</sub>) (43.83 g plant<sup>-1</sup>).

Nimje and Seth<sup>7</sup> reported that application of farmyard manure @ 10 t/ha resulted in significantly higher dry matter yield of soybean at flowering and at harvest stage.

### Economic yield of Soybean:

The data regarding to economic yield of soybean interpreted in table which Application of 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) was recorded highest seed yield (1815 kg ha<sup>-1</sup>) which was significantly higher over control (T<sub>1</sub>) The grain yield was lowest (871.25 kg ha<sup>-1</sup>) in absolute control (T<sub>1</sub>) while yield was improved in nutrient added plots. FYM

application showed significantly increase in grain yield of soybean in all the treatments over control (T<sub>1</sub>) and NPKS (T<sub>2</sub>). It was observed that, the application of FYM increased the grain yield of soybean. The data clearly indicated that addition of integrated application of fertilizer with FYM was found to be beneficial for maintaining the fertility of the soil as well as subsequently improving the productivity potential of soybean in that higher yield obtained from T<sub>5</sub> were FYM used with the fertilizer. and it worked out the optimum level of nutrient supply system through organic manuring and mineral fertilizers for increasing the yield potential of soybean. Similarly Chaturvedi and Chandel<sup>3</sup> found combined application of 100% recommended dose of NPK + FYM @ 10 tonnes improved the general soil environment.

#### Quality parameters:

#### Protein content:

The results revealed (Fig. 1) that highest protein content (31.34 %) was recorded in seed were application by 100% NPKS + Biofertilizer + FYM (T<sub>5</sub>) which was followed by 100% NPKS + Biofertilizer + Grade I Fertilizer (T<sub>4</sub>) (29.39 %) and 100% NPKS + Biofertilizer (Rhizobium +PSB ) (T<sub>3</sub>) (28.81 %). While, lowest protein content (27.10 %) was observed in the control plot. Increased protein content with FYM could be due to supplementation of soil reservoir on mineralization of organic N and P of FYM and enhanced microbial activity of ammonifiers, nitrifiers and phosphate solubilizing bacteria in particular, due to available organic carbon which might have increased root growth and nodulation resulting in increased nitrogen and protein content. Bacchav and Sable<sup>1</sup> recorded that the application of nitrogen through different sources significantly influenced the protein content of soybean over control.

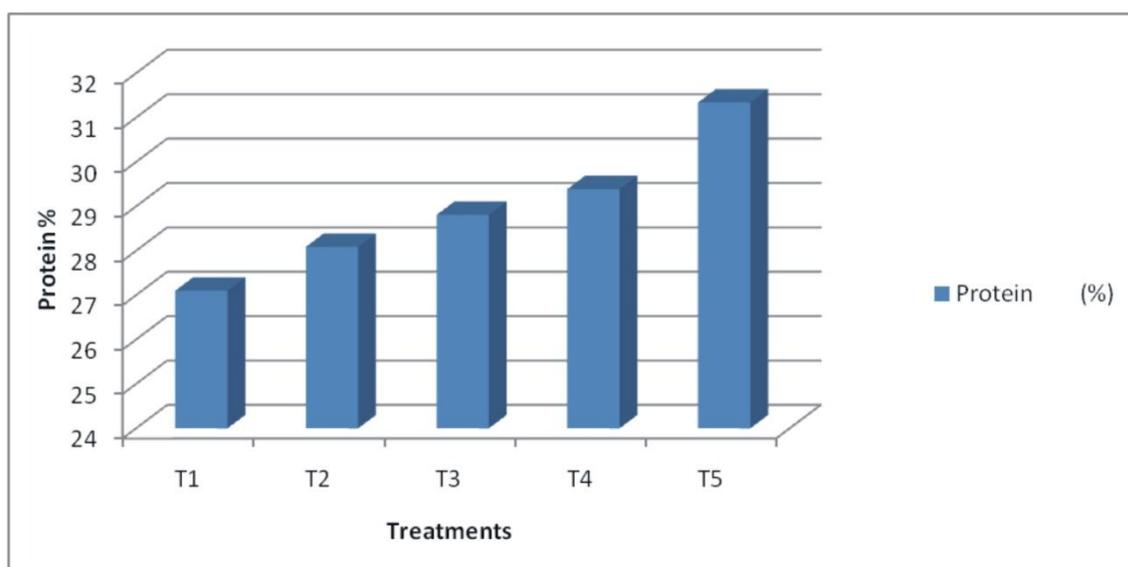


Fig. 1: Effect of INM on protein %

Table 1: Effect of INM on growth parameters and grain yield of Soybean

Treatment	Plant height cm plant <sup>-1</sup>	Number of pod per plant	Number of nodule plant <sup>-1</sup>	Dry matter kg ha <sup>-1</sup>	Economic yield
				(Kg ha <sup>-1</sup> )	(kg ha <sup>-1</sup> )
T <sub>1</sub> : Control	41.43	44.05	23.25	1150.00	871.25
T <sub>2</sub> : 100% NPKS	44.78	61.45	25.10	1190.00	1000.00
T <sub>3</sub> : 100% NPKS + Biofertilizer (Rhizobium +PSB )	46.33	62.90	26.00	1412.50	1282.50
T <sub>4</sub> : 100% NPKS + Biofertilizer + Grade I Fertilizer	47.68	65.40	26.53	1772.50	1693.75
T <sub>5</sub> : 100% NPKS + Biofertilizer + FYM	51.70	71.05	30.40	1970.00	1815.00
<b>S.Em.±</b>	1.20	1.71	0.88	59.1344	33.74
<b>C.D.@5%</b>	3.70	5.28	2.73	182.22	103.98

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