

## Response of Sulphur and Zinc on Growth and Yield Components of Clusterbean

### Abstract

Field test carried out during Zaid 2023 at Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P). The soil in the field was found to be sandy loam, neutral in soil reaction (pH 7.10), natural carbon (0.50 %), accessible N (183.40 kg/ha), accessible P (37.56 kg/ha) and accessible K (200.06 kg/ha). The experiment was a randomized block design as the experiment consisting of nine treatments each repeated three times. The treatment combinations are 1: Sulphur 10kg/ha + Zinc 3kg/ha, 2: Sulphur 10kg/ha + Zinc 6kg/ha, 3: Sulphur 10kg/ha + Zinc 9kg/ha, 4: Sulphur 20kg/ha + Zinc 3kg/ha, 5: Sulphur 20kg/ha + Zinc 6kg/ha, 6: Sulphur 20kg/ha + Zinc 9kg/ha, 7: Sulphur 30kg/ha + Zinc 3kg/ha, 8: Sulphur 30kg/ha + Zinc 6kg/ha, 9: Sulphur 30kg/ha + Zinc 9kg/ha, 10: Control 20:40:25 (N:P:K) kg/ha are used. The important findings of the experiment have been summarized and concluded here under the objectives taken. The application of Sulphur 30kg/ha + Zinc 6kg/ha, observed maximum Plant height (104.00 cm), highest number of nodules per plant (16.93) Plant dry weight (26.56g/plant). Maximum pods/plant (41.07), Seeds/pod (10.00), Test weight (4.45g), Seed yield (2.03t/ha), stover yield (3.98 t/ha), Harvest index (33.76 %) were noted with the treatment combination of Sulphur 30kg/ha + Zinc 6kg/ha.

**Key words:** *Sulphur, Zinc, Cluster Bean.*

**Introduction:**

Cluster bean categorized under Leguminosae family, also called as Guar. Botanically called as *Cyamopsis tetragonoloba*. It is mainly cultivated under rainfed conditions in arid and semi arid regions of tropical India. Cluster bean is an important drought tolerant crop of drought prone area of Rajasthan. This crop has wider scope in reference to achieving sustainable production from very poor soil of erratic rainfall areas. Cluster bean ( $2n=14$ ) is an annual legume crop. It is extensively cultivated for vegetable, green manure, and also for fodder purpose. West Africa and India are stated as the centre of origin for cluster bean by several authors. The crop is cultivated broadly in India, Pakistan, Indonesia, Myanmar, parts of Central Africa.

Kiran yadav and SR Naga (2021) Application of sulphur @ 40 kg per hectare significantly increased the number of pods per plant ,number of seeds per pod, test weight , seed yield, straw yield, protein content, gum content and gum yield in cluster bean and proved significantly superior over lower levels of sulphur.

Hedge and Murthy, 2005 stated that Sulphur is correlated with phosphorus, as phosphate ions are powerful than sulfate. Application of P fertilizer causes an increase in the adsorption site for phosphate anions, thereby releasing sulfate ions into the soil solution (Tiwari and Gupta, 2006). That is, if it is not absorbed by the roots, it is washed off. Studies have shown that there is a positive and negative relationship between sulfur and phosphorus, but their relationship depends on the application and the type of crop. Shivakumar et al. (2021) in cluster bean concluded that by Sulphur (S) 20 kg/ha resulted highest plant height, branches per plant , pods/plant, pod length as well as yield and stover yield . Deo and Khandelwal (2009) stated that for chickpea, Unfavourable relationship between P and S was observed in wheat and moong. Same in case of lentil and chickpea by Hedge and Murthy (2005). The collaboration of these nutrients affects the significant levels of accessible P and S below this response of their application can be examined. Report on effect of combinative treatment of zinc and Sulphur on yield, quality, and content of every nutrient in cluster bean is reasonably limited.

**Material and Methods:**

The experiment performed to understand the Response of Sulphur and Zinc on Growth and Yield Components of Cluster bean was done at Crop Research Farm of Sam Higginbottom University, Formerly Allahabad Agriculture Institute, Prayagraj, Uttar Pradesh in 2023. The experiment was a randomized block design as the experiment consisting of nine treatments each repeated three times, Clusterbean variety Pusa Navbahar was selected for sowing. Seeds were sown in line manually on 2023. Seeds were covered with the soil instantly after sowing.

The spacing implemented was plant to plant 10 cm and row to row 45 cm according to the treatment details and the seeds were sown at 3 - 4 cm deep. Gap-filling and thinning at 8 DAS to maintain the plant population as a treatment for the plant population that promotes crop growth and development.

### **Results and Discussion:**

**Plant height:** At 80 DAS, least (97.33 cm) was recorded with the treatment Control 20:40:25 (N:P:K) kg/ha and highest plant height (104.00 cm) was observed with the application of Sulphur 30kg/ha + Zinc 6kg/ha, and significant difference among the treatments, whereas Sulphur 30kg/ha + Zinc 3kg/ha (103.00 cm), Sulphur 30kg/ha + Zinc 9kg/ha (102.67 cm) were statistically at par with Treatment 8. Ramawtar *et al.* 2013 stated that application Zn and S generated a balanced nutritional environment that boosted metabolic behavior and photosynthetic rate, lead to in development in plant height and eventually increases plant dry weight. Alike types of conclusions were informed by Meena *et al.* (2006). Anuradha (2017) observed maximum plant height (45.1 cm) when treated with 100% recommended dose of fertilizers + PSB + Zinc (5kg/ha). Plant height increases with the application of zinc (Singh *et al.*, 2014).

