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RESEARCH PAPER

Influence of row proportions on yield and yield components of pigeonpea in intercropping system of pigeonpea [*Cajanus cajan* (L.) Millsp.] and ashwagandha (*Withania somnifera* Dunal)

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Abstract : Field experiment was conducted at Agricultural College Farm, Raichur, Karnataka on medium deep black soils during *Kharif* seasons of 2005 and 2006 to study the influence of row proportions of pigeonpea and ashwagandha in the intercropping system on yield and yield components of pigeonpea. The seed yield of pigeonpea in sole cropping system (15.80 q ha^{-1}) was found to be significantly higher than that recorded under different row proportions of pigeonpea and ashwagandha (11.34 to 14.04 q ha^{-1}). Similar trend was noticed with respect to yield components *viz.*, dry matter accumulation in reproductie parts, number of pods per plant, seed weight per plant, seed number per plant and 100-seed weight. Among the different row proportions, the pigeonpea seed yield produced under 2:4 (14.04 q/ha) and 1:2 (13.95 q ha^{-1}) row proportions were higher by 24 and 23 per cent when compared to the seed yield recorded under 2:1 row proportion of pigeonpea and ashwagandha (11.34 q/ha). The same trend was indicated in the yield components of pigeonpea.

Key Words : Pigeonpea, Ashwagandha, Companion cropping, Row proportion

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INTRODUCTION

Intercropping is an age old practice being followed by subsistance farmers to achieve their domestic needs and also monetary benefits to some extent. The main advantage of intercropping is that component crops are able to use growth resources differently and make better overall use of growth resources than grown separately (Willey, 1979). The success of any intercropping system depends mainly on selection of component crops. The component crops should invariably have different growth rhythms and rooting patterns. Pigeonpea is a tall growing, wide spaced crop with deep root system which can accommodate short statured medicinal crop like ashwagandha which is having shallow root system. Hence, the present investigation was carried out at Agricultural College Farm, Raichur on the influence of row proportions of pigeonpea and ashwagandha in intercropping system on yield and yield components of pigeonpea.

MATERIALS AND METHODS

The field experiment was conducted during *Kharif* seasons of 2005 and 2006 at the Agricultural College Farm, Raichur on medium deep black soils. The soil pH was 8.20 with 0.62 per cent organic carbon, 223 kg ha^{-1} of available nitrogen, 35 kg ha^{-1} of available phosphorus and 334 kg ha^{-1} of available potassium. There were 10 treatments comprised of eight row proportions of pigeonpea and ashwagandha and two sole crops of pigeonpea and ashwagandha.The experiment was laid out in a Randomised Block Design with three

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replications. The gross plot size was 3.6 m x 7.2 m and the net plot size varied under different row proportions. The varieties used were Maruthi (ICPL-8863) and Jawahar Asgand 20 of pigeonpea and ashwagandha, respectively. The duration of these varieties is 165 and 160 days, respectively. The population of pigeonpea was maintained at 100 per cent of its sole optimum (55,556 plants ha^{-1}) in all the intercropping treatments by adjusting the intra row space while ashwagandha was given a intra row space of 10 cm, irrespective of row proportions. The crops were sown on 14-7-2005 and 30-6-2006 during 2005 and 2006, respectively. The sole crop of pigeonpea was sown at a spacing of 60 cm x 30 cm and sole ashwagandha was sown at a spacing of 30 cm x 10 cm. Under intercropping treatments a common row spacing of 30 cm was maintained. The recommended dose of fertilizer for pigeonpea (25: 50 NP kg ha^{-1}) and ashwagandha (12:24 NP kg ha^{-1}) were applied as basal dose. In case of intercropping treatments the fertilizers were applied in proportionate to the sole optimum population for main crop and intercrop separately. Five tagged pigeonpea plants used for recording growth parameters were used for recording various yield components. For recording dry matter accumulation in reproductive parts, five plants at random were uprooted and the reproductive parts were separated and were dried at 70° C and weighed. The rainfall received during crop yield was adequate (936 mm) and well distributed during 2005, whereas it was less (572.8 mm) and erratic during 2006. The crops were harvested at physiological maturity. Fischer's (1937) method of analysis of variance was used for analysis and interpretation of data.

RESULTS AND DISCUSSION

The experimental findings obtained from the present study have been discussed in following heads:

Effect of cropping systems :

The seed yield of pigeonpea in sole cropping system (15.80 q ha^{-1}) was found to be significantly higher than the seed yield obtained in intercropped treatments (11.34 to 14.04 q ha^{-1}) in the pooled data. The extent of reduction in seed yield under intercropped treatments was in the range of 11 to 28 per cent when compared to sole crop yield (Table 3). Reduced seed yield of pigeonpea under intercropping system might be attributed to increased plant population per unit area resulting in increased competition for growth resources, specially moisture, nutrients and light. Similarly, the reduction in seed yield of pigeonpea intercropped with medicinal crops has been reported by Maheshwari *et al.* (1997) and Ram and Kumar (1998). The reduction in the seed yield of intercropped pigeonpea could be traced back to a significant reduction in yield components *viz.*, dry matter accumulation in reproductive parts of plant, number of pods per plant, seed weight per plant, seed number per plant and 100 seed weight (Table 1 and 3). Similar reduction in the number of pods (Venkateshwaralu, 1986) and seed weight per plant (Tomar *et al.*, 1984) of pigeonpea intercropped with greengram and soybean when compared to sole crop of pigeonpea were reported.

