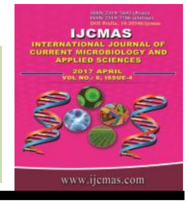
Int.J.Curr.Microbiol.App.Sci (2017) *6*(4): 1508-1512

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 4 (2017) pp. 1508-1512**
Journal homepage: http://www.ijcmas.com



Original Research Article https://doi.org/10.20546/ijcmas.2017.604.184

Enhancing the Yield and Yield Parameters of Cluster Bean through Foliar Application of Nutrients

A.H. Pavithra, S. Sridhara* and Pradeep Gopakkali

Department of Agronomy, University of Agricultural and Horticultural Sciences, Shivamogga-577204, Karnataka, India
**Corresponding author*

A B S T R A C T

Keywords

Cluster bean, Yield, Foliar application.

Article Info

Accepted:
15 March 2017
Available Online:
10 April 2017

A field experiments was carried out in red clay soil during the *kharif* seasons of 2014 and 2015 at College of Agriculture, Shivamogga, to know the performance of Cluster bean on foliar application of nutrients to enhance the yield and yield attributes. The experiment was laid out in randomized complete block design with nine treatments replicated thrice. The foliar application of nutrients consisted of Urea (2%) at 25 and 45 DAS, DAP (2%) at 25 and 45 DAS, KNO_3 (2%) at 25 and 45 DAS, 19:19:19 (2%) at 25 and 45 DAS, 19:19:19 (2%) at 25 + KNO_3 (2%) at 45 DAS, KNO_3 (2%) at 25 DAS + 19:19:19 (2%) at 45 DAS, $ZnSO_4$ 0.5% at 25 DAS + 19:19:19 (2%) at 45 DAS, $ZnSO_4$ 0.5% at 25 DAS + KNO_3 (2%) at 45 DAS and control. Among the foliar application of nutrients, significantly higher grain yield (612.35 kg ha^{-1}), number of seeds pod^{-1} (6.17), highest pod length (4.24 cm), higher number of cluster plant^{-1} (5.57), higher number of pods plant^{-1} (27.37), higher endosperm content (35.74 %), viscosity (257.12 cps^{-1}), test weight (3.60 g), net returns (`. 13230 ha^{-1}) and B:C ratio (2.00) was associated with foliar spray consisting of 2% DAP at 25 and 45 DAS as compared to other treatments.

Introduction

Cluster bean though called as a minor vegetable crop gaining importance for seed production for its gum purpose which has gained multiple uses in different sectors of industries. The dicotyledonous seed of cluster bean from outside to interior consists of three major fractions, *viz*., the husk or hull (14-17 %), endosperm (35-42 %) and germ (43-47 %). The endosperm fraction of cluster bean seed is rich in galactomannan (16.80 to 30.90 %), while the germ and hull portion termed as guar meal obtained after the extraction of gum is rich in protein (28.90-46.00 %) and used as animal and poultry feed (Lee *et al*., 2004 and Rodge, 2008). Foliar fertilization (FF) of nutrients has become an established procedure to increase yield through improved uptake of nutrients and also enhanced the quality of crop product. Crop yield increase mainly by higher utilization and lower environmental pollution through reducing the amount of fertilizers added to soil (Abou El-Nour, 2002). On the other hand, foliar feeding of a nutrient, may actually promote root absorption of same nutrient or other nutrients through improving root growth and increasing nutrients uptake. The solute must adhere to the leaf surface and be retained to allow sufficient time to penetrate, the solute must diffuse through the cuticle, and there must be desorption from the cuticle into the phloem to transport nutrients to high growth areas. Foliar application of nutrients for increasing and exploiting genetic potential of the crop is considered as an efficient and economic method of supplementing the nutrient requirement. Application of inorganic spray will also enhance the nutrient availability and in turn increase the productivity. Nutrients play a pivotal role in increasing yield. Foliar application of major and minor nutrients like NPK shall be more effective than soil application and also avoiding the depletion of these nutrients in leaves, thereby resulting in an increased photosynthetic rate, better translocation of these nutrients from the leaves to the developing grains. Foliar application is credited with the advantage of quick and efficient utilization of nutrients, eliminating losses through leaching, and fixation and helps in regulating the uptake of nutrients by plants (Manomani and Srimathi, 2009).

