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

Abstract:

A field experiment was conducted during *Zaid* 2022 at Crop Research Farm, Department ofAgronomy, SHUATS, Prayagraj (U.P). The soil of experimental plot was sandy loam intexture, nearly neutral in soil reaction (pH 7.2), low in organic carbon (0.49 %), available N(183.30 kg/ha), available P (37.46 kg/ha) and available K (199.61 kg/ha). The experiment waslaid out in Randomized Block Design with nine treatments each replicated thrice on the basisof one year experimentation. The treatments which are T_1: Sulphur 10kg/ha + Zinc 3kg/ha,T_2:Sulphur 10kg/ha + Zinc 6kg/ha,T_3:Sulphur 10kg/ha + Zinc 9kg/ha, T_4: Sulphur 20kg/ha + Zinc 3kg/ha, T_5: Sulphur 20kg/ha + Zinc 6kg/ha, T_6: Sulphur 20kg/ha + Zinc 9kg/ha, T_7: Sulphur 30kg/ha + Zinc 3kg/ha, T_8: Sulphur 30kg/ha + Zinc 6kg/ha,T_9:Sulphur 30kg/ha + Zinc 9kg/ha,T_{10}:Control 20:40:25 (N:P:K) kg/haareused.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, recorded significantly higher Plant height (104.00 cm), number of nodules per plant (16.93) Plant dry weight (26.56g/plant). Significantly 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 recorded with the treatment of Sulphur 30kg/ha + Zinc 6kg/ha.

Keywords:*Sulphur,Zinc,ClusterBean.*

Introduction:

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Cluster bean belongs to the family Leguminoseae. It is also known as Guar. It is a highly important leguminous crop of the kharif season. Cluster bean is mainly grown under rainfed conditions in arid and semi arid regions of tropical India due to the hardy nature and suitability to poor soil and moisture stress conditions. 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 or guar (Cyamopsis tetragonoloba) (2n=14) is an annual legume plant widelygrown for its gum,

vegetable, fodder and green manure values. West Africa and India arementioned as centers of origin for cluster bean by various authors. The crop is cultivatedextensively in India, Pakistan, Indonesia, Myanmar, parts of Central Africa and in the aridSouthWesternUnitedStatestotapitsindustrialpotential,especiallyfortheextractionofgum from the guar seed. India becomes the leading producer of gaur with 60 per cent of theworld production followed by Pakistan with 35 per cent and remaining 5 per cent contributedby USA, Middle East and African countries.

Sulphur interacts with phosphorus as phosphate ion is more strongly bound than sulphate (Hedge and Murthy, 2005). Phosphorus fertilizer application results in increase of anion adsorption sites by phosphate, which releases sulphate ions into the soil solution (Tiwari and Gupta, 2006). Thus, it may be subjected to leaching if not taken up by plant roots. Studies have indicated both synergistic and antagonistic relationship between sulphur and phosphorus but their relationship depends on their rate of application and crop species. Deo and Khandelwal (2009) for chickpea. Antagonistic relationship between P and S was observed in moong and wheat by Islam et al. (2006) and in lentil and chickpea by Hedge and Murthy (2005). The interaction of these nutrient elements may affect the critical levels of available P and S below which response to their application could be observed. Information on effect of combined application of zinc and Sulphur on yield, quality and content of each nutrient in clusterbean is rather limited. Therefore, the present investigation.

Material and Methods:

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The experiment conducted to know the Response of Sulphur and Zinc on Growth and Yield Components of Clusterbean was carried out at Crop Research Farm of Sam Higginbottom University, Prayagraj, Uttar Pradeshin 2022. The experiment was laid out in an RBD (Randomized Block Design) consisting of Ten treatments including Control with 3 replications, Clusterbean variety Pusa Navbahar was selected for sowing. Seedswere sown in line manually on 2023. Seeds were covered with the soil immediately aftersowing. The spacing adopted was plant to plant10 cm and row to row 45 cm according to thetreatmentdetails and the seeds weredrilledat 3 - 4cm depth. Gapfilling&Thinningwasdoneat8DASto maintaintheplantpopulationaccordingto treatment in order to attain recommended plantpopulation forpropergrowth and yield ofcrop.

