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Impact of P, K and Zinc on pod and Root Attributes, Yield and Economics of cowpea (VignasinensisSavi) cv. cowpea 263

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Abstract

A field experiment comparising of four levels each of phosphorus (0, 30, 60 and 90 kg/ha) and potassium (0, 15, 30 and 45 kg/ha) and three levels of zinc (0, 10 and 20 kg/ha) constituting thereby 48 treatment combination which were tested on 'cowpea-263' in single split plot design putting levels of P_2O_5 and potassium in main plots and levels of zinc in sub-plots for two consecutive rainy seasons of 1997 and 1998 at R.B.S. College, Bichpuri, Agra. The results obtained indicated that the application of 90kg, P_2O_5, 45 kg K_2O and 20 kg Zn through SSP, K_2SO_4 and $Zncl_2$, respectively was found most suitable doses so for as fresh and dry weight of plant at flowering, duration of pod picking, root-studies, pod-attributes, yield of marketable pods (q/ha), chemical constants in pod and net-profit (Rs/ha) were concerned in both the years of experimentation.

Cowpea (VignasinensisSavi) is a Kharif legume vegetable crop and is grown throughout the country for green pod, dry seed, fodder and green manure. The cowpea is a quick growing leguminous forage crop usually grown mixed with cereal fodders and grasses to improve the nutritive value of the herbage. It is an excellent cover crop, which suppresses weeds and enriches the soil. Cowpea can be grown under partial shade conditions too.It can be grown in Kharif as well as in zaid reason.

Cowpea fodder is very rich and nutritious fodder. It contains 20-24% crude proteins, 43-49% neutral detergent fibre, 34-37% and acid detergent fibre, 23-25% cellulose and 5-6% hemicelluloses on dry matter basis. The digestibility of cowpea fodder is above 70%. The traditional cowpea populations grown in cyprus are used as multipurpose crop, namely for the production of green pods, green immature seeds and dry mature seeds. In West and East Africa, the tender green leaves are cooked like spinach or as a relish (Rachie, 1985). Vegetables play a vital role by providing and minerals in the diet, besides supplying protein and energy. The nutrients in the vegetable overcome the common disorders like anaemia deficiency disorders and others ailments in human beings.According to Lal and Singh (1993) cowpea 263 is suitable for both spring and rainy seasons. Its plants are dwards, pods medium green thick meaty tenders and about 20 cm long. It is an early maturity variety. It is free golden mosaics and comparatively resistant to other mosaics. Average green pod yield is 8.4-9.0 tonnes per hectare. It is superior over the existing. 'PusaDofasli'; 'PusaBarsati', and PusaKomal varieties in all respects.

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Research Methods

In this context a field experiment. Comprising of four levels each of phosphorus (0, 30, 60 and 90 kg/ha) and potassium (0, 15, 30 and 45 kg/ha) and three levels of zinc (0, 10 and 20 kg/ha) giving thereby 48 treatment combinations was conducted during two consecutive rainy seasons of 1997 and 1998 in single split plot design by putting level of phosphorus and potassium in main plot and level of zinc in sub-plots with three replications. The net plot size was 1.35m x1.35m having 45 cm plot border all around.

The soil of experimental yield was sandy loam pH value 7.8, low in available nitrogen and zinc, medium in phosphorus and potassium. Basal dressing each of phosphorus, potassium and zinc as per their levels through single super phosphate potassium sulphate and zinc chloride respectively was done before sowing. An uniform application of nitrogen at the rate of 10 kg/ha through urea was also done as basal dressing.

The treated seeds with rhizobium culture was sown in well prepared field in the rows of 45 cm at a distance of 15 cm apart in last week of July 1997 and 1998. All the normal cultural operations were performed as per need of the crop.

Research Findings – Discussion

A perusal of the data presented in Table 1,2,3 revealed that the application of 90 kg P_2O_5/ha, 45 kg K_2O/ha and 20 kg Zn/ha tended to augment fresh and dry weight of plant at flowering, duration of pod picking as well root studies such as length and diameter of main root, number of primary branches of main root, number of nodules/root, fresh and dry weight of main root with nodules; pod attributes (fresh weight of pod, pod-shell and grain/pod), dry weight of pod shell and grain, fresh weight of marketable pods (q/ha) and that too chemical constituents (N, P, K, Zn and Crude protein) in pod, and substantially net profit (Rs/ha) in both the seasons of cropping. Such performance in these studies was noted appreciable and best at the application of highest dose of each of P_2O_5, K_2O and Zinc, in this investigation conducted for two consecutive years (Table 1,2,3)

Mustafa and Singh (1993) obtained the results during the investigation revealed favourable impact of 90 kg P_2O_5/ha in cowpea (vignaunguiculata L.).

