SHORT COMMUNICATION

RESPONSE OF GENOTYPES AND GROWTH REGULATORS ON NUTRIENT UPTAKE, ECONOMICS AND ENERGY OUT-PUT OF PIGEONPEA (*CAJANUS CAJAN* (L.) MILLSP) IN *VERTISOLS* OF CHHATTISGARH PLAINS

Tej Lal Kashyap, G.K. Shrivastava, R. Lakpale and N.K. Choubey

Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya, Raipur (CG) 492006
Email : kashyaptl@yahoo.com

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Abstract: In Chhattisgarh, pigeonpea occupies an area of 164.72 m ha with a production of 85.69 m t and productivity of 520 kgha^{-1}. Present study was undertaken to assess the effect of genotypes and growth regulators on nutrient uptake, economics and energy output of pigeonpea in *Vertisols* of Chhattisgarh plains. Field experiment was conducted during *kharf* (rainy) season of 2000-01 at IGKV, Raipur on *Vertisols* having pH 7.19 with available N 218, P 12.15 and K 363 kgha^{-1} . The N and K uptake were found to be higher in cv. Asha, even though their concentration was low; it is due to higher biological yield of cv. Asha. As regards to economics comparison of both cultivars, the gross and net realization estimated to be significantly higher in cv. Asha than cv. C-11. Highest seed protein content was observed in 2,4-D , which is corroborates the findings of Borriobera *et al.* (1995). Protein yield was found to be highest in cycocel and 2,4-D for seed and stalk respectively. Economics of pigeonpea production was inf1uenced by growth regulators. Highest gross and net realization were found in cycocel treatment

Keywords: Growth regulators, Economics, Nutrient uptake

INTRODUCTION

Pigeonpea *Cajanus cajan* (L.) Millsp cultivation in Chhattisgarh state occupies a distinct position in the pulse map of India. In Chhattisgarh, it occupies an area of 164.72 m ha with a production of 85.69 m t and productivity of 520 kgha^{-1} and productivity of pigeonpea can be ascribed to the constraints associated with its agro-ecological and physio-morphological traits. Pigeonpea genotypes have been classified into early, medium and long duration types, each forming a different production system. The expression of variability for different characters differs among the various production systems. Thus, a generalized production strategy can not be formulated for pigeonpea (Sachan,1992). Plant growth substances play a significant role in modification of crop growth, yield and quality of crop (Randhawa and Singh, 1970; Pando and Shrivastava, 1985 and Wang and Zapata,1987). Agro- ecological situations, management factors and renewable energy sources affects the crop production. Considering these points in view this study was undertaken to assess the effect of genotypes and growth regulators on nutrient uptake, economics and energy output of pigeonpea in *Vertisols* of Chhattisgarh plains.

MATERIAL AND METHOD

A field experiment was conducted during *kharf* (rainy) season of 2000-01 at IGKV, Raipur on *Vertisols* having pH 7.19 with available N 218, P 12.15 and K 363 kgha^{-1}. Climate of the region is drying moist, sub-humid with average rainfall of 1200-1400 mm. The crop received 214 mm rainfall during the growth period. The experiment was laid out in a RBD (factorial) with four replications. The treatments consisting of three growth regulators (control, 2,4-D @ 20ppm and cycocel @ l000ppm) and two pigeonpea genotypes (Asha and C-11). Pigeonpea seeds were sown at a seed rate of 20 kg ha^{-1} on 5th August, 2000 with a spacing of 60 cm x 15 cm. Recommended fertilizer dose@ 20:50:30 kg NPK ha^{-1} was applied uniformly. Harvesting was done on 2nd February, 2001. The N, P and K content in seed and stalk were estimated by micro kjeldahl method, Vanado molybdo phosphoric yellow colour method and flame photometry respectively as described by (Jackson, 1967). Protein content, N P K uptake, energetics and economics were also worked out by respective formulas. Cost of production for all treatments was worked out on the basis of the prevailing input and market price of the produce.

RESULT AND DISCUTION

Results revealed that the N, P and K content in seed and stalk was significantly higher in cv. C-1l than cv. Asha (Table l). This is due to the dilution effect on account of higher biological yield of cv. Asha. The N and K uptake were found to be higher in cv. Asha, even though their concentration was low; it is due to higher biological yield of cv. Asha (Table 2). But the phosphorus uptake followed the exact pattern of its concentration. The protein content being a function of nitrogen content is obvious to follow a similar trend as that of nitrogen. But the protein yield was statistically more in cv. Asha because of higher productivity (Table 2). Jarillo *et al*. (1998) also found

*Corresponding Author

that the highest seed yields were generally correlated with relatively high crude protein content.

As regards to economics comparison of both cultivars, the gross and net realization estimated to be significantly higher in cv. Asha than cv. C-11 (Table 3). This high return in cv. Asha might be due to higher productivity. Energetics in relation to energy input, output input ratio and use efficiency were significant1y higher with cv. Asha, due to higher energy output, which is nothing but the outcome of higher yield (Table 3).

