Original Research Article

Effect of Sulphur and foliar Application of Boron on Growth and Yield attributes of Lentil (*Lens culinaris* L.)

ABSTRACT

A field experiment was conducted at Crop Research Farm, Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Prayagraj, UP, during the *Rabi* season of 2022. The soil of experimental plot was sandy loamy in texture, having pH 7.3, electrical conductivity 0.762 mm /cm and organic carbon 0.987%. The experiment consists of three replications in which there were three levels of Sulphur (15, 30, 45 kg/ha) and three levels of boron (0.1%, 0.2% 0.3%) and one control. Among the various treatment combinations in Treatment-9 with the application of Sulphur 45 kg/ha along with boron 0.3% foliar spray at 35 DAS significantly recorded higher plant height (41.25 cm), number of nodules/plant (25.07), dry weight (16.43 g/plant), number of pods/plant (118.67), number of seeds/pod (2.00) in Lentil crop

Keywords*: Boron, Growth, Lentil, Sulphur, Yield attributes.*

1.Introduction

Lentil, well known as "The poor man meat" because of its protein content and cheap availability. Lentil has been one of the world's oldest agricultural crop, resistant to drought and cultivated across the world. Lentil is a legume crop and plays a great role in crop rotation for maintaining soil fertility and through root nodules, lentil can fix atmospheric nitrogen by symbiotic rhizobia therefore fertilizers and soil fertility has a major role for obtaining higher yield. In present scenario, global production of lentil was 6.5 million tonnes and India with 18% of the world's total. Lentil is being cultivated in India in an area of about 1.32 million hectares with a production of 1.18 million tonnes and an average productivity of about 894 kg/ha and Uttar Pradesh contributes an area about 0.46 million hectares with a 31.46% in all over India which has the production of about 0.45 million tonnes (38.47% in all over India) and productivity is 978kg/ha **(Agricultural Statistics at a Glance, 2021)**.

Sulphur is an important secondary nutrient elements and it is indispensable for the synthesis of certain amino acids like cysteine, cystine and methionine besides being involved in various metabolic and enzymatic processes of plants (**Gokila *et al.,* 2017**). Addition of sulphur to nodulated legumes, not only helps in synthesis of S-containing amino acids but also increase the amount of N in leaves and stems and amounts of N fixed in the soil. (**Chaudhary *et al.,* 2020**). Sulphur is also an important macronutrient which takes part in synthesis of amino acids like cysteine, cystine, methionine and vitamins (**Usha *et al*., 2019)**.

Foliar application of micro nutrients would be more appropriate, efficient and economical than soil application because micro nutrients when applied as foliar, they get very quickly and directly to the leaf cells and because of

that effect is very high. Foliar use of boron has been exposed the seed set, produce and excellence of seed in various crops (**Khan *et al.,* 2021**). Foliar applied boron causes increased in yield more than soil applied boron because boron is required more at reproductive stage and foliar applied is instantly present for plant in compare to soil applied boron. Foliar nutrition is designed to eliminate the problems like fixation and immobilization of nutrients. Legume crops required more amount of boron compared to most field crops as boron plays vital role in proper development of reproductive organs. Its deficiency leads to sterility in plants by malformation of reproductive tissues affecting pollen germination, resulting in increased flower drop and reduced fruit set (**Chatterjee *et al.* 2017**). Keeping in the view the immense importance of sulphur and boron fertilization, the present study "**Effect of Sulphur and foliar application of Boron on Growth and Yield of Lentil (*Lens culinaris* L.)**" was undertaken

2.Material and Methods

The experiment was conducted during the *Rabi* season (December – March, 2022), at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj Uttar Pradesh, which is located at 25°39' 42''N latitude, 81°67'56" E longitude and 98 m altitude above the mean sea level. The soil had a sandy loam texture, having pH 7.3, electrical conductivity 0.762 mm /cm and organic carbon 0.987%. In experimental field 5 plants were selected and tagged randomly from every treatment. The observations like plant height, number of nodules/plant, plant dry weight, number of pods/plant, number of seeds/pod, test weight were recorded from tagged plants. The data collected for different parameters were statistically analyzed using **Gomez and Gomez (1984)** analysis of variance for randomized block design. The results are presented at 5% level of significance (p=0.05) for making comparison among treatments.

3. Results and discussion

3.1. Growth attributes: Growth attributes like plant height, number of nodules/plant , dry weight were embodied in Table 1.

3.1.1. Plant height (cm) - significantly higher plant height (41.25 cm) was observed in treatment receiving Sulphur 45 kg/ha + Boron 0.3%. However, application of Sulphur 45 kg/ha + Boron 0.2% (40.70 cm) was statistically at par with Sulphur 45 kg/ha + Boron 0.3%.