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Table – 1
Effect of levels of P, K and Z on fresh and dry weight of plant (q) at flowering, duration of pod picking, root, studies pod attributes, field of marketable pods (q/ha) and chemical constituents (N, K and Z crude protent%) in pod and net profit during 1997 and 1998

Treatments	Fresh weight (g)/plant at flowering		Dry weight (g)/plant at flowering		Days taken to start of pod picking		Days taken to last pod picking		Length of main roots/(cms)		Diameter of main roots (cm)		Number of primary branches of main root (cm)		Number of nodules /root		Fresh weight of root with nodules (g)		Dry weight of root with nodules (g)	
	1997	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**
(A) P-levels																				
P_0	92.9	94.2	22.3	23.5	31.1	32.0	58.1	59.2	10.5	10.8	1.1	1.2	9.3	9.7	27.6	28.8	3.9	4.7	1.3	1.4
P_{30}	102.4	103.8	24.6	25.7	41.3	42.4	79.8	80.9	14.7	15.0	1.3	1.5	13.3	13.7	39.4	40.5	4.9	5.7	1.4	1.5
P_{60}	110.0	111.9	26.6	27.9	50.6	52.6	99.0	100.2	18.6	18.9	1.8	1.9	16.3	16.7	51.2	52.6	6.1	6.8	1.5	1.6
P_{90}	111.9	113.2	26.9	28.3	51.7	53.4	101.8	103.9	19.2	19.6	1.8	1.9	16.8	17.2	51.9	53.2	6.3	7.0	1.5	1.6
SEm±	0.9	0.9	0.3	0.6	0.2	0.2	0.5	0.2	0.2	0.2	0.005	0.02	0.2	0.4	0.3	0.8	0.2	0.034	0.007	0.02
CD (5%)	2.6	2.7	1.0	1.8	0.7	0.8	1.5	0.7	0.5	0.5	0.016	0.07	0.6	1.2	1.0	2.3	0.08	0.09	0.02	0.06
(B) K-levels																				
K_0	92.6	93.8	22.2	23.2	30.4	31.6	58.0	59.1	10.4	10.8	1.1	1.2	9.3	9.6	27.5	28.7	3.9	4.6	1.2	1.3
K_{15}	101.7	102.9	24.4	25.7	40.0	41.1	79.7	80.7	14.4	14.7	1.3	1.4	13.2	13.6	38.2	39.5	4.9	5.6	1.4	1.5
K_{30}	108.7	109.9	26.1	27.5	50.5	51.8	98.4	99.6	17.7	18.1	1.7	1.9	16.3	16.7	50.3	51.5	6.0	6.7	1.5	1.6
K_{45}	115.0	116.4	27.8	29.1	53.7	54.8	102.6	103.8	20.4	20.8	1.9	2.1	16.9	17.3	54.1	55.4	6.5	7.2	1.6	1.8
SEm±	0.9	0.9	0.3	0.6	0.2	0.2	0.5	0.2	0.2	0.2	0.005	0.02	0.2	0.4	0.3	0.8	0.02	0.03	0.007	0.02
CD (5%)	2.6	2.7	1.0	1.8	0.7	0.8	1.5	0.7	0.5	0.5	0.016	0.07	0.6	1.2	1.0	2.3	0.008	0.09	0.02	0.06
(C) Zn-levels																				
Zn_0	99.4	100.7	23.9	25.2	39.5	40.8	80.2	81.2	14.5	14.8	1.4	1.6	11.9	12.3	38.6	39.8	4.6	5.3	1.3	1.4
Zn_{10}	104.7	106.0	25.2	26.5	44.1	45.1	85.1	86.3	15.8	16.2	1.5	1.7	14.3	14.7	42.7	43.8	5.4	6.1	1.4	1.6
Zn_{20}	109.3	110.6	26.3	27.5	47.3	48.6	88.7	89.8	16.9	17.2	1.6	1.7	15.6	15.9	46.3	47.6	6.0	6.8	1.5	1.7
SEm±	0.8	0.7	0.3	0.5	0.4	0.3	0.3	1.2	0.2	0.2	0.005	0.02	0.3	0.3	0.4	0.7	0.008	0.04	0.008	0.006
CD (5%)	2.2	1.9	1.0	1.5	1.6	1.1	0.8		0.5	0.6	0.015	0.06	0.7	0.8	1.1	1.9	0.02	0.11	0.02	0.01

