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Effect of Soil and Foliar Application of Nutrients on Pre-harvest Studies of Cluster Bean

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A B S T R A C T

The present investigation entitled *"*Effect of soil and foliar application of nutrients on pre-harvest studies of Cluster bean*"*. The experiment was conducted on the Research Farm, College of Agriculture, Gwalior (M.P.). The topography of the field was uniform with proper drainage. The experiment was laid out in the randomized block design with 10 treatments and each treatment was replicated three times. The observations were recorded on different aspects of plant population/metre row length, plant height, number of branches per plant, number of leaves per plant, plant dry weight (g). The result of experiment revealed that the PSB + KMB soil applied + NAA 20ppm spray at flower initiation stage at 30 DAS and NPK (18:18:18) 1 % spray at flower initiation and 10 days after 1st spray at all growth stages significantly improved pre-harvest parameters among all the treatments.

Introduction

Cluster bean (*Cyamopsis tetragonoloba* L. Taub) commonly known as Guar, is a drought and high temperature tolerant, deep rooted Kharif annual legume of high social and economic significance. It is highly adaptable towards erratic rainfall have multiple industrial uses and it is one of the most significant crop in cropping system for farmers of arid areas. Guar is also grown in other parts of the world, like, Pakistan, USA, Australia, Brazil and South Africa. In India the productivity of cluster bean is very low. So, there is need to take proper agronomic practices to enhance the productivity of cluster bean and foremost important among them is soil and foliar application of organic and inorganic sources of nutrients exploiting genetic potential of crop. This is considered to be an efficient and economic method of supplementing part of nutrient requirement at critical growth stages of the crop. Foliar application is credited with the advantage of quick and efficient utilization of nutrients, elimination of losses through leaching, fixation and regulating uptake of nutrients by the plant. Since foliar nutrients usually penetrate the leaf cuticle or stomata and enters the cell facilitating easy and rapid utilization of nutrients. So, soil and foliar nutrition on cluster bean helps in achieving the optimum grain yield of cluster bean.

Materials and Methods

The experiment was conducted on the Research Farm, College of Agriculture, Gwalior (M.P.). The topography of the field was uniform with proper drainage. The experiment was laid out in the randomized block design with 10 treatments and each treatment was replicated three times. The following treatment combinations involving as a soil application of PSB and KMB while foliar spray of NAA, MOP, DAP, NPK (18:18:18), zinc sulphate, thiourea, neem coated urea and salicylic acid were applied.

Results and Discussion

Soil and foliar application of nutrients caused a marked variation in growth parameters of cluster bean at all of the crop growth stages. The growth parameters *viz*., plant height, number of branches per plant, number of leaves per plant and dry weight per plant had a direct relationship with soil and foliar application of nutrients. All soil and foliar nutrient treatments significantly increased all growth parameters over control treatment (T_1).

The maximum values of all these growth parameters were recorded with the NPK (18:18:18) 1 % spray at flower initiation and 10 days after 1st spray (T_5) followed by T_{10} (Neem coated urea 1% + salicylic acid 75 ppm spray at flower initiation and 10 days after 1st spray), T_9 (PSB + KMB soil applied + NAA 20 ppm spray at flower initiation stage) and T_2 (PSB soil applied + NAA 20 ppm spray at flower initiation stage) and these treatments were found significantly superior over other treatments.

The order of significance were followed by application of KMB soil applied + NAA 20 ppm spray at flower initiation stage (T_7), DAP 0.5 % spray at flower initiation and 10 days after 1st spray (T_3) Thiourea @ 500 ppm spray at vegetative and flowering stage (T_8) Zinc sulphate 0.25 % spray at flower initiation and 10 days after 1st spray (T_6) and MOP 0.5 % spray at flower initiation and 10 days after 1st spray (T_4).

Similar results had also been reported by Sujatha (2001) reported that foliar application of salicylic acid (100 ppm) on green gram at 75 DAS increased plant height (50.4 cm), root length (16.9 cm), number of leaves (18.4) and Leaf area index (LAI) (1.30).

Mona and Azab (2016) reported that the effects of foliar application of NPK compound with Fe, Zn and Mn at different doses on cowpea plants. In addition, soluble fertilizers NPK (19:19:19) and 500 ppm Fe, 300 ppm Zn and 300 ppm Mn were applied. Four treatments of fertilization were tested: control (no fertilization), (50%), (100%), and (125%).

The NPK fertilizers were sprayed every 15 days. The results are as follows: Foliar fertilization NPK with Fe, Zn and Mn reflect increasement in vegetative growth, yield and its components and nutrient concentration of cowpea plant compared with control.

Prajapati and Modi (2016) conducted an experiment under hydroponics condition using micronutrient containing nutrient solution to evaluate the effect of potassium solubilizing bacteria KSB-8 (*Enterobactor hormaechei*), the results indicated that a remarkable increase in root length, flowering, fruit setting, fruit maturing, K content and chlorophyll content. Thus, it might be concluded that KSB-8 (*Enterobactor hormaechei*) could be used as crop-enhancer and bio-fertilizer for cucumber (*Cucumis sativas*) and other K rich crops under hydroponic condition (Table 1 and 2).

