Original Research Article

Response of Different Levels of NPK and FYM on Growth and Yield of Cluster bean (*Cyamopsistetragonoloba*L.) *var.* Neelam-61

ABSTRACT

Today, with the advancement of environment pollution and health that is obtained from the improper use of chemical fertilizer, production and use of organic fertilizer is considered as an important approach in the field of soil science in the world's interest to investors. A research was conducted during *Zaid* season 2022 on central research farm of department of soil science and agricultural chemistry,(NAI) SHUATS,Prayagraj. Field trial was designed on randomized block design with three replications and nine treatments.It may be concluded from the trial that the different level of NPK and FYM in the experiment gave the highest value.The study compared different treatments on the growth and yield of cluster bean crop. The best results were obtained with T_9 treatmentwhich included ($N_{20}P_{40}K_{40}$kg ha^{-1} + FYM_{10} t ha^{-1}).This treatment resulted in the maximum plants heightwith the most leaves,no. of clusters $plant^{-1}$, no. of pod $cluster^{-1}$, no of pod $plant^{-1}$,length of pod (cm)and highest pod yield. In contrast, the control treatment (T_1) had the lowest results in all categories.The availableNPK and FYM with the treatment combination of T_9($N_{20}P_{40}K_{40}$kg ha^{-1} + FYM_{10} t ha^{-1}) was found to be the best for the improvement of growth and yield of cluster bean.Therefore,farmers of Prayagraj region can adopt this combination to give the highest yield of cluster bean.

Comment [U1]: Do not use the term chemical fertilizer, use the term inorganic fertilizer, because organic fertilizer also contains chemical elements N, P and K as well as other micro chemical elements

Comment [U2]: Describe in one or two sentences the method used

INTRODUCTION

The term "guar" derives from the sanskrit word "Gauahar," which means cow fodder or other livestock fodder. An annual legume plant known as the cluster bean (*Cyamopsistetragonoloba*L.) (2n=14) is cultivated for its edible, fodder, gum, and green fertilizer qualities. An important legume crop, the cluster beanis primarily grown under rainfed conditions in arid and semi-arid

areas of India during the *Zaid* season.According to **Aykroyd (1963)** the composition of clusterbean is 81.0 g moisture, 10.8 g carbohydra,23% protein,1.4 g of fat, 1.4 g of minerals, 0.09 mg thiamine, 0.03 mg riboflavin, 47 I.U. vitamin C, 316 I.U, vitamin A (per 100 g of edible portion).Cluster beans are the only legume product that is as resistant and drought-tolerant, and they are particularly well-suited to the soil climate of Rajasthan (**Porter *et al.*, 1996**).

The synthesis of amino acids and chlorophyll, which are the building blocks of protein and thus essential for plant development, both depend on nitrogen.The main source of nitrogen is provided by *rhizobium* found in the root nodules, so the crop doesn't need extra nitrogen during its initial growth and development stage. Cluster bean is a legume crop with the ability to fix atmospheric nitrogen through its efficient root nodules. The nitrogen application boosted the yield of cluster bean cultivars in terms of dry matter, crude protein, crude fiber, ash content, carbohydrates, leaf area per plant and crude protein. **(Ayub*et al.*,2010).**The second-most crucial nutrient that must be added to the soil in order to maintain plant development and crop yield is phosphorus**(Singh *et al.*,2000)**.Phosphorus is essential for photosynthesis, respiration, energy storage, cell elongation and food quality.The term "energy currency" is another name for it. It promotes early root development and growth, aiding in the rapid establishment of seedlings.Following nitrogen and phosphorus, potassium is the third most significant necessary nutrient. The mechanism involved in photosynthesis, the metabolism and translocation of carbohydrates and proteins, membrane permeability, stomata regulation and water utilization is enzymatically catalyzed by the potassium, which also activates more than 60 enzymes. Other advantages of K include better crop quality actions and plant resistance to pests, diseases, and stresses from drought, frost, salinity and solidity **(Kherawat*et al.*, 2013).** Farmyard manure refers to the decomposed mixture of dung and urine of farm animals along with litter and left-over material from roughages or fodder fed to the cattle. It supplies nitrogen, phosphorus, potassium and micronutrients like Fe, S, Mo, Zn etc. in available from to the plants through biological decomposition and improves physical-chemical properties of soil such as aggregation, aeration, permeability, water holding capacity, slow release of nutrients, increasing in cation exchange capacity, stimulation of soil flora and fauna etc. A well decomposed FYM contains 0.5%N, 0.2%P_2O_5 and 0.5%K_2O. **(Hand book of Agriculture by ICAR, 2010)**.

