Original Research Article

Influence of Sulphur and foliar application of Iron on Growth and Yield of Lentil (*Lens culinaris* L.)

ABSTRACT

A field experiment was conducted during *Rabi* season of 2022 at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, (U.P) India. To study the influence of Sulphur and foliar application of Iron on Growth and Yield of Lentil. The treatments consist of Sulphur (20, 30, 40 kg/ha) and Iron (control, 0.3%, 0.5%). There were 10 treatments replicated thrice. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 6.9), low in organic carbon (0.112%), available N (278.93 kg/ha), available P (10.8 kg/ha), and available K (206.4 kg/ha). Results revealed that at 60DAS the higher plant height (26.5 cm), more number of nodules per plant (26.7), maximum plant dry weight (7.31 g/plant), more no of pods per plant (162.40), more no of seeds per pod (2.53), higher seed yield (1556.19 kg/ha) and higher stover yield (2868.3 kg/ha) were significantly influenced with application of Sulphur 40 kg/ha + Iron 0.5%.

Keywords: *Lentil, Sulphur, Iron, growth parameters and yield attributes.*

INTRODUCTION

Lentil (*Lens culinaris* L.), a significant annual leguminous crop that is referred to as "Masoor" locally, is a member of the Fabaceae family. It is grown for grains, throughout northern and central India. Whole or dehulled grains are also utilised in many different preparations in addition to being used as a dal **(Ali *et al.* 2012)**. Vegetable protein makes up a sizable portion of the average human diet. Lentils contain protein, carbohydrates, oils and ash at the rate of 23.25%, 59%, 1.8% and 0.2% respectively along with magnesium, calcium, phosphorus, iron. Lentil additionally contains a substantial amount of vitamins A and B **(Zafar *et al.* 2003).** The majority of the world's output of food crops—64% of the total—comes from Canada and India. In fact, India was the world's top producer of lentils until Canada recently overtook it, dropping India to second. The country's average area

planted with lentils was 14.24 lakh ha, and it produced 12.17 lakh tonnes at an average productivity of 855 kg/ha.

Sulphur significantly affects the production of pulse-specific protein, which is primarily stored in globulins and is a component of some amino acids, including methionine, cystein, and cystine, and it encourages nodulation in legume crops **(Becana *et al*. 2018)**. Sulphur is an enzyme activator, a vital component for boosting the yield of legume crops, and a constituent of several vitamins like vitamin A, biotin, and thiamine. Additionally, S plays a crucial role in the synthesis of chlorophyll and the activation of enzymes **(Tiwari and Singh, 2012; Singh, 2017)**. According to **Chaudhary *et al*. (2014)**, sulphur is related to crop production for higher nutritional and market grade products.

Because it is crucial for metabolic processes like DNA synthesis, respiration, and photosynthesis, iron is an important micronutrient. It typically contributes to the synthesis of chlorophyll and maintaining of chloroplast structure. According to **Kerkeb and Conolly (2006)**, Iron (Fe) is involved in the breakdown of hormones as well as other chemical processes occurring in plants. According to **Rout and Sahoo (2015)**, Iron (Fe) is crucial for a variety of plant biochemical pathways. It aids in the activation of plant enzymatic processes such the formation of ferredoxin, nitrogenase, and haemoglobin.

Keeping in view the above facts, the present experiment was undertaken to find out **"Influence of Sulphur and Foliar application of Iron on Growth and Yield of Lentil (*Lens culinaris* L.)".**

MATERIAL AND METHODS

A field experiment was conducted during *Rabi* season 2022 at the Crop Research Farm, Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P.), India. The soil of experimental plot was sandy loam texture, nearly neutral in soil reaction (pH 6.9), low in organic carbon (0.112%). The treatments consist of Sulphur 20 kg/ha + Control, Sulphur 20 kg/ha + Iron 0.3%, Sulphur 20 kg/ha + Iron 0.5%, Sulphur 30 kg/ha + Control, Sulphur 30 kg/ha + Iron 0.3%, Sulphur 30 kg/ha + Iron 0.5%, Sulphur 40 kg/ha + Control, Sulphur 40 kg/ha + Iron 0.3%, Sulphur 40 kg/ha + Iron 0.5% and Control (20-40-20 NPK kg/ha). The experiment was laid out in Randomized Block Design, with 10 treatments replicated thrice. 5

plans were randomly selected and tagged for recording observations. The observations were recorded at 20, 40, 60, 80 Days after sowing and at harvest for plant height (cm), number of nodules, dry weight (g/plant), number of pods per plant, number of seeds per pod, test weight (g), seed yield (kg/ha), stover yield (kg/ha) and harvest index (%). Recommended dose of fertilizers 20-40-20 NPK kg/ha were applied as basal dose. Foliar application of Iron was done at pre-flowering and pod formation stage. The data were subjected to statistical analysis by analysis of variance method **(Gomez and Gomez, 1976).**