Partitioning of dry matter in fruiting parts is a single most important factor contributing to the final seed yield. The pooled data on the dry matter accumulated in the pods of pigeonpea at harvest (Table 1) indicate that pigeonpea intercropped under different treatments accumulated 11 to 25 per cent lower dry matter in pods (29.52 to 54.93 g $plant^{-1}$) when compared to that observed under sole crop of pigeonpea (33.10 g $plant^{-1}$). The reduction in dry matter in pods in intercropped pigeonpea was mainly attributed to the competition it faced from ashwagandha for growth resources.

Effect of row proportions :

The seed yield of pigeonpea in the pooled analysis under

Table 1 : Dry matter accumulation in pods (g $plant^{-1}$) of pigeonpea as influenced by row proportions in pigeonpea and ashwagandha intercropping system

Tr. No.	Treatments	Dry matter accumulation in pods (g $plant^{-1}$)								
		90 DAS			135 DAS			At Harvest		
		2005	2006	Pooled	2005	2006	Pooled	2005	2006	Pooled
T_1	Sole pigeonpea	6.06	3.82	4.94	33.91	25.78	29.85	36.52	29.68	33.10
T_2	Sole ashwagandha	--	--	--	--	--	--	--	--	--
T_3	Pigeonpea + Ashwagandha (1:1 row proportion)	4.78	2.87	3.83	28.87	22.02	25.45	32.33	22.89	27.61
T_4	Pigeonpea + Ashwagandha (1:2 row proportion)	4.96	3.02	3.99	29.95	22.92	26.44	33.53	23.15	28.34
T_5	Pigeonpea + Ashwagandha (1:3 row proportion)	4.95	3.18	4.07	31.47	20.78	26.13	33.99	22.57	28.28
T_6	Pigeonpea + Ashwagandha (1:4 row proportion)	5.37	3.55	4.46	31.99	20.38	26.19	34.84	20.59	27.72
T_7	Pigeonpea + Ashwagandha (2:1 row proportion)	4.76	2.33	3.55	25.31	15.52	20.42	31.80	18.06	24.93
T_8	Pigeonpea + Ashwagandha (2:2 row proportion)	4.93	3.08	4.01	27.11	21.16	24.14	32.68	22.02	27.35
T_9	Pigeonpea + Ashwagandha (2:3 row proportion)	5.14	3.12	4.13	29.07	20.10	24.59	33.79	20.83	27.31
T_{10}	Pigeonpea + Ashwagandha (2:4 row proportion)	5.46	3.56	4.51	31.60	22.53	27.07	34.40	24.64	29.52
	S.E.±	0.06	0.17	0.10	0.24	0.31	0.16	0.14	0.78	0.41
	C.D. at 5%	0.18	0.51	0.29	0.73	0.90	0.49	0.40	2.34	1.23

2:4 and 1:2 row proportions of pigeonpea and ashwagandha were at par with each other and were significantly superior over rest of the row proportions studied (Table 3). The seed yield produced under 2:4 and 1:2 row proportions were higher by 24 and 23 per cent when compared to the seed yield recorded under 2:1 row proportion of pigeonpea and ashwagandha. Similarly higher seed yield of pigeonpea under 1:2 row proportion with soybean was recorded by Joshi *et al.* (1997) and similar to that higher pigeonpea seed yield under 2:4 row proportion with soybean was recorded by Hunshal and Malik (1988). The higher seed yield of pigeonpea under 1:2 and 2:4 row proportions could be due to their higher yield attributing characters *viz.*, dry matter accumulation in reproductive parts of plant, number of pods per plant, seed weight per plant, seed number per plant and 100 seed weight (Table 1, 2 and 3) and could be attributed to lack of or lower competition it faced from ashwagandha for growth resources when compared to other row proportions.

Thus, it can be concluded that 2:4 and 1:2 row proportions of pigeonpea and ashwagandha were at par with each other and recorded significantly higher seed yield and yield components when compared to 2:1 row proportion.