Materials and Methods

Field experiments were conducted at College of Agriculture, University of Agricultural and Horticultural Sciences (UAHS), Navile, Shivamogga under rainfed condition during 2014 and 2015. The field is situated at 13^0 58' N latitude and 75^0 34' E latitude with an altitude of 650 meters above mean sea level. The experiment consisted of nine different foliar application of nutrients *viz*., F_1: Urea (2%), F_2: DAP (2%), F_3: KNO_3 (2%), F_4: 19:19:19 (2%) at 25 and 45 DAS, F_5: 19:19:19 (2%) at 25 + KNO_3 (2%) at 45 DAS, F_6: KNO_3 (2%) at 25 DAS + 19:19:19 (2%) at 45 DAS, F_7: $ZnSO_4$ 0.5% at 25 DAS + 19:19:19 (2%) at 45 DAS, F_8: $ZnSO_4$ 0.5% at 25 DAS + KNO_3 (2%) at 45 DAS and F_9: Control. The experiment was laid out in a Randomized Complete Block Design and replicated thrice. The soil of the experimental site was red clay in texture having pH 5.6, with low available nitrogen (241 kg ha^{-1}), higher available P (87 kg ha^{-1}) and low available K (241 kg ha^{-1}). The crop was sown on 18th August 2014 and 2015. The seeds were sown in the furrows at 30 cm apart. In the respective rows, two seeds per hill were placed at 10 cm spacing. The basal dose of 20 kg N and 40 kg P_2O_5 and 20 kg K_2O was applied at the time of sowing.

The data on the yield and yield components like number of pods $plant^{-1}$, number of seeds pod^{-1}, pod length and number of clusters $plant^{-1}$ were worked after the harvest of crop. The grain yield and stover yield obtained from net plot is computed for hectare and expressed in kilogram $hectare^{-1}$. The harvest index was computed by dividing the grain yield by biological yield. The economics was worked out based on the prevailing market prices of both inputs and outputs during the years of experimentation.

Seeds were pulverized to get endosperm splits and germ meal. Germ meal was discarded by using 1 mm sieve. Weight of the pure endosperm splits was recorded and endosperm percentage is given as,

Endosperm Percentage =

$$\frac{\text{Weight of endosperm splits}}{\text{Initial weight of seed taken (10 g)}} \times 100$$

One gram of guar gum powder was added to 10 ml isopropyl alcohol. Guar gum was dispersed by glass rod after one litre of boiled distilled water was added then keep it for one hour. After cooling, the solution was mixed uniformly with the help of glass rod and viscosity was measured by using BROOKEFIELD DV-E Viscometer. Viscosity was expressed in cps^{-1} of 1% solution of guar gum.

Results and Discussion

Economic yield is expressed as a function of factors that contribute to yield, which known as yield attributes. The variation in the yield due to different treatments could be attributed to the variations in the yield attributing parameters. Significantly higher values of yield components *viz*., number of seeds per pod (6.17), highest pod length (4.24 cm), higher number of clusters plant^{-1} (5.57) and higher number of pods per plant (27.37) was recorded with foliar spray of DAP (2 %) at 25 and 45 DAS compared to control (Table 1). Increase in yield and yield attributes might be due to fulfillment of the demand of the crop by higher assimilation and translocation of photosynthates from source to sink through adequate supply of nutrients by foliar application of fertilizers these results are in corroboration with the findings of Kuttimani and Velayutham (2011). Foliar application of DAP (2%) at 25 and 45 DAS was recorded significantly higher grain yield (612.35 kg ha^{-1}) as compared to control (468.43 kg ha^{-1}) (Table 1). The magnitude of increase in the yield due to foliar application of nutrients was higher in treatment receiving DAP (2%) at 25 and 45 DAS (30.72 %) as compared to control.