RESULT AND DISCUSSION

GROWTH PARAMETERS

The growth parameters like plant height, number of nodules per plant, dry weight were significantly affected by the application of Sulphur and Iron. Lentil crop fertilized with 40 kg S/ha along with foliar application of Iron 0.5% resulted in significant increase in plant height (26.5 cm) at 60 DAS. This enhancement in plant organs might be due to the consequence of cell proliferation, enlargement, and elongation that occurs as a result of faster crop growth with sulphur application. **Saini *et al*. 2017** reported similar outcomes as well. Iron application, which is crucial for the synthesis of chlorophyll, photosynthesis, and a plant growth regulator, may be the cause of further plant height development. Similar results were also reported by **Jin *et al*. 2008.** Lentil crop fertilized with 40 kg S/ha along with foliar application of Iron 0.5% resulted in significant increase in number of nodules per plant (26.7). Increased infection and rhizobial colonisation in the rhizosphere may be the reason of the rise in nodule count due to the increased availability of micronutrients. **B.K. Patel *et al*. 2020** reported similar outcomes as well. Lentil crop fertilized with 40 kg S/ha along with foliar application of Iron 0.5% resulted in significant increase in dry weight (7.31 g/plant). Increase in dry weight might be due to iron involved in various physiological process such as enzyme activation, chlorophyll formation, electron transport and stomata regulation. Similar findings were observed by **Kavya *et al*. 2020.** Lentil crop fertilized with recommended dose of fertilizers (20-40-20 NPK Kg/ha) resulted in significant increase in Relative growth rate (0.0483 g/g/day). Improved growth and development of the crop plants in the present investigation might be the result of enhanced metabolic activities and photosynthetic rate resulting in improvement in relative growth rate of plants.

YIELD ATTRIBUTES AND YIELD

Yield attributes like number of pods per plant, number of seeds per pod, seed yield and stover yield were significantly affected by the application of Sulphur and Iron. Lentil crop fertilized with 40 kg S/ha along with foliar application of Iron 0.5% resulted in significant increase in number of pods per plant (162.40) and seeds per pod (2.53). This could be as a result of foliar application of iron during the flowering and pod-formation stages, which is in charge of efficient photosynthate transfer from source to sink and results in a higher number of pods and seeds per pod. Similar results were previously reported by **Barla *et al.* 2022.** Lentil crop fertilized with 40 kg S/ha along with foliar application of Iron 0.5% resulted in significant increase in seed yield (1556.19 kg/ha) and stover yield (2868.3 kg/ha). Sulphur was found to boost yield attributes when balanced nutrients were applied because the element is known to help plants to form reproductive organs, which result in the development of pods and seeds. Sulphur application led to an increase in yield attributing parameters in lentil. Similar results were previously reported by **Sahu *et al.* 2021.**

Table 1. Influence of Sulphur and foliar application of Iron on Growth attributes of Lentil.

S.No	Treatment combinations	Plant height (cm)	No. of nodules per plant	Dry weight (g/plant)	Relative Growth Rate (g/g/day)
1	Sulphur 20kg/ha + Control	23.7	24.1	6.29	0.0477
2	Sulphur 20kg/ha + Iron 0.3%	24.8	25.2	6.26	0.0417
3	Sulphur 20kg/ha + Iron 0.5%	25.2	25.4	6.75	0.0423
4	Sulphur 30kg/ha + Control	24.2	24.4	6.38	0.0480
5	Sulphur 30kg/ha + Iron 0.3%	25.5	25.7	6.82	0.0420
6	Sulphur 30kg/ha + Iron 0.5%	25.9	26.1	6.96	0.0407
7	Sulphur 40kg/ha + Control	24.4	24.9	6.49	0.0460
8	Sulphur 40kg/ha + Iron 0.3%	26.1	26.4	7.20	0.0390
9	Sulphur 40kg/ha + Iron 0.5%	26.5	26.7	7.31	0.0390
10	Control (20-40-20 NPK kg/ha)	23.4	23.4	6.08	0.0483
	F-test	S	S	S	S
	SEm (±)	0.13	0.13	0.10	0.0014
	CD (p=0.05)	0.39	0.40	0.33	0.004

Table 2. Influence of Sulphur and foliar application of Iron on yield attributes and yield of Lentil.

S.No	Treatment combinations	No. of Pods/plant	No. of seeds/pod	Seed yield (kg/ha)	Stover yield (kg/ha)
1	Sulphur 20kg/ha + Control	155.47	1.20	1018.89	1861.9
2	Sulphur 20kg/ha + Iron 0.3%	158.13	1.73	1159.63	2170.3
3	Sulphur 20kg/ha + Iron 0.5%	159.27	1.93	1266.90	2314.6
4	Sulphur 30kg/ha + Control	156.80	1.33	1047.80	1955.1
5	Sulphur 30kg/ha + Iron 0.3%	159.53	2.00	1361.79	2455.8
6	Sulphur 30kg/ha + Iron 0.5%	160.87	2.07	1434.81	2599.3
7	Sulphur 40kg/ha + Control	157.40	1.53	1136.40	2032.7
8	Sulphur 40kg/ha + Iron 0.3%	161.80	2.33	1515.27	2755.5
9	Sulphur 40kg/ha + Iron 0.5%	162.40	2.53	1556.19	2868.3
10	Control (20-40-20 NPK kg/ha)	151.33	1.07	966.85	1753.0
	F-test	S	S	S	S
	SEm (±)	0.32	0.08	14.39	39.84
	CD (p=0.05)	0.94	0.25	42.78	118.40

CONCLUSION

Based on the above findings it can be concluded that application of Sulphur 40 kg/ha in combination with Iron 0.5% as foliar spray has performed better in growth parameters and yield attributes of lentil and also proven profitable. Since the findings are based on one season, further trails are needed to confirm the results.

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