The Significant increase in plant height might be due to the progressive response of lentil crop to graded levels of sulphur and boron foliar spray. **Aparna *et al.* (2022)** reported that application of sulphur increased the plant height in lentil due to the fact that sulphur plays a vital role in photosynthetic process of plant which improves growth and development. These findings are in line with **Bindu *et al.*, (2022); Sahay *et al.*, (2015); Reddy *et al.*, (2022).**

3.1.2. Number of nodules/plant- significantly higher number of nodules (25.07) was observed in treatment receiving Sulphur 45 kg/ha + Boron at 0.3%. However, application of Sulphur 45 kg/ha + Boron 0.2% (24.47) was statistically at par with Sulphur 45 kg/ha + Boron at 0.3%.

The significant increase in number of nodules/plant with the application of sulphur and boron foliar spray might be due the fact that sulphur increases the amount of glucose flowering to the roots and ATP biosynthesis. **Bindu *et al.* (2022)** reported that application of sulphur significantly increases the P uptake by the roots which helps in nodule formation and root elongation. Similar results were also reported by **Aparna *et al.*, (2022); Kumari *et al*., (2021).**

3.1.3. Plant Dry Weight (g/plant)- significantly higher dry weight (16.43 g) was observed in treatment receiving Sulphur 45 kg/ha + Boron at 0.3%. However, application of Sulphur 45 kg/ha + Boron 0.2% (16.20) was statistically at par with Sulphur 45 kg/ha + Boron at 0.3%.

significant increase in plant dry weight in different stages of growth of crop might be due the role of sulphur in absorption of nutrients by plant and role of boron which have lead to vigorous shoot growth and accumulation of photosynthates due to higher photosynthetic rate and metabolic activity. These findings are in line with **Reddy *et al.*, (2022); Kumari *et al.*, (2019); Sahay *et al.*, (2015).**

3.2. Yield attributes: Number of pods/plant, number of seeds/plant, test weight were embodied in Table 1.

Significant and higher number of pods/plant (118.67) was observed in treatment receiving Sulphur 45 kg/ha + Boron at 0.3%. However, application of Sulphur 45 kg/ha + Boron 0.2% (115.67) was statistically at par with Sulphur 45 kg/ha + Boron at 0.3%. significant and higher number of seeds/pod (2.00) was observed in treatment receiving Sulphur 45 kg/ha + Boron at 0.3%. However, application of Sulphur 45 kg/ha + Boron 0.2% (1.80) was statistically at par with Sulphur 45 kg/ha + Boron at 0.3%. significant and higher number of seeds/pod (2.00) was observed in treatment receiving Sulphur 45 kg/ha + Boron at 0.3%. However, application of Sulphur 45 kg/ha + Boron 0.2% (1.80) was statistically at par with Sulphur 45 kg/ha + Boron at 0.3%.

Significant response in yield attributes like number of pods/plant, number of seeds/pod might be due to the synergistic effect of sulphur and foliar spray of boron. Boron which plays a key role in pollination and fertilization. The improved availability of sulphur and favourable nutritional environment might have helped the plants at peak growth period and flowering stages which have augumented the number of pods/plant, number of seeds/pod that enhances yield. These results are in line with the findings of **Teja *et al., (*2021); Reddy *et al.*, (2022); Aparna *et al.*, (2022) and Bindu *et al*., (2022).**

Conclusion

Based on the study it can be concluded that with application of sulphur 45kg/ha and boron 0.3% foliar spray at 35 DAS recorded higher growth, yield parameters and also proven economically viable.

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Table 1. Influence of sulphur and boron on growth parameters and yield attributes of lentil.

S. No.	Treatments	Plant height (cm)	Number of nodules/plant	Plant dry weight (g/plant)	Pods/plant	Seeds/pod	Test weight (g)
1.	Sulphur 15 kg/ha + Boron 0.1%	36.84	22.73	14.32	107.67	1.13	18.00
2.	Sulphur 15 kg/ha + Boron 0.2%	37.71	23.00	14.58	108.33	1.27	18.07
3.	Sulphur 15 kg/ha + Boron 0.3%	37.93	23.53	14.91	112.00	1.40	18.20
4.	Sulphur 30 kg/ha + Boron 0.1%	38.77	23.20	15.36	112.33	1.47	18.27
5.	Sulphur 30 kg/ha + Boron 0.2%	38.92	23.53	15.69	113.00	1.53	18.33
6.	Sulphur 30 kg/ha + Boron 0.3%	39.36	23.33	15.77	115.00	1.67	18.47
7.	Sulphur 45 kg/ha + Boron 0.1%	39.64	23.60	16.07	115.33	1.73	18.47
8.	Sulphur 45 kg/ha + Boron 0.2%	40.70	24.47	16.20	115.67	1.80	18.53
9.	Sulphur 45 kg/ha + Boron 0.3%	41.25	25.07	16.43	118.67	2.00	18.73
10.	20-40-20 NPK kg/ha (Control)	36.56	22.13	14.30	110.33	1.07	18.07
	F-Test	S	S	S	S	S	NS
	SEm (+)	0.43	0.35	0.10	1.03	0.06	0.18

CD (p=0.05)	1.30	1.04	0.32	3.07	0.20	-