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Growth and yield of chickpea (*Cicer arietinum* L.) as influenced by different weed management practices

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Abstract

A field experiment was conducted to study the effect of physical and chemical weed management practices on growth and yield of chickpea (*Cicer arietinum* L.) on sandy loam soils at College Farm, Agricultural College, Mahanandi campus of Acharya N. G. Ranga Agricultural University during *rabi*, 2020-2021. The experiment laid out in randomized block design with eight treatments and replicated thrice. The results revealed that significantly higher and comparable values of plant height, number of branches plant⁻¹, drymatter accumulation, seed yield and haulm yield were registered with two hand weedings at 20-25 DAS and 35-40 DAS (T₂) and with alachlor 50 EC @ 1250 a.i. ha⁻¹ as pre-emergence application fb intercultivation at 20-25 DAS fb hand weeding at 35-40 DAS (T₆).

Keywords: Chickpea, hand weeding, herbicides, intercultivation and yields

Introduction

Chickpea (*Cicer arietinum* L.) is an important *rabi* pulse crop grown in India for its economic importance besides maintaining soil fertility and often known as “king of pulses”. In general chickpea is known as gram or bengal gram. Chickpea ranks third among world’s food legumes with rich source of zinc in addition to its quality protein. In India, chickpea is cultivated in 9.69 million hectares of area with a production of 11.08 million tonnes and with a productivity of 1142 kg ha⁻¹ (www.indiastatagri.com, 2019-20) [14]. In Andhra Pradesh, it is cultivated in 0.46 million hectares of area with a production of 0.56 million tonnes and with a productivity of 1218 kg ha⁻¹ (www.apdes.ap.gov.in, 2019-20) [13].

Weed management is one of the important factors, which cause marked effect on the growth and yield of chickpea. The magnitude of loss due to weeds largely depends upon the composition of weed flora, period of crop weed competition and intensity of weed growth. Generally, in chickpea the critical period of crop weed competition falls between 30-45 days after sowing (Goud *et al.*, 2013) [4]. Uncontrol of weeds due to poor management practices under the neglected methods results in yield loss of 40 to 87 percent of chickpea (Solh and Pala, 1990) [11].

In this context, hand weeding may be the best as it effectively removes all the weeds. But, the use of herbicides will reduce human drudgery and weed management become cost effective and time saving. Therefore, the use of right method offers better control of weeds from the beginning of the crop and gives advantage for proper initial growth and competitive superiority. Considering the above facts and views, the present experiment was undertaken to study the growth and yield of chickpea (*Cicer arietinum* L.) as influenced by different weed management practices.

Materials and Methods

A field trail was carried out at Agricultural College Farm, Mahanandi campus of Acharya N. G. Ranga Agricultural University during *rabi* 2020-2021. The experiment laid out in a randomized block design with eight treatments which replicated thrice consists of weedy check (T₁), two hand weedings at 20-25 DAS and 35-40 DAS (T₂), intercultivation fb hand weeding at 20-25 DAS (T₃), alachlor 50 EC @ 1250 g a.i. ha⁻¹ as pre-emergence application fb hand weeding at 20-25 DAS (T₄), alachlor 50 EC @ 1250 g a.i. ha⁻¹ as pre-emergence application fb intercultivation at 20-25 DAS (T₅), alachlor 50 EC @ 1250 g a.i. ha⁻¹ as pre-emergence application fb intercultivation at 20-25 DAS fb hand weeding at 35-40 DAS (T₆), alachlor 50 EC @ 1250 g a.i. ha⁻¹ as pre-emergence application fb fomesafen + fluzafop-p-butyl @ 222 g

a.i. ha⁻¹ at 2-3 leaf stage of weeds (T₇) and fomesafen + fluazifop-p-butyl @ 222 g *a.i.* ha⁻¹ at 2-3 leaf stage of weeds fb hand weeding at 35-40 DAS (T₈).

The soil of the experimental field was sandy loam in texture, with neutral in reaction (pH 7.33), low in organic carbon (0.49%), available nitrogen (258 kg ha⁻¹) and available phosphorus (49 kg ha⁻¹) and high in available potassium (584 kg ha⁻¹). Diammonium phosphate (DAP) was applied to the experimental plots @ 125 kg ha⁻¹ as basal. The chickpea variety of NBeG-3 having duration of 90-100 days was sown with a spacing of 30 cm x 10 cm and gap filling was done at 10 DAS. Hand weeding was done twice at 20-25 DAS and 35-40 DAS. Intercultivation was done at 20-25 DAS with the help of multi tyne weeder and star weeder. Pre-emergence herbicide (alachlor) was sprayed one day after sowing and post-emergence herbicide (fomesafen + fluazifop-p-butyl) was sprayed at 2-3 leaf stage of weeds. Observations on plant height (cm), number of branches plant⁻¹, dry matter accumulation (kg ha⁻¹), seed yield (kg ha⁻¹) and haulm yield (kg ha⁻¹) were recorded by following standard procedure. The critical difference was correlated at 5 percent level of significance to compare different treatment means as suggested by Panse and Sukhatme (1985) [8].

