



Effect of chickpea based intercropping systems on competitive relationship between chickpea and intercrop

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Abstract : A field experiment was conducted during *Rabi* season of 2009-10 to study the effect of planting geometry and chickpea based different intercropping systems on competitive relationship between chickpea and intercrops. Land equivalent ratio was observed highest in chickpea + linseed at 3:3 row proportions. Competitive ratio of main crop (chickpea) was highest in chickpea + linseed at 3:3 row proportions. It means, chickpea was more competitive in chickpea + linseed at 3:3 row proportions than in any other intercropping system. Intercrop safflower was more competitive in chickpea + safflower at 6:3 row proportions which was at par with sunflower in chickpea + sunflower in 6:3 row proportions. The aggressivity of chickpea was highest (0.23) in chickpea + linseed at 3:3 row proportions.

Key Words : Intercropping, Chickpea, Land equivalent ratio, Aggressivity

View Point Article : Wasu, R.M., Gokhale, D.N., Dadgale, P.R. and Kadam, G.T. (2013). Effect of chickpea based intercropping systems on competitive relationship between chickpea and intercrop. *Internat. J. agric. Sci.*, 9(1): 351-353.

Article History : Received : 03.12.2012; Revised : 22.12.2012; Accepted : 02.01.2013

INTRODUCTION

The present area of 1.05 million hectares in under cultivation of chickpea during *Rabi* season in Maharashtra can be further increased by growing it as intercrop with wide spaced crops like linseed and safflower. The initial slow growth rate and deep root system of safflower offers a good scope of intercropping with fast growing, early maturing and shallow rooted chickpea. Different intercrops and their special arrangement in intercropping have important effects on competition between component crops and their growth (Sarkar *et al.*, 2000). Further the most of the intercropping systems are beneficial than growing in their respective sole crops. But studies on performance of different plant geometry and chickpea based different intercropping systems on competitive relationship between chickpea and intercrops at different duration and at different row proportion in intercropping are lacking. Hence, the present investigation was undertaken.

MATERIALS AND METHODS

A field experiment was conducted during *Rabi* season of 2009-10 at Farm, Department of Agronomy, College of Agriculture, Marathwada Krishi Vidyapeeth, Parbhani. The experimental field was clayey and slightly alkaline in nature with pH 8.10, organic carbon content 0.42 per cent, available nitrogen 118 kg ha⁻¹, available P₂O₅ 16.50 kg ha⁻¹ and available K₂O 434.86 kg ha⁻¹. The treatments consisted of four treatments of sole crops *i.e.* T₁ - chickpea, T₂ - linseed, T₃ - sunflower and T₄ - safflower with six intercropping treatments involving different combinations with chickpea *i.e.* T₅ - chickpea + linseed (3:3), T₆ - chickpea + linseed (6:3), T₇ - chickpea + sunflower (3:3), T₈ - chickpea + sunflower (6:3), T₉ - chickpea + safflower (3:3) and T₁₀ - chickpea + safflower (6:3) row proportions.

The row to row distance between chickpea and different intercrops was maintained at 45 cm and plant to plant at 10 cm in chickpea and linseed, while 20 cm in sunflower and safflower. Sole chickpea was fertilized with 25 and 50 kg of N and P₂O₅ ha⁻¹, while linseed with 60 and 40 kg of N and P₂O₅ ha⁻¹,

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sunflower with 60:40:30 kg of N:P₂O₅:K₂O ha⁻¹ and safflower with 60:30:30 kg of N:P₂O₅:K₂O ha⁻¹, respectively. In intercropping both component crops were fertilized with the proportion of the recommended N, P₂O₅ and K₂O for respective sole crop based on area occupied by each of them. Two manual hoeings and two insecticidal sprays against pod borer were followed. All the ten treatments were tried in Randomized Block Design with three replications. All the four crops were planted on 13th November. The chickpea, linseed and sunflower were harvested in last week of February, while safflower harvested in last week of March. Competitive functions like land equivalent ratio, competition ratio and aggressivity were computed as per standard procedures given by Willey and Rao (1979).

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Grain yield and productivity :

From Table 1 it could be seen that the grain yield of chickpea was highest (1775 kg ha⁻¹) in pure stand and it was significantly superior over the other treatment combinations. Among the various intercroppings chickpea + linseed combination produced higher grain yield of chickpea in 6:3 row proportion while lowest grain yield was produced with chickpea + sunflower intercropping system when grown in (3:3) row proportion. The results are similar to those reported by Singh and Yadav (1992).

The data from Table 1 pointed out that grain yields of intercrops were highest in their respective sole cropping than in intercroppings. The lowest grain yield was observed when grown in (6:3) row proportion with chickpea.

The mean productivity of sole safflower was highest which was significantly superior over rest of the treatments and was at par with chickpea + safflower in (3:3) row proportion. The mean productivity was lowest in sole linseed and in chickpea + sunflower intercropping in (3:3) row proportion.

