Indian Journal of Agronomy **51** (1) : 54–56 (March 2006)

Effect of seed priming and tillage management on productivity of chickpea (*Cicer arietinum*) genotypes under rainfed conditions

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Received : October 2004

ABSTRACT

A field experiment was undertaken during 1998–99 to 2000–01 at the Indian Institute of Pulses Research, Kanpur, to study the effect of seed soaking and tillage management on growth, yield and yield attributes of chickpea (*Cicer arietinum* L.) genotypes under rainfed conditions. Significantly higher grain and straw yields of chickpea were obtained with compact (double cross planking) tillage than normal (single cross planking) tillage. Soaking of seeds in 5% solution of KCl for 12 hr increased the grain and straw yields of chickpea over without soaking of seeds (control). Chickpea cv 'KWR 108' recorded significantly higher seed and straw yields than 'Pant G 114'. Highest net return and benefit : cost ratio of chickpea were recorded in compact tillage soaking of seeds in 5% solution of KCl for 12 hr and chickpea cv. 'KWR 108'.

Key words : Tillage practices, Seed priming, Economic returns

Chickpea is an important pulse crop of country with drought as single most important abiotic constraint of higher productivity. The various agronomic manipulations for minimizing the drought effect involve alterations in seed bed, seeding technology, use of mulches or antitranspirants and genotypes. The conservation tillage practices, developed mainly for large-scale mechanized agriculture needs to be adopted for rainfed pulses in India. Agronomic management of drought is integration of various management practices, so that the adverse effect of moisture stress can be reduced for efficient crop growth and to harvest maximum yield. The present investigation deals with impact of tillage practices and seed treatment soaking to alleviate the vagaries of drought on chickpea.

MATERIALS AND METHODS

A field experiment was carried out during 3 consecutive years of 1998–99 to 2000–01 at the Indian Institute of Pulses Research, Kanpur, to study the effect of tillage practices and seed soaking on performance of chickpea genotypes under rainfed conditions. The treatment combinations, comprising 2 tillage practices (main plot), 3 seed soaking and 2 genotypes of chickpea (sub-plot) were evaluated in split-plot design with 3 replications. The soil was sandy loam with pH 7.35, low in organic carbon (0.32%) and available nitrogen (253 kg/ha) and medium in available phosphorus (17.6 kg/ha) and available potassium (205 kg/ha). Chickpea was sown in October in all the 3 years in 30 cm rows. Recommended dose of fertilizer @ 20, 40, 20 and 20 kg N,P,K and S/ha were applied at the time of sowing. The harvesting of chickpea was done on 7 April 1999, 31 March 2000 and 4 April 2001. The rainfall received during the cropping season was 35.2, 4.5 and 52.4 mm in 1998–99, 1999–2000 and 2000–01 respectively.

RESULTS AND DISCUSSION

Effect of tillage

Significantly higher plant height, number of branches, dry matter and dry weight of root/plant were recorded in compact tillage than normal tillage practice. However, number and dry weight of nodules were obtained significantly higher in normal tillage than compact tillage practice. Number of pods, grains/pod and 100-seed weight were recorded significantly higher in compact than in normal tillage (Table 1).

Compact tillage recorded significantly higher grain and straw yields (5.59 and 18.67%) in than normal tillage (Table 2). However, significantly highest harvest index was obtained in normal tillage. The increase in grain and straw yield of chickpea in compact tillage might be owing to lowering of the extent of soil moisture loss from the upper surface of the soil and consequently soil moisture was conserved for longer duration in favour of crop

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growth. Highest net return were recorded in compact tillage.

Effect of seed priming

Among the seed priming treatments, significantly highest plant height, dry weight of roots, number and dry weight of root nodules/plant were recorded in soaking of seeds in 5% solution of KCl no-socking seed treatment. Significantly higher number of pods/plant, grains/pod and 100-seed weight of chickpea was recorded in soaking of seed in 5% solution of KCl than untreated control. Soaking of seed in water also recorded significantly higher growth and yield attributes of chickpea than respective check.

