# Response of different levels of nitrogen, phosphorus and sulphur on yield parameters and yield of soybean [*Glycine max* (L) Merill]

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## ABSTRACT

A field experiment was carried out during the kharif season at the crop research farm of the Department of Agronomy, Allahabad school of Agriculture, SHUATS, Allahabad, Uttar Pradesh to evaluate the effect of different levels of nitrogen, phosphorus and sulphur on yield parameters and yield of soybean [*Glycine max* (L) Merrill]. The experiment was laid out in randomized block design and replicated thrice. The treatments consisted of different doses of nitrogen (30 and 45 kg/ha), phosphorus (40, 60 and 80 kg/ha), blanket application of potash (20 kg/ha) and sulphur (20 and 40 kg/ha). The treatment comprising nitrogen 45 kg/ha, phosphorus and sulphur at 40 kg per ha each along with a blanket application of potash at 20 kg/ha recorded highest number of pods per plant (34.77) which was at par with the treatment having nitrogen 45 kg/ha, phosphorus 60 kg/ha and sulphur 20 kg/ha (31.77). However, the treatment comprising nitrogen 45 kg/ha, phosphorus and sulphur at 40 kg/ha each recorded statistically maximum number of grains per pod (2.88) and seed yield (2,279.84 kg/ha).

**Keywords:** Soybean; nitorgen; phophorus; sulphur; yield

## INTRODUCTION

Soybean [*Glycine max* (L) Merrill] is an important oilseed crop and foodgrain legume of India that ranks fifth in the world in area and production after USA, Brazil, China and Argentina (Agarwal et al 2013). It is now the second largest oilseed in India after groundnut (Singh and Rai 2004). Soybean is not new to India, however, commercial cultivation of yellow seeded soybean is comparatively of recent origin. Earlier low yielding black seeded, shattering type of soybean varieties were grown under different names in hills and scattered pockets in the plains. Soybean is hailed as the Miracle Golden Bean of the 20$^{th}$ century and it is rightly praised as treasure trove of many countries (Khader 2019).

It is an excellent health food containing 40 to 44 per cent good quality protein, 20 per cent cholesterol free oil, 20 per cent carbohydrates and 0.69 per cent phosphorus. It also contains some phyto-chemicals, which protect human body against cancer, diabetes, blood pressure. It also fixes atmospheric nitrogen 45-60 kg per hectare through root nodules and ads about 0.5 to 1.5 tonnes organic matter per hectare leaf fall (Kanase et al 2006). In addition to this, it also contains vitamin A, B, C, D, E and K and all other essential amino acids.

Several previous researches proved that soy products rich in protein can reduce the serum concentrations of total cholesterol, low-density lipoproteins (LDLs), and triglycerides if consumed instead of animal protein.

Apart from these lipid-lowering effects, fermented soy products also proved to be effective in attenuating the effects of diabetes mellitus, blood pressure, cardiac disorders and cancer-related issues. The nutritional value of the fermented soy products

gains much attention due to its increased levels compared to the non-fermented ones (Jayachandran and Xu 2019).

Because soy is rich in quality protein and digestible energy, most of the soymeal is turned into animal feed, by baking the protein-rich fiber that remains after the oil is removed. The remainder of soymeal is used to make some soyfoods like tofu and soy milk. The soybean oil that remains after processing out the meal has many uses including cooking oil, biodiesel and bioheat and non-toxic industrial supplies like paints and cleaners (https://ncsoy.org/media-resources/uses-of-soybeans/). The soybean crop cycle in India starts from June, the climax arrives in October in the form of harvest, the other months are lean period for the crop of soybean.

In the present study, an experiment was carried out to study the effect of different levels of nitrogen, phosphorus and sulphur on yield parameters and yield of soybean.

## MATERIAL and METHODS

The experiment was conducted at central crop research farm of the Department of Agronomy, SHIATS, Allahabad, Uttar Pradesh.

The soil of the experimental area was sandy loam in texture. The sowing was done in 4 m x 3 m plots adopting a spacing of 20 cm x 10 cm on 6 July. Seed was treated with chloropyriphos (1-10%) in combination with the recommended dose of thiram (0.25%) before sowing.

The experiment was laid out in randomized block design with 3 replications. The treatments comprised $T_1$ (N 30 kg + P 40 kg + S 20 kg/ha), $T_2$ (N 30 kg + P 60 kg + S 20 kg/ha), $T_3$ (N 30 kg + P 80 kg + S 20 kg/ha), $T_4$ (N 30 kg + P 40 kg + S 40 kg/ha), $T_5$ (N 30 kg + P 60 kg + S 40 kg/ha), $T_6$ (N 30 kg + P 80 kg + S 40 kg/ha), $T_7$ (N 45 kg + P 40 kg + S 20 kg/ha), $T_8$ (N 45 kg + P 60 kg + S 20 kg/ha), $T_9$ (N 45 kg + P 80 kg + S 20 kg/ha), $T_{10}$ (N 45 kg + P 40 kg + S 40 kg/ha), $T_{11}$ (N 45 kg + P 60 kg + S 40 kg/ha) and $T_{12}$ (N 45 kg + P 80 kg + S 40 kg/ha). A blank application of potash at 20 kg per hectare was given along with all the treatments. The crop was raised with all the recommended package of practices for growing seed crop of soybean. Two manual weedings were done at 7 and 21 days after sowing.

