GAU Res. J. 1987. 13 (1) : 1-6

Effect of Various Levels of Nitrogen, Phosphorus and Cycocel on Yield and Yield Contributing Attributes of Cluster Bean Green Pod under Rainfed Conditions [*Cyamopsis tetragonoloba* (L.) Taub.] cv. Pusa Naubahar

S. J. P. Singh, C. B. S. Rajput and K. P. Singh

Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221 005

ABSTRACT

Yield of green pods and yield contributing attributes of cluster bean cultivar Pusa Naubahar increased significantly and positively correlated by various levels of nitrogen, phosphorus and foliar application of cycocel during the years 1981 and 1982. The dry weight of green pods per plant by the application of cycocel did not differ significantly during both years. Finally, 40 kg of nitrogen, 60 kg of phosphorus and 500 ppm of cycocel significantly improved yield of green pod and yield contributing attributes over control in the years 1981 and 1982.

(*Received on 23rd May, 1986*)

INTRODUCTION

Among the several approaches made to improve cluster bean productivity, regulation of plant metabolism by using exogenous growth substances or soil feeding of nitrogen, phosphorus and foliar feeding of cycocel has been reported to improve the yield and yield contributing attributes by influencing the plant physiological processes favourably (Tomar *et al.*, 1972 and Rao *et al.*, 1983). The present investigation was undertaken to study the influence of nitrogen, phosphorus and cycocel on cluster bean vegetable under rainfed condition.

MATERIALS AND METHODS

A field experiment was conducted at the Vegetable Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221 005, during *kharif* season of years 1981 and 1982. The experiment was laid out in split plot design with three replications. The treatments comprised three levels of nitrogen (0, 20 and 40 kg/ha), three levels of phosphorus (0, 30 and 60 kg/ha) and three concentrations of cycocel (2-chloroethyl trimethyl ammonium chloride) (0, 500 and 1000 ppm). The half dose of nitrogen and full dose of

phosphorus was applied as basal dressing. Remaining half dose of nitrogen was applied as top dressing 20 days after sowing. One foliar spray of cycocel solution was done at 25 days after sowing.

The soil was sandy loam, low in available nitrogen (0.095%), phosphorus (0.081%) and potassium (0.542%) having pH value of 7. The physical conditions of soil were coarse sand (5.44%), fine sand (44.80%), silt (29.59%) and clay (18.19%).

RESULTS AND DISCUSSION

Guar being a legume responds to the small amount of nitrogen and improves the yield and yield contributing attributes (Sanderson, 1974 and Denins, 1977). The data presented in Tables 1 and 2 indicate that increasing levels of nitrogen produced highly significant yield and yield attributes like number of green pods per plant, number of clusters per plant, fresh and dry weight of green pod, mean weight of cluster, mean weight of green pod, length, thickness and number of seeds per green pod and total crude protein percentage during both the years (1981 and 1982).

The various levels of phosphorus significantly increased all the yield and yield contributing atrributes during both the years (1981 and 1982). The maximum and minimum values were obtained in 60 kg/ha P_2O_5 and control. Similar findings were reported by Gill and Singh (1981) and Tomar *et al.*, (1973).

In both the years (1981 and 1982) the various concentrations of cycocel increased all the yield and yield attributes significantly except dry weight of fresh green pod per plant. The maximum and minimum values were obtained in 500 ppm cycocel and control respectively. These findings are obtained from depressing nature of vegetative growth, but increased the leaves longevity which is the main source of photosynthesis and other metabolism thereby augmenting yield by prolonging the period of metabolization of metabolites from leaves and fruits (Tolber, 1960).

Correlation coefficient between yield and yield contributing attributes

The correlation coefficient of yield and yield contributing attributes has been worked out on average data of two years and presented in Table 3. This indicated that the various levels of nitrogen and phosphorus along with growth retardant cycocel are more effective in favour of yield and yield contributing attributes like number of green pod per plant, number of cluster per plant, green pod per cluster, fresh and dry weight of green pod, mean weight of cluster, mean weight of green pod, length, thickness and number of seeds per green pod and total crude protein percentage. Similar findings were reported by Gill and Singh, (1981) and Rao *et al.* (1983).

TABLE 1

Effect of nitrogen, phosphorus and cycocel on yield contributing attributes of cluster bean and green pod during year 1981.