Results and Discussion:

Comment [H13]: The results of the research should be justify by two or three updated references.

Plant height: At 80 DAS, minimum plant height (97.33 cm) was recorded with thetreatmentControl 20:40:25 (N:P:K) kg/ha and maximum plantheight(104.00 cm)wasrecordedwiththeapplicationofSulphur 30kg/ha + Zinc 6kg/ha, and therewassignificantdifferenceamongthe treatments, whereas Sulphur 30kg/ha + Zinc 3kg/ha

(103.00cm), Sulphur 30kg/ha + Zinc 9kg/ha (102.67 cm) were statistically at par with Treatment 8. Zn and S application created a balanced nutritional environment which enhanced metabolic activities and photosynthetic rate, resulting in improvement in plant height and ultimately increases plant dry weight. Similar types of results were reported by Meena *et al*. (2006), Ramawtar*et al*. (2013).

Number of nodules per plant: minimum number of nodules per plant (13.87) was recorded with thetreatmentControl 20:40:25 (N:P:K) kg/ha and maximum number of nodules per plant(16.93)wasrecordedwiththeapplicationofSulphur 30kg/ha + Zinc 6kg/ha, and therewassignificantdifferenceamongthe treatments, whereas Sulphur 30kg/ha + Zinc 3kg/ha (16.33) was statistically at par with Treatment 8. due to availability 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 similar results have also reported by Kasturi krishna and Ahlawat (2000).

Plant dry weight: At 80 DAS, minimum dry weight (23.78 g) was recorded with thetreatmentControl 20:40:25 (N:P:K) kg/ha and maximum dry weight(26.56 g)wasrecordedwiththeapplicationofSulphur 30kg/ha + Zinc 6kg/ha, and therewassignificantdifferenceamongthe 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.

NumberofPods/plants: MaximumNumberofPods/plant(41.07)wasrecordedwiththetreatment of application of Sulphur 30kg/ha + Zinc 6kg/ha over all thetreatments,andminimumwasrecordedinControl 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 parwith Sulphur 30kg/ha + Zinc 6kg/ha. Various yield attributing characterslike number of pods plant, number of seeds pod and 100 seed weightincreased significantlyas the dose of sulphur was increased. This is probably due to its role in synthesis of sulphurcontaining amino acids, proteins and enhanced photosynthetic activity of plant with increasedchlorophyllsynthesis (Juszczuk andOstaszewska,2011).

Numberof Seeds/Pod: Significantly Maximum Number of seeds/pods (10.00)wasrecordedwiththetreatment of application of Sulphur 30kg/ha + Zinc 6kg/ha over all thetreatments,andminimumwasrecordedinControl 20:40:25(N:P:K)kg/ha(6.00).However, the treatments Sulphur 30kg/ha + Zinc 3kg/ha (9.40) which was found to be statistically at parwith Sulphur 30kg/ha + Zinc 6kg/ha.

Seedindex(g): highest was(4.45 g)recordedwiththetreatment of application of Sulphur 30kg/ha + Zinc 6kg/ha over all thetreatments,andminimumwasrecordedinControl 20:40:25(N:P:K)kg/ha(2.70).However, the treatments Sulphur 30kg/ha + Zinc 3kg/ha (4.37 g) which was found to be statistically at parwith Sulphur 30kg/ha + Zinc 6kg/ha. Similarly, application of sulphur increased pod, seed and stoveryield significantly up to 45 kg ha, however, these results were at par with 30 kg ha. The improvement in yield due to increase in sulphur levels might be due to its important rolein energy transformation, activation of enzymes and carbohydrate metabolism (Davidian andKopriva,2010).

Conclusion:

It is concluded that application of Sulphur 30kg/ha + Zinc 6kg/ha recorded higher growth and yield attributes and as compared to other treatments.

Table 1:Response of SulphurandZincapplicationon growth and Yieldattributesof Cluster bean.

Treatments	Plant Height	Nodules per plant	Plant Dry weight	**Pods/plant (No)**	**Seeds/pod (No)**	**Seed index (g)**
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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