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RESEARCH ARTICLE

NODULATING EFFICIENCY OF COWPEA GENOTYPES WITH DIFFERENT STRAINS OF BRADYRHIZOBIUM

Sharma, S. P., Sharma, P. P. and *Mukesh Vyas

Department of Plant Breeding and Genetics, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology – Udaipur 313001

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ABSTRACT

Pulses are known to have additional advantage on seed production and quality if inoculated with symbiotic strains. A considerable variation in nodulation efficiency has been observed in genotypes. Thus twenty diverse genotypes of cowpea *Vigna unguiculata* (L.) walp were inoculated with two Bradyrhizobium strains under field conditions to investigate nodulation efficiency. Observations recorded were- number of nodules, nodule fresh weight, nodule dry weight, leghaemoglobin content, nitrogen content. The overall performance of genotypes was superior in Bradyrhizobium treated (S_2>S_1) than untreated (S_3). Genotypes DCP-9, IC-39890, DCP-10, HC-03-04 RC-19, COVU-702, DCP-9 and RC-101 exhibited higher number of nodules per plant, nodule fresh weight, nodule dry weight. Leghaemoglobin content and nitrogen content in plant.

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INTRODUCTION

Development of high yielding varieties of pulses has changed the food scenario to a great extent. Nitrogen fertilizer in an essential factor in realizing the grain yield potential of high yielding varieties indiscriminate use of chemical fertilizers has increased the cost of cultivation and also created serious pollution hazards. As such, use of biofertilizers is advocated. Pulses are known to have an additional advantage of symbiotic nitrogen fixation with rhizobial culture. This ability of pulses can be exploited to substitute the requirement of nitrogen fertilizer using rizobial culture. Biological nitrogen fixation carried out by Bradyrhizobium legume symbiosis is considered as most efficient agricultural system on account of rate of nitrogen fixation. The symbiosis involved interaction and contribution of the genetic system of legume host and Bradyrhizobium microsymbionts, hence considerable variation in nodulating efficiency has been reported within genotypes and Bradyrhizobium strains. The present paper describes the nodulating efficiency of 20 cowpea genotypes with two different strains of Bradyrhizobium.

****Corresponding author: Mukesh Vyas,***
Department of Plant Breeding and Genetics, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology – Udaipur 313001

MATERIALS AND METHODS

The experiment was laid out in compact family block design with three replications under field conditions to grow 20 diverse genotypes of cowpea inoculated with two Bradyrhizobium strains. Strain 1 (S_1) was an isolate from Hissar, while strain 2 (S_2) was isolate from Delhi region. Each entry was grown in five rows of four meter length with row to row and plant to plant distance of 45 cm x 10 cm respectively at the experimental farm of Rajasthan College of Agriculture, Udaipur. Observations were recorded on five randomly selected competitive plants of each genotype in each replication for all traits viz.-number of nodule, nodule fresh weight, nodule dry weight, leghaemoglobin content, nitrogen content.

RESULTS AND DISCUSSION

The Bradyrhizobium inoculation resulted in increased number of nodules, nodule fresh weight, nodule dry weight, leghaemoglobin content and nitrogen content in plant. The performance of all the genotypes was superior in S_1 and S_2 as compared to S_3 (control) which might be due to increase in nitrogen fixation due to Bradyrhizobium treatments which affected favorably to other yield contributing traits. Significant genotypic differences were observed with regard to nitrogen fixation in black gram (Mandal *et al*., 1990).

Table 1. Number of nodules, fresh weight and dry weight of nodules per plant in cowpea [*Vigna unguiculata* (L.) walp] genotypes under three environments

Genotypes	Number of nodules per plant			Fresh weight of nodules per plant (g)			Dry weight of nodules per plant (g)		
	S I	S II	S III	S I	S II	S III	S I	S II	S III
DCP - 9	39.43	45.36	32.1	222.12	276.02	168.85	66.13	73.1	44.12
DCP - 10	34.80	38.20	28.2	239.82	248.88	181.76	76.13	75.05	39.10
CA2C - 21	33.33	39.63	27.76	254.58	280.02	182.72	62.1	69.35	45.02
RC - 101	28.03	38.43	25.26	219.56	241.49	160.02	49.03	54.34	37.15
V - 240	28.90	35.70	24.1	223.89	233.78	148.02	47.16	39.16	36.25
DCS - 5	32.10	34.63	26.06	221.21	236.93	133.76	59.16	71.25	36.80
IC – 52102	29.30	33.33	23.26	206.29	230.45	127.30	52.23	59.16	35.22
V - 625	27.20	28.40	21	196.32	212.64	120.82	58.05	66.04	32.02
RC - 19	32.10	38.36	24.86	248.64	280.4	171.36	60.1	62.14	46.06
Covu - 702	30.87	33.40	27.66	212	240.82	136.48	60.11	63.33	36.90
V - 585	29.60	34.10	21.5	208.13	249.76	132.45	57.17	57.04	38.88
IC - 20523	31.37	35.00	24.66	225.12	257.25	145.65	62.34	66.07	39.70
DCP – 8	25.43	25.56	19.93	184.08	204.32	127.22	52.14	59.06	30.25
IC – 39856	30.27	30.10	27	204.16	235.84	121.92	55.22	64.04	35.81
HC – 03-04	31.00	33.63	24.7	212.45	248.96	124.08	71.33	84.17	38.8
IC – 39890	34.97	43.00	26.6	268.64	283.36	192.18	60.19	65.2	45.30
GC – 3	31.03	36.13	24.83	210.72	245.68	128.05	48.16	50.12	39.23
GC – 01-3	32.33	37.30	26.93	236.08	273.62	172.02	51.12	50.1	43.19
HC – 9866	31.43	35.60	24.53	220.18	267.36	133.62	58.18	66.26	42.10
GC – 9737	21.17	26.33	19.56	192.61	212.32	122.56	44.15	48.35	32.05
	SEM± 1.039	CD 5% 2.97		SEM ±	6.47 CD (5%)18.53		SEM ± 0.22	CD (5%)0.65	