Soaking of seeds in 5% solution of KCl recorded significantly higher grain (22.75%) and straw yields (30.27%) of chickpea compared to untreated check. Soaking of seeds in water also recorded significantly higher grain and straw yields of chickpea than untreated control. The harvest index was highest in untreated control than soaking of seeds in 5% KCl. Musa *et al.* (1999) reported similar effects of seed priming. The level of decrease exhibited in disease incidence of plants, pod borer damage and number of unfilled pods. Soaking of seeds in 5% KCl solution for 12 hr recorded maximum net return followed by soaking of seed in water and untreated check.

Response of varieties

Growth attributes of chickpea was significantly higher

Table 1. Growth and yield attributes of chickpea as affected by different tillage practices, seed priming and genotypes of chickpea (average data of 3 years)

Treatment	Plant height (cm)	Branches/ plant	Dry matter/ plant (g)	Dry weight of roots/ plant (g)	Nodules/ plant	Dry weight of nodules/ plant (mg)	Pods/ plant	Grains/ pod	100-seed weight (g)
Tillage									
Normal	30.7	7.5	17.2	14.4	11.6	215.0	40.3	1.4	16.9
Compact	36.2	8.6	19.8	10.7	10.0	111.4	45.5	1.6	18.3
CD (P=0.05)	1.9	0.9	1.3	1.2	1.1	13.0	2.1	0.2	1.4
Seed priming									
Without soaking	29.9	6.6	15.4	9.8	10.0	154.9	39.6	1.4	15.2
Soaking in water for 12 hr	34.1	8.0	18.6	13.7	10.5	165.7	43.8	1.5	17.8
Soaking in KCl (5%) for 12 hr	36.4	9.6	21.5	14.2	11.9	169.0	44.7	1.6	19.7
CD (P=0.05)	1.6	0.7	0.8	0.8	NS	8.9	1.8	0.16	1.10
Genotype									
'KWR 108'	35.4	9.0	20.1	14.1	12.2	213.8	44.2	1.6	18.7
'Pant G 114'	31.5	7.0	16.8	10.9	9.5	112.6	41.3	1.3	16.4
CD (P=0.05)	1.7	0.7	1.0	0.9	0.9	10.2	2.0	0.2	1.3

Table 2. Yield and economics of chickpea genotypes as influenced by various tillage and seed soaking (average data of 3 years)

Treatment	Yield (q/ha)		Harvest index (%)	Net return (Rs/ha)	Benefit : cost ratio
	Grain	Straw			
Tillage practice					
Normal	18.97	31.55	37.3	18,994	3.07
Compact	20.03	37.44	34.8	20,617	3.20
CD (P=0.05)	0.96	1.44	1.9		
Seed priming					
Without soaking	17.01	29.47	36.6	16,138	2.77
Soaking in water for 12 hr	20.55	35.65	36.6	21,356	3.31
Soaking in KCl (5%) for 12 hr	20.94	38.39	35.3	21,842	3.32
CD (P=0.05)	0.76	0.94	1.6		
Chickpea genotype					
'KWR 108'	19.82	37.61	34.1	19,254	2.86
'Pant G 114'	19.17	31.38	38.4	18,231	2.79
CD (P=0.05)	NS	1.21	1.8		

Selling price : Chickpea seed Rs 1,400/q and chickpea straw Rs. 50/q

in 'KWR 108' genotype than 'Pant G 114'. Chickpea cv. 'KWR 108' recorded significantly higher number of pods/plant, grains/pod, and 100-seed weight than 'Pant G 114'.

Chickpea cv. 'KWR 108' recorded significantly higher grain and straw yields of chickpea than 'Pant G 114'. Significantly highest harvest index of chickpea was recorded in 'Pant G 114' than 'KWR 108'. The increase in grain and straw yields was 3.39 and 19.05% in chickpea cv. 'KWR 108' than 'Pant G 114' respectively. Singh (2001) reported similar genotypic differences. Chickpea cv. 'KWR 108' recorded maximum net return while the returns were lower in case of 'Pant G 114'.

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