Treatments	*Yield of green pod/ha (qtls.)*	*No. of green pod/ plant*	*No. of cluster/ plant*	*No. of green pod/ cluster*	*Fresh weight of green pod/ plant (g)*	*Dry wt. of green pod/ plant (g)*	*Mean wt. of cluster (g)*	*Mean wt. of green pod (g)*	*Length of green pod (cm)*	*Thickness of pod (cm)*	*No. of seeds/ green pod*	*Total crude protein %*
Levels of nitrogen (kg/ha)												
0	75.48	32.21	10.75	4.35	77.89	12.96	8.72	2.37	8.67	0.386	8.94	20.69
20	100.15	49.74	12.80	4.98	107.83	20.84	10.15	2.67	10.85	0.433	9.96	22.24
40	122.77	74.59	17.78	6.57	165.10	31.68	16.68	3.28	12.75	0.527	11.19	23.47
S.Em.	±0.845	1.374	0.487	0.193	0.959	0.213	0.412	0.048	0.172	0.023	0.088	02.26
C.D. at 1%	3.890	6.325	2.242	0.888	4.415	0.980	1.896	0.220	0.791	0.133	0.405	10.40
Levels of phosphorus (kg/ha)												
0	70.81	42.67	11.58	4.69	72.85	11.48	8.25	2.59	9.91	0.378	9.21	20.59
20	102.44	55.99	14.07	5.25	123.99	23.58	11.80	2.84	10.79	0.461	10.08	22.49
60	125.16	64.88	15.68	5.95	152.98	30.39	15.23	3.20	11.47	0.507	10.80	23.34
S.Em.	±1.984	1.268	0.153	0.206	0.788	0.136	0.315	0.067	0.183	0.015	0.181	0.157
C.D. at 1%	6.061	3.873	0.467	0.629	2.258	0.415	0.962	0.204	0.256	0.045	0.552	0.464
Concentrations of Cycocel (ppm)												
0	91.78	47.92	13.11	4.87	81.42	20.88	10.74	2.59	11.56	0.401	9.57	21.88
500	108.10	59.85	14.46	5.59	122.55	22.87	12.98	2.95	10.74	0.490	10.48	22.46
1000	98.53	55.77	14.16	5.44	117.61	21.69	11.80	2.78	9.87	0.455	10.03	22.07
S.Em.	±0.921	1.374	0.030	0.123	0.543	—	0.497	0.111	0.078	0.004	0.118	0.101
C.D. at 1%	2.490	2.617	0.081	0.332	1.464	N.S.	1.342	0.300	0.210	0.010	0.319	0.233

N.S. = Not Significant.

TABLE 2

Effect of nitrogen, phosphorus and cycocel on yield and yield contributing attributes of cluster bean green pod during the year 1982.

Treatments	*Yield of green pod/ha (qtls.)*	*No. of green pod/ plant*	*No. of cluster/ plant*	*No. of green pod/ cluster*	*Fresh weight of green pod/ plant (g)*	*Dry wt. of green podper plant (g)*	*Mean wt. of cluster (g)*	*Mean wt. of green pod (g)*	*Length of green pod (cm)*	*Thick-ness of green pod (cm)*	*No .of seed/ green pod*	*Total crude. protein (%)*
Levels of nitrogen (kg/ha)												
0	74.23	39.61	10.75	4.51	77.89	11.92	8.07	2.22	8.96	0.386	8.94	20.78
20	96.67	50.39	13.02	4.96	105.83	20.02	9.99	2.56	10.89	0.933	9.96	22.02
40	117.33	71.00	16.71	5.77	152.61	30.24	3.29	12.49	12.49	0.527	11.16	23.69
S.Em.	±2.857	0.544	0.390	0.092	0.721	1.272	0.105	0.255	0.255	0.029	0.088	0.095
C.D. at 1%	13.153	2.504	1.795	0.423	3.319	5.856	0.483	1.174	1.174	0.133	0.405	0.437
Levels of P_2O_5 (kg/ha)												
0	63.35	43.985	11.34	4.22	70.46	10.11	8.31	2.22	9.90	0.378	9.21	20.16
30	98.19	53.890	13.89	5.18	118.99	22.78	11.80	2.78	10.89	0.461	10.08	92.30
60	120.70	64.750	15.34	5.83	134.87	29.29	16.00	3.07	11.69	0.507	10.80	23.50
S.Em.	±1.164	0.539	0.14	0.046	0.819	0.097	0.284	0.111	0.131	0.015	0.181	0.108
C.D. at 1%	3.556	1.646	0.42	0.140	2.502	0.296	0.867	0.339	0.400	0.045	0.552	0.329
Concentrations of cycocel (ppm)												
0	91.01	48.79	12.86	4.71	104.16	20.59	9.98	2.50	11.60	0.401	9.57	21.83
500	100.03	58.48	14.13	5.39	117.71	21.59	12.76	2.88	10.65	0.490	10.48	22.48
1000	95.80	53.14	13.74	5.14	111.20	20.54	11.78	2.86	10.00	0.455	10.03	22.15
S.Em.	±0.384	2.548	0.010	0.043	1.291		0.405	0.101	0.141	0.004	0.118	0.022
C.D. at 1%	0.928	6.886	0.027	0.116	3.490	N.S.	1.095	0.273	0.381	0.010	0.319	0.059