After harvest of the crop, data were collected on five randomly selected plants under each treatment. Observations were made on number of pods per plant, number of grains per pod, 100-seed weight and seed yield per hectare.

## RESULTS and DISCUSSION

The treatment comprising nitrogen 45 kg/ha, phosphorus and sulphur at 40 kg/ha each along with a blanket application of potash at 20 kg/ha recorded highest number of pods per plant (34.77) which was at par with the treatment having nitrogen 45 kg/ha,

Table 1. Effect of different levels of nitrogen, phosphorus and sulphur treatments on yield attributes of soybean

| Treatment | Number of pods/plant | Number of grains/pod | Seed index | Seed yield (g) |
|---|---|---|---|---|
| $T_1$ (N 30 kg + P 40 kg + S 20 kg) | 15.99 | 1.55 | 6.54 | 816.94 |
| $T_2$ (N 30 kg + P 60 kg + S 20 kg) | 22.88 | 2.22 | 4.82 | 1,037.68 |
| $T_3$ (N 30 kg + P 80 kg + S 20 kg) | 20.88 | 2.00 | 4.67 | 781.68 |
| $T_4$ (N 30 kg + P 40 kg + S 40 kg) | 16.32 | 2.00 | 4.6 | 795.75 |
| $T_5$ (N 30 kg + P 60 kg + S 40 kg) | 25.10 | 1.77 | 5.02 | 821.14 |
| $T_6$ (N 30 kg + P 80 kg + S 40 kg) | 19.55 | 1.66 | 5.41 | 709.57 |
| $T_7$ (N 45 kg + P 40 kg + S 20 kg) | 19.55 | 1.66 | 3.31 | 611.67 |
| $T_8$ (N 45 kg + P 60 kg + S 20 kg) | 31.77 | 2.44 | 6.34 | 1,490.65 |
| $T_9$ (N 45 kg + P 80 kg + S 20 kg) | 21.77 | 1.55 | 4.1 | 572.55 |
| $T_{10}$ (N 45 kg + P 40 kg + S 40 kg) | 34.77 | 2.88 | 7.54 | 2,279.84 |
| $T_{11}$ (N 45 kg + P 60 kg + S 40 kg) | 23.66 | 1.66 | 4.17 | 619.31 |
| $T_{12}$ (N 45 kg + P 80 kg + S 40 kg) | 21.89 | 1.44 | 4.32 | 555.50 |
| SEd (±) | 1.79 | 0.16 | - | 151.63 |
| $CD_{0.05}$ | 3.72 | 0.34 | NS | 314.46 |

phosphorus 60 kg/ha and sulphur 20 kg/ha along with a blanket application of potash at 20 kg/ha (31.77).

However, the treatment comprising nitrogen 45 kg/ha, phosphorus and sulphur at 40 kg/ha each along with a blanket application of potash at 20 kg/ha recorded statistically maximum number of grains per pod (2.88) and seed yield (2,279.84 kg/ha). The seed index ranged from 3.31 to 6.54 among the different treatments but there was no significant difference among the treatments for seed index.

Joshi and Billore (1998) found that there was gradual increase in seed yield up to 40 kg S/ha application. At 40 kg S/ha the yield attributes like branches per plant, pods per plant and seed index were the cumulative contributory factors for highest yield.

Jat et al (1999) reported that yield of soybean increased significantly by applying 40 kg S/ha which by and large was due to significant increase in pods per plant and seeds per pod.

It can, thus, be concluded from the study that the application of nitrogen at 45 kg/ha and phosphorus and sulphur at 40 kg/ha each with a blanket application of potash at 20 kg/ha gave maximum number of pods/plant, number of grains/ pod and seed yield.

## REFERENCES

Agarwal DK, Billore SD, Sharma AN, Dupare BU and Srivastava SK 2013. Soybean: introduction, improvement and utilization in India: problems and prospects. Agricultural Research **2:** 293-300.

https://ncsoy.org/media-resources/uses-of-soybeans/ (Retrieved: 02.03.2022)

Jat LN, Nepalia V and Kumawat RN 1999. Effect of weed management and sulphur fertilization on the productivity on soybean (*Glycine max*). Indian Journal of Agricultural Sciences **69(7):** 521-522.

Jayachandran M and Xu B 2019. An insight into the health benefits of fermented soy products. Food Chemistry **271:** 362-371.

Joshi OP and Billore SD 1998. Economic optima of sulphur fertilizer for soybean (*Glycine max*). Indian Journal of Agricultural Sciences **68(5):** 244-246.

Kanase AA, Mendhe SN, Khawale VS, Jarande NN and Mendhe JT 2006. Effect of integrated nutrient management and weed biomass addition on growth and yield of soybean. Journal of Soils and Crops **16(1):** 236-239.

Khader V 2019. Soyabean the Miracle Golden bean in Indian foods. Acta Scientific Nutritional Health **3(3):** 44-49.

Singh R and Rai RK 2004. Yield attributes, yield and quality of soybean (*Glycine max* L *Merill*) as influenced by integrated nutrient management. Indian Journal of Agronomy **49(4):** 471-474.