Table – 2

Treatments	Fresh weight of pod shell (g)		Fresh weight of grain /pod (g)		Fresh weight of pod (g)		Dry Weight (g) of Pod Shell		Dry Weight (g) of grains		Fresh weight of marketable pods (q/ha)		Nitrogen contents (%) in Pods		Crude Protein contents (%) in pod	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
(A) P-levels																
P_0	2.4	2.8	0.7	0.9	3.3	3.7	0.4	0.5	0.3	0.3	57.3	58.5	2.78	3.06	17.37	19.12
P_{30}	3.2	3.6	0.9	1.1	4.1	4.7	0.4	0.5	0.3	0.4	83.1	84.3	2.98	3.22	18.25	20.12
P_{60}	4.1	4.5	1.2	1.4	5.5	5.9	0.5	0.6	0.4	0.5	103.0	104.3	2.97	3.27	18.56	20.43
P_{90}	4.4	4.7	1.3	1.4	5.7	6.2	0.5	0.6	0.4	0.5	107.2	108.3	3.00	3.31	18.75	20.68
SEm±	0.01	0.03	0.01	0.01	0.06	0.1	0.01	0.03	0.005	0.02	0.3	0.8	0.008	0.01	0.05	0.06
CD (5%)	0.04	0.09	0.03	0.03	0.2	0.4	0.04	0.02	0.01	0.05	0.8	2.5	0.023	0.04	0.14	0.25
(B) K-levels																
K_0	2.4	2.7	0.7	0.9	3.3	3.6	0.4	0.5	0.2	0.3	56.2	57.1	2.87	3.18	17.93	19.87
K_{15}	3.2	3.5	0.9	1.0	4.1	4.6	0.5	0.6	0.3	0.4	82.4	83.5	2.91	3.18	18.18	19.87
K_{30}	4.1	4.5	1.1	1.4	5.2	5.8	0.5	0.6	0.3	0.4	102.8	103.9	2.94	3.24	18.37	20.25
K_{45}	4.5	4.9	1.4	1.5	5.9	6.4	0.6	0.7	0.4	0.5	106.4	110.6	2.95	3.26	18.43	20.37
SEm±	0.01	0.03	0.01	0.01	0.06	0.1	0.01	0.01	0.005	0.02	0.3	0.8	0.008	0.01	0.05	0.06
CD (5%)	0.04	0.09	0.03	0.03	0.2	0.4	0.04	0.02	0.01	0.05	0.8	2.5	0.023	0.04	0.14	0.25
(C) Zn-levels																
Zn_0	2.8	3.2	0.9	1.2	3.9	4.4	0.4	0.5	0.3	0.3	76.0	77.2	2.90	3.21	18.12	20.06
Zn_{10}	3.5	3.9	1.0	1.2	4.6	5.1	0.5	0.6	0.4	0.4	87.9	88.9	2.92	3.23	18.25	20.18
Zn_{20}	4.2	4.6	1.1	1.3	5.3	5.8	0.6	0.7	0.4	0.5	99.0	100.3	2.93	3.22	18.31	20.12
SEm±	0.01	0.02	0.01	0.06	0.05	0.05	0.003	0.008	0.002	0.005	0.3	0.8	0.004	0.01	0.025	0.06
CD (5%)	0.03	0.06	0.05	0.02	0.13	0.16	0.010	0.025	0.006	0.01	1.0	2.4	0.012	0.02	0.975	0.12

Table – 3

Treatments	Phosphorus contents(%) in Pods		Potassium contents (%) in Pods		Zinc contents (%) in Pods		Net Profit /hectare (Rs.)	
	1997	**1998**	**1997**	**1998**	**1997**	**1998**	**1997**	**1998**
(A) P-levels								
P_0	0.43	0.55	1.76	2.08	30.6	31.5	7272.19	7467.87
P_{30}	0.44	0.55	1.81	2.13	31.7	32.7	12114.33	12328.62
P_{60}	0.45	0.57	1.80	2.12	33.1	34.3	16013.06	16241.60
P_{90}	0.46	0.58	1.81	2.17	34.4	35.7	16812.86	16944.58
SEm±	0.002	0.003	0.009	0.011	0.3	0.3		
CD (5%)	0.008	0.010	0.027	0.032	0.9	0.9		
(B) K-levels								
K_0	0.42	0.54	1.73	2.05	28.8	29.8	7985.10	8174.44
K_{15}	0.44	0.56	1.76	2.10	31.8	32.9	12392.42	12612.02
K_{30}	0.45	0.56	1.80	2.13	33.6	34.7	15653.22	15924.35
K_{45}	0.46	0.59	1.90	2.22	35.7	36.8	16181.69	16271.83
SEm±	0.002	0.003	0.009	0.011	0.3	0.3		
CD (5%)	0.008	0.010	0.027	0.032	0.9	0.9		
(C) Zn-levels								
Zn_0	0.44	0.55	1.78	2.10	30.2	31.2	11139.02	11334.55
Zn_{10}	0.45	0.57	1.79	2.12	33.2	34.3	13094.77	13172.44
Zn_{20}	0.45	0.57	1.81	2.15	33.9	35.1	14925.55	15230.01
SEm±	0.001	0.002	0.006	0.007	0.2	0.2		
CD (5%)	0.004	0.007	0.019	0.020	0.5	0.6		

References:

1. **Lal, T. and Singh S. (1993).** 'Cowpea 263' is a dual season vegetable Indian Horti. : 37(4): 18-20.
2. **Mustafa Mohd. and Singh, T. (1993).**Phenologicaltriats and pod yield of cowpea (Vignaunguiceulata L.) affected by various levels of phosphorus application and dates of sowing under Faizabad conditions. Prog. Horti. 25(1-2) : 69-72.
3. **Singh, B.B. and B.R. Ntare (1985).** Development of improved cowpea varities in Africa. In cowpea Research Production and Utilization, (Ed. S.R. Singh and K.O. Rachie, PP. 105-115, John Wiley and Sons, N. York.)