N.S. = Not Significant.

TABLE 3

Correlation coefficient between yield and yield contributing attributes (average data of two years, i.e. 1981 and 1982).

Yield of green pod/ha (qtls.)	*No. of green pod/ plant* (X_1)	*No. of cluster/ plant* (X_2)	*No. of green pod/ cluster* (X_3)	*Fresh wt. of green pod/plant* (X_4)	*Dry wt. of green pod/ plant (g)* (X_5)	*Mean wt. of cluster (g)* (X_6)	*Mean of green pod (g)* (X_7)	*Length of green pod(cm)* (X_8)	*Thick-ness of green pod(cm)* (X_9)	*No. of seeds/ green pod* (X_{10})	*Total protein (%)* (X_{11})
Y	0.896**	0.913**	0.912**	0.950**	0.941**	0.902**	0.952**	0.758**	0.936**	0.945**	0.982**
X_1		0.980**	0.973**	0.854**	0.944**	0.959**	0.963**	0.743**	0.974**	0.961**	0.913**
X_2			0.968**	0.968**	0.939**	0.963**	0.971**	0.782**	0.967**	0.969**	0.927**
X_3				0.951**	0.923**	0.979**	0.973**	0.683**	0.974**	0.963**	0.904**
X_4					0.989**	0.958**	0.981**	0.759**	0.955**	0.937**	0.944**
X_5						0.935**	0.961**	0.769**	0.939**	0.907**	0.941**
X_6							0.967**	0.319**	0.950**	0.934**	0.895**
X_7								0.729**	0.976**	0.962**	0.944**
X_8									0.702**	0.778**	0.813**
X_9										0.973**	0.941**
X_{10}											0.951**
X_{11}											

**Significant at 1% level.

REFERENCES

Dennis, R. E. (1977). Growing guar in arid zone, Ariz. Univ. Dept. Plant Sci. Agri. File Fc. Z88-0.

Gill, P. S. and Singh, K. (1981). Effect of fertilization and yield contributing characters on grain yield of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] *Haryana Agri. Univ. Jour. Res.* **11**(3): 333-338.

Rama Rao, R. C.; Venkateswarlu, M. S. and Sankara Reddy, G. H. (1983). Effect of growth regulators on yield attributes and yield of TMVZ groundnut at various plant densities. *Indian J. Agron.* **28**(3): 243-247.

Sanderson, K. M. (1974). •Guar (*Cyamopsis tetragonoloba*) in the Rodesian lowkeld. *Rodesia Agri. Jour.* **71**: 17-91.

Tolbert, N. E. (1960). 2-chloroethyl trimethyl ammonium chloride and related compound as plant growth substances. *J. Biol. Chem.* **235**: 475-479.

Tomar, P. S.; Kundu, R. S.; Gill, P. S. and Bishnoi, K. C. (1972). Effect of seed rates and levels of phosphorus and nitrogen on growth, yield and quality of guar forage. *Ind. J. Agron.* **16**: 143-146.

Tomar, P. S.; Dalal, S. K.; Gill, P. S. and Bishnoi, K. C. (1973). Comparative efficiency of guar [*Cyamposis tetragonoloba* (L.) Taub.] varieties with varying level of phosphorus and seed rate. Ann. Arid. Zone (12): 163-66.