Table 1: Mean productivity (kg ha⁻¹) as influenced by various treatments

Sr. No.	Treatments	Grain yield of chickpea (kg ha ⁻¹)	Grain yield of intercrops (kg ha ⁻¹)	Productivity (kg ha ⁻¹)
1.	T ₁ - Chickpea sole	1775	-	1775
2.	T ₂ - Linseed sole	-	457	457
3.	T ₃ - Sunflower sole	-	1205	1205
4.	T ₄ - Safflower sole	-	1964	1964
5.	T ₅ - Chickpea + linseed (3:3)	1131	236	1367
6.	T ₆ - Chickpea + linseed (6:3)	1268	193	1461
7.	T ₇ - Chickpea + sunflower (3:3)	442	722	1164
8.	T ₈ - Chickpea + sunflower (6:3)	618	556	1174
9.	T ₉ - Chickpea + safflower (3:3)	557	1346	1903
10.	T ₁₀ - Chickpea + safflower (6:3)	713	1054	1767
	S.E. ±	-	-	36.40
	C.D. at 5%	-	-	108.18
	General mean	929.14	859.22	1423.70

Table 2: Competitive relationship and yield advantages of chickpea and intercrops as influenced by various treatments

Treatments	Land Equivalent Ratio (LER)			Competition ratio		Aggressivity
	Chickpea	Intercrop	Total	Chickpea	Intercrop	
T ₁ - Chickpea sole	1	-	1	-	-	-
T ₂ - Linseed sole	-	1	1	-	-	-
T ₃ - Sunflower sole	-	1	1	-	-	-
T ₄ - Safflower sole	-	1	1	-	-	-
T ₅ - Chickpea + linseed (3:3)	0.64	0.52	1.16	1.23	0.81	-0.23
T ₆ - Chickpea + linseed (6:3)	0.71	0.42	1.13	0.84	1.81	-0.20
T ₇ - Chickpea + sunflower (3:3)	0.25	0.60	0.85	0.41	2.41	-0.70
T ₈ - Chickpea + sunflower (6:3)	0.35	0.46	0.81	0.38	2.65	-0.87
T ₉ - Chickpea + safflower (3:3)	0.31	0.69	1.00	0.48	2.10	-0.72
T ₁₀ - Chickpea + safflower (6:3)	0.40	0.54	0.94	0.37	2.67	-1.02
General mean	0.52	0.69	0.99	0.62	1.97	-0.55

Land equivalent ratio (LER) :

The highest land equivalent ratio (1.16) was obtained in chickpea + linseed (3:3) which was followed by chickpea + linseed (6:3) and chickpea + sunflower (3:3) row proportions (Table 2). The lowest land equivalent ratio (0.81) was obtained in chickpea + sunflower (6:3) row proportion. This might be due to these crops produce more yield in intercropping as compared to their respective sole crops. Similar conclusion was drawn by Padhi *et al.* (2010).

Competition ratio :

The highest competition ratio (1.23) of chickpea was observed in chickpea + linseed intercropping system when grown at 3:3 row proportion (Table 2). It means that chickpea was more competitive in chickpea + linseed (3:3) intercropping system than in other cropping system, followed by chickpea + linseed at 6:3 row proportion. The lowest competition ratio (0.37) of chickpea was observed in chickpea + safflower at 6:3 row proportion. It means, chickpea was least competitive in chickpea + safflower (6:3) intercropping system than in other cropping system.

In intercrops highest competition ratio (2.67) was observed in safflower in chickpea + safflower at 6:3 row proportion. It means that among all intercrops safflower within chickpea + safflower at 6:3 row proportion was more competitive. Similar results were observed by Willey and Rao (1981).

Aggressivity :

The aggressivity of chickpea was maximum (0.20) in chickpea + linseed (6:3) row proportion. It means that the chickpea was more aggressive in chickpea + linseed (6:3) row

proportion than in any other intercropping treatment due to less competition offered by linseed for nutrients, soil moisture and light (Table 2).

In intercropping, when chickpea intercropped with sunflower and safflower, the aggressivity of chickpea was least while sunflower and safflower were more aggressive over chickpea due to more competition offered by them (sunflower and safflower) for nutrients, soil moisture and light. Similar results were obtained by Tripathi *et al.* (2003).

REFERENCES

- Kulmi, G.S. and R.S. Chundawat (1997).** Production potential and economics of chickpea (*Cicer arietinum* L.) based intercropping system under irrigated condition. *Crop Res. Hissar*, **13** (1): 19-25.
- Mishra, J.P., Ali, M. and Arya, R.L. (2001).** Genotypic compatibility in relation to row ratio in intercropping of linseed (*Linum usitatissimum*) and gram (*Cicer arietinum* L.) under rainfed condition. *Indian J. Agric. Sci.*, **76** (6): 359-362.
- Sarkar, R.K., Shit, D. and Maitra, S. (2000).** Competition function, productivity and economics of chickpea (*Cicer arietinum*) based intercropping system. *Indian. J. Agron.*, **45** (4): 681-686.
- Singh, D.K. and D.S. Yadav (1992).** Production potential and economics of chickpea (*Cicer arietinum* L.) based intercropping system under rainfed condition. *Indian. J. Agron.*, **37** (3): 424-429.
- Thakur, N.S., Pannase, S.K. and Sharma, R.S. (2000).** Production potential of gram (*Cicer arietinum* L.) based intercropping system under rainfed condition. *Indian. J. Agron.*, **45** (3): 534-539.
- Tripathi, H.N., Chand, S. and Tripathi, A.K. (2003).** Biological and economical feasibility of chickpea (*Cicer arietinum*) + Indian mustard (*Brassica juncea*) cropping system under varying levels of phosphorus. *Indian. J. Agron.*, **50** (1): 31-34.

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