Comment [U3]: literary sources?

Comment [U4]: literary sources?

Comment [U5]:

Materials and Methods

The course of present investigation entitled "Effect of Different Levels of NPK and FYM on Growth and Yield of Cluster bean (*Cyamopsistetragonoloba*L.) *var*. Neelam-61"comprise of a field experiment which was carried out at the research farm of soil science and agricultural chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during in*Zaid* season 2022. The maximum temperature of the location ranges between 46-48^{0}C and seldom falls below 4-5^{0}C. The relative humidity ranges between 20-94%. The average rainfall of this area is around 1100mm annually.Experiment was laid out in randomized block design (RBD) with 9 treatments. The treatments have been replicated three times. The different treatments were employed randomly in each replication. The details of the treatment combinations are given below.

Comment [U6]: What are the characteristics and nutrient content of the fertilizer used and the soil used

Table 1. Treatment combination

Treatment	Treatment Combination
T_1	[Absolute Control]
T_2	@$N_0P_0K_0$kg ha^{-1} + @FYM_5 t ha^{-1}
T_3	@$N_0P_0K_0$kg ha^{-1} + @FYM_{10} t ha^{-1}
T_4	@$N_{10}P_{20}K_{20}$kg ha^{-1} + @FYM_0 t ha^{-1}
T_5	@$N_{10}P_{20}K_{20}$ kg ha^{-1} + @FYM_5t ha^{-1}
T_6	@$N_{10}P_{20}K_{20}$ kg ha^{-1} + @FYM_{10} t ha^{-1}
T_7	@$N_{20}P_{40}K_{40}$kg ha^{-1} +@FYM_0 t ha^{-1}
T_8	@$N_{20}P_{40}K_{40}$ kg ha^{-1} + @FYM_5 t ha^{-1}
T_9	@$N_{20}P_{40}K_{40}$kg ha^{-1} + @FYM_{10} t ha^{-1}

what about pest control and watering techniques?

Results and discussions

Plant height (cm)

Thesignificantly maximum plant height was recorded as 21.04, 68.80, and 121.62 cm in $T_9[N_{20}P_{40}K_{40}$kg ha^{-1} + FYM$_{10}$ t ha^{-1}]and the minimum plant height was recorded as 13.52, 50.45 and 82.53 cmin T_1 (Absolute Control) at 30, 60 and 90 DAS respectively. Increase in plant height due to increase in NPK and FYM may be due to adequate supply of nutrients which in turn helps in vigorous vegetative growth of plants and subsequently increase the plant through cell elongation, cell division, photosynthesis and turbidity of plant cell.Similar findings were reported by,Chavan*et al.* (2015), Deshmukh*et al.*(2014),

Comment [U7]: how can you be sure that this is the path from FYM, even though the nutrient content of FYM is unknown

Comment [U8]: What's similar?

Number of leaves plant^{-1}

Thesignificantly maximumnumber of leaves plant^{-1} was recorded 20.11, 37.95 and 46.88 in treatment $T_9[N_{20}P_{40}K_{40}$kg ha^{-1} + FYM$_{10}$ t ha^{-1}]and the minimum number of leaves plant^{-1} was recorded as 4.75, 10.59 and 17.87in T_1 [Absolute Control] at 30, 60 and 90 DAS respectively. Increase in number of leaves may be due to adequate nutrients supply which enhanced the vegetative growth of plant and subsequently the number of leaves. Similar findings were reported by,Chavan*et al.*(2015), Ayub*et al.*(2012).

Number of cluster plant^{-1}

The significantlymaximum number of cluster plant^{-1} was recorded 25.54 in treatment $T_9[N_{20}P_{40}K_{40}$kg ha^{-1} + FYM$_{10}$ t ha^{-1}]respectivelywhich was superior all overother treatment combination. The minimum number of cluster plant^{-1}was recorded 11.55 in treatment T_1[Absolute Control] respectively.Similar results were also reported byChavan*et al.*(2015), Ayub*et al.* (2012).

Number of pod cluster^{-1}

Thesignificantly maximum number of pod cluster^{-1} was recorded 12.12 in treatment $T_9[N_{20}P_{40}K_{40}$kg ha^{-1} + FYM$_{10}$ t ha^{-1}]respectivelywhich was superior all over other treatment combination. The minimum number of pod cluster^{-1}was recorded 4.64 in treatment T_1[Absolute Control] respectively. Increased in number of pods may be due to adequate availability of nutrients during reproductive stage of crop results in the formation of more pods cluster. Similar results were also reported byChavan*et al.*(2015), Deshmukh*et al.*(2014).