Table.1 Yield and yield attributes of guar as influenced by foliar application of nutrients (pooled data of two years)

Treatments	Grain yields (kg ha^{-1})	Straw yields (kg ha^{-1})	Number of Pod plant^{-1}	Number of seeds pod^{-1}	Pod length (cm)	Clusters per plant^{-1}
T_1	503.74	1311.38	20.89	5.31	3.72	4.55
T_2	612.35	1386.44	27.37	6.17	4.24	5.57
T_3	502.09	1303.55	21.17	4.98	3.63	4.17
T_4	601.62	1352.39	26.66	6.02	4.17	5.17
T_5	518.36	1339.22	23.00	5.52	3.85	4.75
T_6	555.41	1342.18	23.62	5.77	3.99	4.95
T_7	577.12	1345.21	25.68	5.89	4.10	5.02
T_8	510.03	1338.14	22.74	5.52	3.83	4.72
T_9	468.43	1222.22	20.25	4.62	3.47	4.00
S. Em.±	16.87	38.81	1.53	0.20	0.12	0.23
C.D at 5 %	111.72	NS	4.58	0.59	0.36	0.68

T_1: Urea (2%) at 25 and 45 DAS
T_2: DAP (2%) 25 and 45 DAS
T_3: KNO_3 (2%) 25 and 45 DAS
T_4: 19:19:19 (2%) 25 and 45 DAS
T_5: 19:19:19 (2%) at 25 + KNO_3 (2%) at 45 DAS
T_6: KNO_3 (2%) at 25 DAS + 19:19:19 (2%) at 45 DAS
T_7: $ZnSO_4$ 0.5% at 25 DAS + 19:19:19 (2%) at 45 DAS
T_8: $ZnSO_4$ 0.5% at 25 DAS + KNO_3 (2%) at 45 DAS
T_9: Control

Table.2 Endosperm content, viscosity and test weight of guar as influenced by foliar application of nutrients (pooled data of two years)

Treatments	Endosperm content (%)	Viscosity (cps^{-1})	Test weight (g)
T_1	30.94	233.33	3.40
T_2	35.25	257.12	3.60
T_3	28.90	219.04	3.38
T_4	34.65	253.91	3.53
T_5	32.48	236.30	3.42
T_6	33.15	243.73	3.48
T_7	34.09	249.10	3.48
T_8	31.88	234.82	3.42
T_9	27.97	207.16	3.38
S. Em.±	0.62	8.84	0.07
C.D at 5 %	1.87	26.50	NS

T_1: Urea (2%) at 25 and 45 DAS
T_2: DAP (2%) 25 and 45 DAS
T_3: KNO_3 (2%) 25 and 45 DAS
T_4: 19:19:19 (2%) 25 and 45 DAS
T_5: 19:19:19 (2%) at 25 + KNO_3 (2%) at 45 DAS
T_6: KNO_3 (2%) at 25 DAS + 19:19:19 (2%) at 45 DAS
T_7: $ZnSO_4$ 0.5% at 25 DAS + 19:19:19 (2%) at 45 DAS
T_8: $ZnSO_4$ 0.5% at 25 DAS + KNO_3 (2%) at 45 DAS
T_9: Control

Table.3 Economics of Cluster bean cultivation as influenced by foliar application of Nutrients (pooled data of two years)

Treatments	Cost of cultivation (₹. ha^{-1})	Gross returns (₹. ha^{-1})	Net returns (₹. ha^{-1})	B:C ratio
T_1	12967	21980	9013	1.70
T_2	13202	26432	13230	2.00
T_3	15846	23993	8147	1.51
T_4	13311	25929	12618	1.95
T_5	16746	25734	8989	1.54
T_6	16746	26066	9320	1.56
T_7	14494	26393	11899	1.82
T_8	14956	24348	9392	1.63
T_9	12897	19237	6340	1.49
S. Em.±	-	675	675	0.05
C.D at 5 %	-	2023	2023	0.14

