

Studies on irrigation requirement of chickpea (*Cicer arietinum*)

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ABSTRACT

An experiment was conducted during the winter season of 1992-93 and 1993-94 showed on a sandy loam soil showed that chickpea (*Cicer arietinum* L.) responded significantly to irrigation. Application of one irrigation at branching (45 days after sowing, DAS) produced significantly higher grain yield as compared with no-irrigation and one at pre-flowering (75 DAS) or at pod filling stage (105 DAS). Two irrigations at branching and pod filling stage gave the maximum grain yield. The maximum water use efficiency was recorded with one irrigation at branching.

Key words: Irrigation, Chickpea

Chickpea (*Cicer arietinum* L.), one of the important pulse crops of mid western plains of Uttar Pradesh, produces low grain yield (9 q/ha) primarily because of traditional system of management and its cultivation on conserved soil moisture. Hence, an experiment was undertaken to study the response of chickpea to irrigation schedules based on critical stage of this crop.

MATERIALS AND METHODS

The experiment was conducted during winter season of 1992-93 and 1993-94 at Ujhani. The soil was sandy loam, low in N (125 kg/ha) and medium in P (11.2 kg P/ha) and K (196.9 kg K/ha). The field capacity, permanent wilting point and bulk density were 14.9%, 4.6% and 1.63 g/cm³, respectively, with pH 7.5. The experiment was laid

out in randomised block design with four replications. The treatments comprising 6 irrigation schedules (no irrigation, irrigation at branching, irrigation at pre-flowering, irrigation at pod filling, irrigation at branching and pre-flowering and irrigation at branching and pod filling).

Chickpea (Avrodhi) was sown after a pre-sowing irrigation on 16 November and 2 November in first and second years, respectively, using 75 kg seed/ha and spacing of 30 × 10 cm. The crop received 45 kg P₂O₅/ha at the time of sowing. Two hand weedings were done 25 and 45 days after sowing. A rainfall of 64.8 and 37.6 mm was received during 1992-93 and 1993-94, respectively. At each irrigation (including pre-sowing irrigation) 75 mm irrigation water was applied. There was no moisture contribution from

Table 1. Yield, yield attributes and water use efficiency (WUE) of chickpea as influenced by irrigation levels

Treatment	Pods/ plant		Grains/ pod		1000-grain weight (g)		Grain yield (kg/ha)		WUE (kg/ha-mm) pooled
	1992- 93	1993- 94	1992- 93	1992- 94	1992- 93	1993- 94	1992- 93	1993- 94	
No irrigation	25.8	27.7	1.4	1.5	205.0	208.5	7.64	7.30	30.92
Irrigation at branching (45 DAS)	36.2	38.1	1.5	1.6	229.0	229.0	18.40	19.44	37.85
Irrigation at pre-flowering (75 DAS)	33.1	33.1	1.5	1.7	216.3	219.9	17.02	14.72	31.74
Irrigation at pod-filling (105 DAS)	29.4	29.4	1.6	1.6	219.7	220.5	14.40	12.65	27.08
Irrigation at branching and pre-flowering (45 and 75 DAS)	39.2	36.8	1.6	1.4	225.7	228.7	20.81	19.26	26.72
Irrigation at branching and pod-filling (45 and 105 DAS)	45.0	49.5	1.4	1.5	230.7	232.7	23.96	23.80	31.84
CD (P = 0.05)	6.1	7.3	NS	NS	9.0	8.2	1.80	1.94	0.58

DAS = Days after sowing

ground water- table.

RESULTS AND DISCUSSION

Yield attributes

Application of one irrigation at branching produced significantly higher number of pods per plant as compared with no irrigation and one irrigation at pod filling stage in both the years. However, the number of pods per plant with one irrigation at branching or pre-flowering remained at par during both the years. The highest number of pods per plant were obtained with two irrigations at branching and pod filling stage, which were significantly higher than that of one irrigation at any stage of crop growth during both the years and two irrigations at branching and pre-flowering during 1993-94 only. The 1000-grain weight with one irrigation at branching was significantly higher than with no irrigation and one irrigation at pre-flowering or pod filling stage in both the years. The maximum 1000-grain weight was recorded with two irrigations at branching and pod filling stage which was significantly higher with one irrigation at pre-flowering or pod filling stage but remained at par with one irrigation at branching and two irrigations at branching and pre-flowering stages during both the years (Table 1).

Grain yield

Chickpea responded significantly to irrigation in both the years (Table 1). The mean yield showed that one irrigation at branching produced significantly higher grain yield over no irrigation and one irrigation either at pre-flowering or pod filling stage. It might be due to higher number of pods per plant and 1000-grain weight. Increase in yield with one irrigation at branching was 153.28% as compared with no irrigation and 19.22 and 39.33% with one irrigation at pre-flowering and pod filling respectively. This

could be assigned to integrated effects of early plant vigour. Thus, the crop could tolerate soil moisture stress to a considerable extent at the later stages of crop growth and development. Panwar *et al.* (1977) and Raghu and Chaubey (1983) reported similar results. Two irrigations at branching and pod filling also produced significantly higher grain yield in comparison to one irrigation at branching in both the years but mean increase was only 26.22%. Aujla and Cheema (1985) also reported that increase in yield of chickpea was marginal beyond one irrigation.

Water use efficiency

The mean water use efficiency (kg/ha/mm) showed that one irrigation at branching gave significantly higher WUE (Table 1) as compared to rest of the irrigation treatments as well as no irrigation in both the years. The water use efficiency due to two irrigations, at branching and pod filling was significantly higher than that of one irrigation at pod filling or two irrigations at branching and pre-flowering stages but remained at par with one irrigation at preflowering. It may be inferred from the present study that chickpea should be irrigated twice at branching and pod filling stage of crop growth and development if possible.

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