Growth regulators causes variation in N, P, K content at plant. The higher seed N, P and K contents were observed in 2,4-D treatment, but their concentration in stalk were noted in cycocel (Table 1), On the contrary, Shende *et al*. (1987) observed increased N and P contents in seed due to foliar spray of cycocel. Since, the seed yield in 2,4-D was less as compared to cycocel a comparatively lower seed nutrient concentration in cycocel, might be due to dilution effect. This was also noticed in case of stalk yield, but because the stalk yield was higher in 2,4-D, its nutrients concentration was found to be lower. Low N concentration was found in seed due to cycocel, but its uptake was highest might be due to higher yield. Higher N uptake in stalk is positively correlated with high N concentration in it. The seed P concentration was the highest in 2,4-D which ultimately resulted in higher seed P uptake, but highest P uptake, inspite of low stalk P concentration might be due to higher stalk yield. As regards seed K uptake, 2,4-D and cycocel had the same K uptake values which was significantly more than the control. But incase of stalk, the K uptake was highest in 2,4-D obviously due to more of stalk yield (Table 2). The protein content based on N concentration obviously followed the similar trend of nitrogen. Highest seed protein content was observed in 2,4-D , which is corroborates the findings of Borriobera *et al.* (1995). Protein yield was found to be highest in cycocel and 2,4-D for seed and stalk respectively.

Economics of pigeonpea production was inf1uenced by growth regulators. Highest gross and net realization was found in cycocel treatment (Table 3). Gupta (2000) also observed higher gross and net return with cycocel application. From energy considerations, the energy output, energy output input ratio and energy use efficiency were highest in case of 2,4-D due to highest biological yield coupled with low energy input on accounts of its application of a lower concentration.

Although cv. Asha and application of 2,4-D @ 20 ppm increased N P K content, but from economics and energy considerations cv. Asha and cycocel spray was the most viable.

Table 1. Nutrient content in pigeonpea as affected by genotypes and growth regulators

Treatment	Content (%)							
	Nitrogen		Phosphorus		Potassium		Protein	
	Seed	Stalk	Seed	Stalk	Seed	Stalk	Seed	Stalk
Genotypes								
Asha	3.36	0.85	0.24	0.08	0.45	0.74	21.37	5.09
C-11	3.57	0.91	0.31	0.09	0.50	0.83	22.38	5.89
SEm±	0.11	0.01	0.008	0.001	0.008	0.010	0.31	0.61
CD (p=0.05)	0.33	0.04	0.024	0.003	0.024	0.033	0.93	0.49
Growth Regulators								
Control	3.34	0.83	0.23	0.08	0.45	0.78	20.90	5.22
2, 4-D@ 20 ppm	3.57	0.85	0.30	0.08	0.50	0.77	22.88	5.30
Cycocel @ 1000 ppm	3.49	1.00	0.25	0.09	0.47	0.80	21.84	6.11
SEm±	0.18	0.03	0.010	0.003	0.010	0.013	0.40	0.20
CD (p=0.05)	NS	0.09	0.030	0.009	0.030	NS	1.20	0.60

Table 2. Nutrient uptake in pigeonpea as affected by genotypes and growth regulators

Treatment	Nutrient Uptake (kg ha^{-1})						Protein yield (kg ha^{-1})	
	Nitrogen		Phosphorus		Potassium			
	Seed	Stalk	Seed	Stalk	Seed	Stalk	Seed	Stalk
Genotypes								
Asha	71.44	74.97	4.34	6.49	9.45	69.03	454.79	467.01
C-11	59.25	71.18	5.18	7.35	8.15	68.49	375.30	475.81
SEm±	2.72	1.22	0.22	0.28	0.27	1.06	17.09	15.19
CD (p=0.05)	8.20	3.67	0.66	0.84	0.81	NS	51.09	NS
Growth Regulators								
Control	57.77	73.26	4.58	6.66	7.80	68.99	361.04	457.61
2, 4-D@ 20 ppm	66.46	69.84	5.55	7.33	9.31	70.52	415.37	484.35
Cycocel @ 1000 ppm	71.79	76.12	5.06	6.77	9.31	66.76	465.72	472.27
SEm±	3.33	1.94	0.27	0.32	0.33	1.30	18.32	18.60
CD (p=0.05)	10.05	5.84	0.81	NS	0.99	NS	55.20	NS

Table 3. Effect of genotypes and growth regulators on energetics and economics of pigeonpea

Treatment	Energy input (MJ x 10^{-3} ha^{-1})	Energy input (MJ x 10^{-3} ha^{-1})	Energy output input ratio	Energy use efficiency (q MJ x 10^{-3} ha^{-1})	Cost incurring (Rs ha^{-1})	Gross realization (Rs ha^{-1})	Net realization Rs ha^{-1}	Re $^{-1}$ invested
Genotypes								
Asha	7.79	14.95	18.93	14.67	14052	3730	21371	2.57
C-11	7.79	127.08	16.30	12.66	14052	3275	14553	2.02
SEm±	-	1.61	0.21	0.16	-	872	419	0.06
CD (p=0.05)	-	4.84	0.62	0.47	-	2028	1264	0.19
Growth Regulators								
Control	7.76	132.76	17.43	13.56	13632	29449	15817	2.15
2, 4-D@ 20 ppm	7.77	141.69	18.23	14.16	13938	31724	17786	2.22
Cycocel @ 1000 ppm	7.85	135.10	17.20	12.08	14588	34871	20283	2.53
SEm±	-	1.87	0.25	0.19	-	1068	603	0.08
CD (p=0.05)	-	5.66	0.76	0.58	-	3218	1316	0.24

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