Number of pod plant^{-1}

The significantlymaximum number of podplant^{-1} was recorded 87.79 in treatment T_9[$N_{20}P_{40}K_{40}$kg ha^{-1} + FYM_{10} t ha^{-1}]respectively and minimum number of pod plant^{-1}was recorded 33.06 in treatment T_1[Absolute Control] respectively. Increased in number of pods may be due to adequate availability of nutrients during reproductive stage of crop results in the formation of more pods. Similar results were also reported byChavan*et al*.(2015), Deshmukh*et al*.(2014).

Length of pod (cm)

The significantlymaximum length of pod (cm) was recorded 12.77cm in treatment T_9[$N_{20}P_{40}K_{40}$kg ha^{-1} + FYM_{10} t ha^{-1}]respectivelywhich was superior all over other treatment combination. The minimum length of pod (cm)was recorded 9.92cm in treatment T_1[Absolute Control] respectively.Similar findings were reportedDeshmukh*et al*. (2014), Sajid*et al*. (2009), Singh*et al*. (2007).

Total pod yield (qha^{-1})

The significantlymaximum pod yield (qha^{-1}) was recorded 60.88 qha^{-1} in treatment T_9[$N_{20}P_{40}K_{40}$kg ha^{-1} + FYM_{10} t ha^{-1}]respectively, which was higher than pod yield any other treatment combination. The minimum of pod yield (qha^{-1})was recorded 32.38 qha^{-1} in treatment T_1(Absolute Control) respectively.Similar results were also reported byDeshmukh*et al*.(2014), Ayub*et al*. (2012), Sajid *et al*.(2009).

Table 2. Evaluation of NPK and FYM on plant height(cm), no of leavesplant^{-1},no. of cluster plant^{-1},no. of pod cluster^{-1},no. of pod plant^{-1},length of pod (cm) and total pod yield (q ha^{-1}) of cluster bean *var.* neelam-61 at different days interval and after cluster bean harvest

Comment [U9]: check again how to present the table

S. No.	Plant height (cm)			No. of Leaves plant^{-1}			No. of cluster plant^{-1}	No. of pod cluster^{-1}	No. of pod plant^{-1}	Length of pod (cm)	Total pod yield (q ha^{-1})
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS					
T_1	13.52	50.45	82.53	4.75	10.59	17.87	11.55	4.64	33.06	9.92	32.38
T_2	15.47	52.28	87.56	7.86	14.94	22.01	14.78	6.55	45.51	10.39	41.67
T_3	18.28	56.72	91.11	10.17	17.78	29.05	16.95	7.60	56.63	10.55	47.85
T_4	15.83	53.26	86.33	9.03	17.01	27.16	13.81	6.85	49.04	10.49	36.46
T_5	17.59	57.00	94.67	12.84	20.71	32.47	17.68	8.29	70.39	11.48	44.67
T_6	19.20	60.38	100.93	15.03	25.96	38.37	20.91	10.36	80.12	11.77	51.54
T_7	16.76	57.80	98.96	14.29	23.33	36.77	18.74	8.86	64.34	11.50	47.99
T_8	18.23	63.15	109.66	17.89	30.72	41.64	21.08	10.54	75.75	12.16	56.54
T_9	21.04	68.80	121.62	20.11	37.95	46.88	25.54	12.12	87.89	12.77	61.43
F- test	S	S	S	S	S	S	S	S	S	S	S
S. Em. (±)	0.2562	0.8838	1.6017	0.1822	0.3159	0.4326	0.3617	0.1172	0.9108	0.1740	0.8845
C.D. (P= 0.05)	0.7681	2.6496	4.8020	1.5462	0.9472	1.2970	1.0845	0.3515	2.7306	0.5218	2.6518

CONCLUSION

On the basis of findings it is concluded that the treatment combination $N_{20}P_{40}K_{40}$ + FYM_{10} t ha^{-1}*i.e,* Treatment T_9 shows significantly maximum plant height, no. leaves, no. of clusters $plant^{-1}$, no. of pod $cluster^{-1}$, no of pod $plant^{-1}$,length of pod (cm)and pod yieldof cluster bean as comparison to all over other treatment combinations.

References

Comment [U10]: references have not used Mendeley's application and the literature used is on average very old, it should be the last 5-10 years

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