**Number of nodules per plant:** Lowest amount of nodules per plant (13.87) was recorded with the treatment Control 20:40:25 (N:P:K) kg/ha and highest number of nodules per plant (16.93) was recorded with the application of Sulphur 30kg/ha + Zinc 6kg/ha, and there was substantial variance among the treatments, whereas Sulphur 30kg/ha + Zinc 3kg/ha (16.33) was statistically at par with Treatment 8. Kasturi Krishna and Ahlawat (2000) reported that due to accessibility of zinc might have stimulated the metabolic and enzymic activity and there by increases the plant growth attributes which increases the number of branches/plant and number of nodules per plant.

**Plant dry weight:** At 80 DAS, minimum dry weight (23.78 g) was observed with the treatment Control 20:40:25 (N:P:K) kg/ha and maximum dry weight (26.56 g) was recorded with the application of Sulphur 30kg/ha + Zinc 6kg/ha, and there was significant difference among the treatments, whereas Sulphur 30kg/ha + Zinc 3kg/ha (26.09 g), Sulphur 30kg/ha + Zinc 9kg/ha (25.94 g) were statistically at par with Treatment 8.

Weldua *et al.*, (2012) observed the Zinc application on yield Zinc fertilization also significantly increased the above ground biomass at maturity stage.

**Number of Pods/plants:** Maximum Number of Pods/plant (41.07) was recorded with the treatment of application of Sulphur 30kg/ha + Zinc 6kg/ha over all the treatments, and minimum was recorded in Control 20:40:25 (N:P:K) kg/ha (38.01). However, the treatments Sulphur 30kg/ha + Zinc 3kg/ha (40.01) which was found to be statistically at par with Sulphur

30kg/ha + Zinc 6kg/ha. Various yield attributing characters like number of pods plant, number of seeds pod and 100 seed weight increased significantly as the dose of sulphur was increased. It may be due to its role in synthesis of sulphur having amino acids, proteins and developed photosynthetic activity of plant with better chlorophyll synthesis (Juszczuk and Ostaszewska, 2011). Baviskar *et al.* (2011) found that application of sulphur 50 kg/ha registered higher green pod yield.

**Number of Seeds/Pod:** Highest Number of seeds/pods (10.00) was observed with application of Sulphur 30kg/ha + Zinc 6kg/ha over all the treatments, and minimum was recorded in Control 20:40:25 (N:P:K) kg/ha (6.00). However, the treatments Sulphur 30kg/ha + Zinc 3kg/ha (9.40) which was observed to be statistically at par with Sulphur 30kg/ha + Zinc 6kg/ha.

**Seed index (g):** Maximum was (4.45 g) observed with the treatment of application of Sulphur 30kg/ha + Zinc 6kg/ha among all the treatments, and minimum was recorded in Control 20:40:25 (N:P:K) kg/ha (2.70). However, the treatments Sulphur 30kg/ha + Zinc 3kg/ha (4.37 g) which was observed to be statistically at par with Sulphur 30kg/ha + Zinc 6kg/ha. Similarly, application of sulphur increased pod, seed and stover yield significantly up to 45 kg ha, however, these results were at par with 30 kg ha. Davidian and Kopriva, (2010) stated that the increase in yield due to rise in sulphur amounts may be due to its vital role in energy transformation, activation of enzymes and carbohydrate metabolism.

**Conclusion:**

It was determined that application of Sulphur 30kg/ha + Zinc 6kg/ha observed higher growth and yield attributes as compared to other treatments.

**Table 1: Response of Sulphur and Zinc application on growth and Yield attributes of Cluster bean.**

<b>Treatments</b>	<b>Plant Height</b>	<b>Nodules per plant</b>	<b>Plant Dry weight</b>	<b>Pods/plant (No)</b>	<b>Seeds/pod (No)</b>	<b>Seed index (g)</b>
T1	99.00	14.07	23.83	38.07	7.00	3.00
T2	99.67	14.53	24.10	38.33	7.33	3.00
T3	98.33	13.93	23.78	37.67	7.00	2.76
T4	101.00	14.87	25.25	39.01	8.00	3.61
T5	101.67	15.20	25.79	39.01	8.33	3.78
T6	100.67	14.53	24.84	38.67	8.00	3.13
T7	103.00	16.33	26.09	40.01	9.40	4.37
T8	104.00	16.93	26.56	41.07	10.00	4.45
T9	102.67	15.53	25.94	39.34	8.67	4.01
T10	97.33	13.87	23.78	38.01	6.00	2.70
Sem(±)	1.20	0.24	0.37	0.63	0.21	0.03
CD (p=0.05)	3.58	0.73	1.11	1.88	0.64	0.09

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