T_1: Urea (2%) at 25 and 45 DAS
T_2: DAP (2%) 25 and 45 DAS
T_3: KNO_3 (2%) 25 and 45 DAS
T_4: 19:19:19 (2%) 25 and 45 DAS
T_5: 19:19:19 (2%) at 25 + KNO_3 (2%) at 45 DAS
T_6: KNO_3 (2%) at 25 DAS + 19:19:19 (2%) at 45 DAS
T_7: $ZnSO_4$ 0.5% at 25 DAS + 19:19:19 (2%) at 45 DAS
T_8: $ZnSO_4$ 0.5% at 25 DAS + KNO_3 (2%) at 45 DAS
T_9: Control

Spraying of DAP helps in quick absorption of nitrogen and phosphorus which enhanced the growth of root and shoot effectively which intern resulted in higher uptake of nutrients and translocation of assimilates from source to sink effectively which leads to higher yield attributes and higher seed yield.

Similar findings were reported by Behera Nigamanda and Elamathi (2007) on blackgram. Higher endosperm content (35.74 %), viscosity (257.12 cps^{-1}) and test weight (3.60 g) (Table 2) was noticed in the treatment which received nutrient as foliar application of DAP @ 2% at 25 and 45 DAS as compared to control.

Higher gross returns, net returns and B: C ratio were significantly recorded with foliar application of DAP @ 2% at 25 and 45 DAS (`.26431, 13230 ha^{-1} and 2.00, respectively) as compared to control (Table 3). Higher grain yield of guar as the foliar application is easiest cultural practice in achieving good grain yield with minimum production cost.

The results are in close agreement with the findings of Chandrasekhar and Bangarusamy (2003) in green gram. Lower gross return, net return and B: C ratio were recorded in control over other foliar application of fertilizer treatments. It might be due to reduced yield, besides lower cost of cultivation. Absence of application of nutrients reduced yield of crop and finally reuslted in lower gross and net return.

References

Abou El-nour, E.A.A. 2002. Can supplemented potassium foliar feeding reduce the recommended soil potassium. *Pak. J. Biol. Sci.*, 5(3): 259-262.

Behera, Nigamanda and Elamathi, S. 2007. Studies on the time of nitrogen, application of foliar spray of DAP, and growth regulators on yield attributes, yield and economics of green gram. *Int. J. Agric. Sci.*, pp. 168-169.

Chandrasekhar, C.N. And Bangarusamy, U. 2003. Maximizing the yield of mungbean by foliar application of growth regulating chemicals and nutrients. *Madras Agric. J.*, 90(1-3): 142-145.

Kuttimani, R. And Velayutham, A. 2011. Foliar application of nutrients and growth regulators on yield and economics of green gram. *Madras Agric. J.*, 98(4): 141-143.

Lee, J.T., Connor, A.S., Haq, A.U., Bailey, C.A. and Cartwright, A.L. 2004. Quantitative measurement of negligible trypsin inhibitors activity and nutrient analysis of guar mean fraction. *J. Agric. Food Chem.*, 52(21): 6492–6495.

Manomani, V., And Srimathi, P. 2009. Influence of mother crop nutrition on seed and quality of blackgram. *Madras Agric. J.*, 96(16): 125-128.

Rodge, A.B. 2008. Quality and export potential of arid legumes. In Souvenir, Kumar, D. and Henry A (Eds). Scientific Publishers (India), Jodhpur, pp. 10-17.

How to cite this article:

Pavithra, A.H., Sridhara and Pradeep Gopakkali. 2017. Enhancing the yield and yield parameters of Cluster bean through Foliar application of Nutrients. *Int.J.Curr.Microbiol.App.Sci.* 6(4): 1508-1512.
doi: https://doi.org/10.20546/ijcmas.2017.604.184