Table.1

Treatments	Plant population/m row length		Plant height (cm)			
	Initial	Final	30 DAS	60 DAS	90 DAS	Harvest
T_1: Control (water spray).	10.43	9.86	20.13	76.18	85.70	86.07
T_2: PSB soil applied + NAA 20 ppm spray at flower initiation stage.	10.53	10.23	22.37	86.40	98.50	101.27
T_3: DAP 0.5 % spray at flower initiation and 10 days after 1st spray.	10.64	9.66	20.00	80.47	91.50	93.16
T_4: MOP 0.5 % spray at flower initiation and 10 days after 1st spray.	10.21	9.32	19.07	78.03	88.13	89.23
T_5: NPK (18:18:18) 1 % spray at flower initiation and 10 days after 1st spray.	10.43	9.69	20.17	94.13	106.39	108.00
T_6: Zinc sulphate 0.25 % spray at flower initiation and 10 days after 1st spray.	10.40	10.10	19.53	78.07	88.73	90.30
T_7: KMB soil applied + NAA 20 ppm spray at flower initiation stage.	10.24	9.67	21.17	84.80	95.53	98.47
T_8: Thiourea @ 500 ppm spray at vegetative and flowering stage.	10.23	9.99	21.03	79.73	91.03	92.97
T_9: PSB + KMB soil applied + NAA 20 ppm spray at flower initiation stage.	10.63	10.26	23.47	86.97	99.00	102.27
T_{10}: Neem coated urea 1%+salicylic acid 75ppm spray at flower initiation and 10 days after 1st spray.	10.35	10.03	20.37	91.33	103.32	106.35
S.E.(m)±	**0.202**	**0.358**	**0.757**	**2.751**	**3.367**	**2.399**
C.D.(at 5%)	**NS**	**NS**	**2.250**	**8.174**	**10.004**	**7.128**

Table.2

Treatments	Number of branches/plant				Number of leaves/plant				Plant dry weight (g)			
	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest
T_1: Control (water spray).	4.13	5.33	6.60	6.60	10.03	24.57	26.37	23.83	2.00	9.03	26.17	26.83
T_2: PSB soil applied + NAA 20 ppm spray at flower initiation stage.	4.90	7.17	8.30	8.30	11.67	32.60	38.49	34.33	2.93	12.57	35.77	38.67
T_3: DAP 0.5 % spray at flower initiation and 10 days after 1st spray.	3.87	6.33	7.67	7.67	10.60	29.93	34.67	30.73	2.37	10.77	31.03	33.30
T_4: MOP 0.5 % spray at flower initiation and 10 days after 1st spray.	4.10	5.63	6.73	6.73	10.26	25.53	31.30	27.27	2.23	9.83	27.33	28.03
T_5: NPK (18:18:18) 1 % spray at flower initiation and 10 days after 1st spray.	4.20	7.60	8.87	8.87	10.67	35.69	40.37	36.31	2.17	14.83	38.87	41.57
T_6: Zinc sulphate 0.25 % spray at flower initiation and 10 days after 1st spray.	3.97	6.13	7.27	7.27	9.93	26.43	31.43	28.93	1.93	10.07	28.27	30.17
T_7: KMB soil applied + NAA 20 ppm spray at flower initiation stage.	4.80	6.50	7.73	7.73	11.33	31.00	36.93	33.47	2.67	12.43	33.50	35.07
T_8: Thiourea @ 500 ppm spray at vegetative and flowering stage.	4.73	6.27	7.30	7.30	11.17	28.63	33.57	30.30	2.60	10.47	29.03	31.10
T_9: PSB + KMB soil applied + NAA 20 ppm spray at flower initiation stage.	5.37	7.30	8.37	8.37	12.13	33.19	39.41	35.32	3.17	12.80	35.93	38.93
T_{10}: Neem coated urea 1%+salicylic acid 75ppm spray at flower initiation and 10 days after 1st spray.	4.53	7.50	8.40	8.40	10.80	34.81	39.79	36.26	2.53	13.81	36.57	39.53
S.E.(m)±	**0.158**	**0.322**	**0.365**	**0.365**	**0.232**	**0.943**	**1.012**	**0.885**	**0.157**	**0.787**	**1.225**	**1.082**
C.D.(at 5%)	**0.471**	**0.956**	**1.085**	**1.085**	**0.689**	**2.803**	**3.006**	**2.629**	**0.466**	**2.340**	**3.639**	**3.215**

Dey *et al.* (2017) conducted a field experiment to find out the influence of Urea, KCl, Zn placement and spray on growth of Cowpea crop. Application of various levels of Urea, KCl and Zinc which significantly increased dry matter production/plant, plant height, number of branches/plant, number of trifoliate/plant, total nodule/plant. Foliar nutrient sprays *viz.*, 2% urea, 2% KCL, 1.5% ZnSO4. Foliar spray treatment with the aqueous solution of nutrients was done to the 15 and 30 DAS of cowpea crop. Significant increase was recorded in plant height, dry matter production, Maximum growth was recorded when spread with 2% urea spray followed by 2% KCl at flowering and 15 days later is the viable nutrient management package to the Cowpea for getting higher income through higher productivity.

The results obtained are also in close conformity with the findings of Haq and Mallarino (2000), Reddy *et al*., (2005), Deshmukh *et al.* (2008) and Afshari *et al*., (2013).

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