Table 2 : Seed weight (g plant^{-1}), seed number per plant and 100 seed weight (g) of pigeonpea as influenced by row proportions in pigeonpea and ashwagandha intercropping system

Tr. No.	Treatments	Seed weight (g plant^{-1})			Seed number per plant			100 Seed weight (g)		
		2005	2006	Pooled	2005	2006	Pooled	2005	2006	Pooled
T_1	Sole pigeonpea	36.91	27.50	32.21	351.40	260.65	306.03	9.97	9.83	9.90
T_2	Sole ashwagandha	--	--	--	--	--	--	--	--	--
T_3	Pigeonpea + Ashwagandha (1:1 row proportion)	31.66	23.04	27.35	302.03	218.10	260.07	9.86	9.70	9.78
T_4	Pigeonpea + Ashwagandha (1:2 row proportion)	33.15	24.00	28.58	313.20	230.45	271.83	9.92	9.72	9.82
T_5	Pigeonpea + Ashwagandha (1:3 row proportion)	31.54	23.24	27.39	298.87	227.62	263.25	9.96	9.78	9.87
T_6	Pigeonpea + Ashwagandha (1:4 row proportion)	30.03	25.07	27.55	289.94	230.04	259.99	9.82	9.74	9.78
T_7	Pigeonpea + Ashwagandha (2:1 row proportion)	27.73	22.06	24.90	264.90	208.95	236.93	9.76	9.66	9.71
T_8	Pigeonpea + Ashwagandha (2:2 row proportion)	30.62	23.22	26.92	284.97	219.48	252.23	9.79	9.73	9.76
T_9	Pigeonpea + Ashwagandha (2:3 row proportion)	29.95	24.15	27.05	293.64	228.63	261.14	9.78	9.74	9.76
T_{10}	Pigeonpea + Ashwagandha (2:4 row proportion)	33.07	24.62	28.85	315.14	235.14	275.14	9.96	9.75	9.86
	S.E.±	0.37	0.25	0.24	0.71	0.58	0.40	0.09	0.08	0.05
	C.D. at 5%	1.10	0.74	0.73	2.12	1.73	1.21	NS	NS	NS

NS = Non significant

Table 3 : Seed yield (q ha^{-1}) and number of pods per plant of pigeonpea as influenced by row proportions in pigeonpea and ashwagandha intercropping system

Tr. No.	Treatments	Seed yield (q ha^{-1})			No. of pods per plant		
		2005	2006	Pooled	2005	2006	Pooled
T_1	Sole pigeonpea	18.78	12.81	15.80	108.91	80.30	94.61
T_2	Sole ashwagandha	--	--	--	--	--	--
T_3	Pigeonpea + Ashwagandha (1:1 row proportion)	16.06	10.30	13.18	96.90	73.45	85.18
T_4	Pigeonpea + Ashwagandha (1:2 row proportion)	16.71	11.18	13.95	99.51	76.40	87.96
T_5	Pigeonpea + Ashwagandha (1:3 row proportion)	15.87	10.14	13.01	100.79	70.02	85.41
T_6	Pigeonpea + Ashwagandha (1:4 row proportion)	14.69	9.33	12.01	101.93	68.68	85.31
T_7	Pigeonpea + Ashwagandha (2:1 row proportion)	13.95	8.72	11.34	95.77	61.16	78.47
T_8	Pigeonpea + Ashwagandha (2:2 row proportion)	14.50	9.14	11.82	97.76	69.05	83.41
T_9	Pigeonpea + Ashwagandha (2:3 row proportion)	14.67	9.32	12.00	100.29	69.20	84.75
T_{10}	Pigeonpea + Ashwagandha (2:4 row proportion)	16.79	11.28	14.04	101.70	73.31	87.51
	S.E.±	0.24	0.29	0.25	0.58	0.43	0.35
	C.D. at 5%	0.72	0.87	0.76	1.73	1.29	1.04

REFERENCES

Fischer, R.A. (1937). *Statistical methods for research workers.* Oliver and Boyd., Edinburgh, UNITED KINGDOM.

Hunshal, C.S. and Malik, **D.S.** (**1988).** Assessment of yield advantages in intercropping system. *J. Maharashtra Agric. Univ.*, **13**: 56-58.

Joshi, P.K., Aleemuddin, M. and Mergal, S.D. (1997). Planting pattern in pigeonpea (*Cajanus cajan*) and soybean (*Glycine max*) intercropping. *Indian J. Agron*., **42**: 228-230.

Maheshwari, S.K., Sharma, R.K. and Gangrade, S.K. (1997). Performance of palmarosa and pigeonpea intercropping under different plant geometrics. *Indian J. Agric. Sci.,* **67**: 320-324.

Ram, M. and Kumar Sushil (1998). Intercropping medicinal spices and oilseed crops with geranium (*Pelargonium graveolens*) for improving productivity in assured input system of a subtropical environment. *J. Med. Arom. Plant Sci*., **20**: 1060-1066.

Tomar, S.S., Sharma, R.B. and Nanded, K.N. (1984). Relative efficiency of multi-intercrop studies in pigeonpea under rainfed conditions. *Indian J. Agron.*, **29**: 475-479.

Venkateshwaralu, S. (1986). Intercropping pigeonpea with short duration pulses in semi-arid alfisols. *Indian J. Dryland Agric. Res. Dev.,* **1**: 48-55.

Willey, R.W. (1979). Intercropping – its importance and research needs. Part-I, Competition and yield advantages. *Field Crop Abstr.*, **32**: 1-10.

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