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Research Article

STUDY ON EFFECT OF SUPPLEMENTARY IRRIGATION ON RAINFED CHICKPEA (*CICER ARIETINUM* L.)

Nav Raj Acharya[1], Jiban Shrestha[2], Subarna Sharma[1], Gun Bahadur Lama[1]

[1]Regional Agricultural Research Station, Khajura, Banke
[2]National Maize Research Program, Rampur, Chitwan

Corresponding author email: navrajacharya@narc.gov.np

Abstract

Chickpea is one of the important winter legumes in Nepal. It is grown after rice or maize either as sole or mixed crop. In Nepal, chickpea is mostly grown as rainfed crop on residual soil moisture or sometimes under irrigation. Lack of irrigation results drought and heat stress which affects crop growth and development. Irrigation at proper time is one of the most important factors for achieving higher crop yield. The experiment regarding use of supplementary irrigation time on chickpea was carried out at Regional Agricultural Research Station, Khajura, Banke, Nepal during the winter season of the year 2011 and 2012. The experiment was laid out in Randomized Complete Block Design with three replications. Seven different time intervals of irrigation was applied in the experiment for both years. Treatments differed significantly in terms of grain yield but showed non -significant difference in days to flowering and maturity over the years. The combined analysis of the experiments showed that the highest grain yield (2318 kg/ha) was produced when irrigation was supplied at vegetative stage followed by irrigation supplied at flowering stage (2298 kg/ha) and pod fill stage (2104 kg/ha) respectively.

Key words: Chickpea; supplementary irrigation; vegetative stage; grain yield

Introduction

Chickpea (*Cicer arietinum* L.) belongs to genus *Cicer*, tribe Cicereae, family Fabaceae, and subfamily apilionaceae. It originated in southeastern Turkey (Ladizinsky, 1975). The name *Cicer* is of Latin origin, derived from the Greek word 'kikus' meaning force or strength. Chickpea is a herbaceous annual plant which branches from the base. It is almost a small bush with diffused, spreading branches. Chickpea is one of the major grain legume crops grown as a sole or mixed crop in the rice (*Oryza sativa* L.) and maize (*Zea mays* L.) based cropping pattern in Nepal. Although it as sixth position among the grain legumes, it shares only 6% of the total area and production of grain legumes. It is the second most important crop after lentil (*Lens culainaris* Medic.) among winter legumes grown in the terai and inner terai of the country. It is grown either as a sole crop or a mixed crop with rapeseed (*Brassica napus* L.) and other winter crops. Area under chickpea has decreased over the last decade, as a result of increasing incidences of several biotic and abiotic stresses (Pandey *et al*., 2000). Chickpea is a rich source of protein, minerals and vitamins which supplements and complements a cereal based diet (ICRISAT, 1991). Further, chickpea is already a traditional component of the Nepalese diet and so there are no problems of consumer acceptance as experienced with exotic or novel foodstuffs. Thus promotion of chickpea production and consumption should be a majo strategy to improve human nutrition in Nepal. The information regarding irrigation time on chickpea was not sufficient in Nepal, so this experiment was conducted in order to identify impact of irrigation time on grain yield and performance of chickpea.

Materials and Methods

The experiment was conducted at Regional Agricultural Research Station, Khajura, Banke, Nepal during winter season of 2011 and 2012. The experiments was laid out in Randomized Complete Block Design and it was replicated three times in the month of November of the both years. Seven different time intervals for irrigating the crop were included in the experiment for both years. Seven treatments were included in the experiment are; No irrigation, Irrigation at vegetative stage, Irrigation at flowering stage, Irrigation at pod filling stage, Irrigation at vegetative + flowering stage, Irrigation at flowering + podfill stage and Irrigation at vegetative + flowering + podfill stage. Plot size was 12 m^2 with the row spacing of 40 cm and 10 cm. Thinning was done to maintain the plant population. Chemical fertilizers were applied @ 20:40:20 N:P_2O_5:K_2O kg/ha in which whole dose of phosphatic and potassium fertilizer with 50% dose of nitrogenous fertilizer as a basal dose while remaining nitrogen fertilizer was applied as top dress. All

the agronomic practices were provided as per need for better growth of the plant.

Results and Discussion

Irrigation effect on chickpea grain yield was highly significant (Table 1). One time irrigation at vegetative stage had the highest grain yield (2318 kg/ha) followed by irrigation at flowering (2298 kg/ha) and at pod fill stage (2104 kg/ha) in comparison with rainfed condition. Saxena (1980) reported that using supplemental irrigation in order to resolve stress at critical stages of plant growth had significant effect on grain yield increase. Soltani *et al.* (2001) reported that using supplemental irrigation to free the crops from soil moisture stress at critical growth and development stages, would increase chickpea grain yield. It appears that water defect at chickpea generative stages prevents yield potential attainment through flowers and pods shedding (Nayyar *et al*., 2006). Romteke *et al.* (1998) and Ney *et al*. (1994) have reported an increase in grain yield due to supplemental irrigation for chickpea and green pea, respectively.

Even though the chickpea is considered a drought tolerant crop, its seed yield can increase also with a supplementary irrigation, applied between flowering and beginning seed growth, mainly in environments and years with very low amounts of rainfall during the reproductive stage (Soltani *et al.*, 2001; Abbate *et al.*, 1994; Milia, 1993; Lombardo *et al.*, 1993; Gristina *et al.*, 1993). Romteke *et. al*. (1998), Summerfield and Roberts (1986), Singh *et. al*. (1991), and Silim and Saxena (1993a) have emphasized on the negative effects of moisture defect on chickpea grain yield and yield components. Dahiya *et al*. (1993) determined nutritional requirement of 2 chickpea varieties in semi –irrigated conditions and specified that their highest yields were attained using 27 kg/ha nitrogen and 69 kg/ha phosphorus and by 2 times irrigation at branching stage and onset of pod formation stage, obtaining the maximum consumption of water with one time irrigation. According to Silim and Saxena (1993b), high percentage of green sheath, especially in critical period of grain-filling reduces evaporation from soil surface, results in the improvement of soil moisture status and an increase in the amount of water available for plants, plus superiority of yield under irrigation conditions.

Conclusion

It is concluded from the above experiment that planting time significantly affected grain yield of chickpea. The highest grain yield was obtained with application of one-time irrigation at vegetative stage followed by flowering and pod-filling stage respectively. The use of supplemental irrigation at vegetative, flowering and pod-filling stage is essential for obtaining higher grain yield of chickpea.

Table 1: Effect of supplementary irrigation time on flowering, maturity and grain yield of Chickpea at Regional Agricultural Research Station. Khajura, Banke, Nepal during winter season of years; 2011 and 2012

S.N.	Treatments	Flowering (days)	Maturity (days)	Grain yield (kg/ha)
1	No irrigation	105.6	146.8	2001[d]
2	Irrigation at vegetative stage	103.8	146.1	2318[a]
3	Irrigation at flowering stage	105.0	147.1	2298[b]
4	Irrigation at pod filling stage	104.3	147.1	2104[c]
5	Irrigation at vegetative + flowering stage	104.3	146.6	1858[e]
6	Irrigation at flowering + podfill stage	105.0	148.1	1618[f]
7	Irrigation at vegetative + flowering + podfill stage	105.8	148.6	1459[g]
	Mean	104.8	147.2	1950.5
	F -test	ns	ns	**
	CV %	1.83	1.03	7.10
	LSD0.05			2.74

**, Significant at 0.01 probability level respectively. ns, Non-significant

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