Table 2. Mean leghaemoglobin and Nitrogen content per plant in cowpea [Vigna unguiculata (L.) walp] genotypes under three environments

Genotypes	Leghaemoglobin content per plant			N content per plant		
	S I	S II	S III	S I	S II	S III
DCP - 9	151.49	152.45	151.75	18.36	21.38	19.11
DCP - 10	140.68	142.35	140.95	17.71	22.35	19.91
CA2C - 21	145.48	145.15	144.9	16.70	19.80	18.12
RC - 101	152.10	150.17	149.41	20.05	23.24	21.38
V - 240	146.48	145.2	144.70	19.90	20.34	20.27
DCS - 5	124.94	125.05	124.13	17.55	18.44	17.45
IC – 52102	135.03	135.1	134.81	16.10	19.64	17.54
V - 625	126.15	127.04	125.5	16.45	18.23	16.65
RC - 19	131.04	131.05	130.45	16.45	19.29	18.31
Covu - 702	175.15	115.20	160.46	14.54	16.15	14.52
V - 585	116.24	116.44	115.32	14.41	18.13	15.44
IC - 20523	150.57	150.41	144.36	17.10	19.14	19.44
DCP – 8	145.64	148.15	142.47	14.64	15.25	14.55
IC – 39856	142.06	142.1	138.03	14.49	19.17	17.34
HC – 03-04	150.24	150.25	145.00	18.91	22.02	21.34
IC – 39890	149.07	149.63	152.72	18.45	20.75	19.44
GC – 3	146.40	146.4	144.00	14.73	18.14	18.41
GC – 01-3	147.2	147.24	147.87	16.74	19.09	17.62
HC – 9866	142.20	142.68	139.73	17.18	19.65	19.2
GC – 9737	137.15	137.35	132.79	13.41	17.16	15.03
	SEM ±0.55	CD (5%) 1.57		SEM ± 0.04	CD (5%) 0.12	

Nodule number per plant was significantly increased in all the genotypes than control. It was maximum in DCP-9 about 39.43 (S_1), 45.36 (S_2) and 32.10 (S_3). Increase in number of nodules with rhizobium inoculation was also observed by Gamer *et al*. (1988) in soybean. Namdeo *et al*. (1988) in pigeon pea. Nodule fresh weight and nodule dry weight were increased in most of the genotypes when compared with the control. IC-39890 exhibited 268.64 (S_1), 283.36 (S_2) and 192.18 (S_3). Nodule dry weight DCP-10 exhibited 76.13 (S_1), HC-03-04 exhibited 84.17 (S_2) and RC-19 exhibited 46.06 in (S_3). Increase in nodule fresh weight and dry weight by rhizobial treatment was also observed by Gamer *et al*. (1988) in soybean and Namdeo *et al*. (1988) in pigeon pea. Leghaemoglobin content increased by Bradyrhizobium inoculation in all the genotypes than control. COVU-702 exhibited 175.15mg in S_1, DCP-9 exhibited 152.45mg in S_2 and COVU-702 exhibited 160.46 mg in S_3. Similar results were observed by Ghobrial *et al*. (1995) in soybean, Mathur *et al*. (1998) in Vigna mungo. Genotypes which showed high nitrogen content in plants RC-101 20.05% in S_1 and 23.24% in S_2 and 21.38% in S_3. Similar results were observed by Raut and Kohire (1991) in chickpea. Genotypes DCP-9, IC-39890, DCP-10, HC-03-04 RC-19, COVU-702, DCP-9 and RC-101 exhibited higher number of nodules per plant, nodule fresh weight, nodule dry weight. Leghaemoglobin content and nitrogen content in plant. It reflects efficient symbiosis of Bradyrhizobium strains II (S_2) with genotypes. Therefore these genotypes can be used further in any breeding programme. From the above study it is concluded that to estimate the efficiency of genotypes for nitrogen fixation in cowpea, nodules number, nodule fresh weight, nodule dry weight, leghaemoglobin content and nitrogen content in plant should be taken into account.

REFERENCES

Gamer, E.R.; Sapra, V.T. and Floyd 1988. Genotypic variation for nitrogen fixation in soybean. *Journal of Agronomy and Crop Science*, 161 (2) : 123-128.

Ghobrial, W.N.; Abadi, D.; A.B.D. Elkoosos, R.Y. and Hegezy, M.H. 1995. Nitrogen fixation potential as affected by *B. japonicum* strains and soybean cultivars for maximizing soybean productivity. *Annals of Agricultural Science (cairo)*, 40 (1) : 117-128.

Mandal, J., Chattopadhyay, A., Hazra, P. and Som, M. G. 1990. Genetic variability for three biological nitrogen fixationcomponents in cow pea (*Vigna unguiculata* (L.) Walp.) cultivars. *Crop Research*, 18 (2) : 222-225.

Mathur, V.L.; Kant, L. and Joshi, A. 1998. Study of nodulation Leghaemoglobin content and NRA in blackgram (*Vigna mungo* (L.) Hepper) *Legume Research*, 21 (4): 221-224.

Namdeo, S.L.; Gupta, S.C. and Bangar, K.S. 1998. Response of pigeonpea varities to *Rhizobium* strains. *Indian J. Pulses Res*., 1 (2) : 102-105.

Raut, R.S. and Kohere, O.D. 1991. Phosphorus response in chickpea (*Cicer arietinum L.) with* Rhizobium *inoculation. Legume Research*, 14 (2) : 78-82.

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