Results and Discussion

Growth parameters

Table 1: Plant height, number of branches plant⁻¹, dry matter accumulation in chickpea as influenced by different weed management practices

Treatments	Plant height (cm)	Number of branches plant ⁻¹	Dry matter accumulation (kg ha ⁻¹)
T ₁ : Weedy check	32.00	14.80	1530
T ₂ : Two hand weedings at 20-25 DAS and 35-40 DAS	38.70	20.77	3581
T ₃ : Intercultivation fb hand weeding at 20-25 DAS	35.07	17.22	2636
T ₄ : Alachlor 50 EC @ 1250 g <i>a.i.</i> ha ⁻¹ as PE fb hand weeding at 20-25 DAS.	35.43	18.73	3161
T ₅ : Alachlor 50 EC @ 1250 g <i>a.i.</i> ha ⁻¹ as PE fb intercultivation at 20-25 DAS.	35.27	18.00	2998
T ₆ : Alachlor 50 EC @ 1250 g <i>a.i.</i> ha ⁻¹ as PE fb intercultivation at 20-25 DAS fb hand weeding at 35-40 DAS.	37.39	19.53	3427
T ₇ : Alachlor 50 EC @ 1250 g <i>a.i.</i> ha ⁻¹ as PE fb Fomesafen + Fluazifop-p-butyl @ 222 g <i>a.i.</i> ha ⁻¹ at 2-3 leaf stage of weeds.	33.70	16.70	2480
T ₈ : Fomesafen + Fluazifop-p-butyl @ 222 g <i>a.i.</i> ha ⁻¹ at 2-3 leaf stage of weeds fb hand weeding at 35-40 DAS.	37.13	19.07	3398
S.Em±	1.071	0.639	104.0
CD (P=0.05)	3.25	1.94	315

DAS = Days after sowing, fb = followed by, PE = Pre-emergence

Yields

Higher seed yield (kg ha⁻¹) and haulm yield (kg ha⁻¹) in chickpea with two hand weedings at 20-25 DAS and 35-40 DAS (T₂) might be due to increase in growth and yield attributes by reducing crop weed competition which ultimately favoured better environment for crop growth and development of chickpea. These results of higher seed yield and higher haulm yield with hand weeding were also reported by Goud *et al.* (2013), Kumar *et al.* (2014), Balwan *et al.* (2016), Singh and Jain (2017), Chandrakar *et al.* (2018) and

The plant height (cm), number of branches plant⁻¹ and dry matter accumulation (kg ha⁻¹) are important vegetative characters that act as an index for plant growth and vigour which ultimately reflects the crop productivity. The growth parameters in chickpea were influenced by different weed management practices. Significantly, highest growth parameters were recorded with two hand weedings at 20-25 DAS and 35-40 DAS (T₂). Similar observations of higher plant height with hand weedings were also reported by Chaudhari *et al.* (2016) [3] and Hargilas (2018) [5] similarly higher number of branches plant⁻¹ and maximum crop dry matter accumulation with hand weedings was recorded earlier by Mirjha *et al.* (2013) [7], Balwan *et al.* (2016) [1]. Among integrated methods, alachlor 50 EC @ 1250 g *a.i.* ha⁻¹ as pre-emergence application fb intercultivation at 20-25 DAS fb hand weeding at 35-40 DAS (T₆) found superior and exhibited on par values with hand weeding treatment (T₂). The results of higher plant height, greater number of branches plant⁻¹ and more crop dry matter accumulation with alachlor as pre-emergence fb intercultivation and hand weeding are in conformity with the findings of Sushree (2017) [12]. It might be due to weed free conditions for longer period of time that have reduced crop weed competition resulting in better nutrient uptake by plant leading to rapid cell development and vigorous crop growth of chickpea.

Hargilas (2018) [4, 6, 1, 10, 2, 5]. Among integrated methods, combination of pre-emergence herbicide with intercultivation and hand weeding *i.e.*, alachlor 50 EC @ 1250 g *a.i.* ha⁻¹ as pre-emergence application fb intercultivation at 20-25 DAS fb hand weeding at 35-40 DAS (T₆) reported higher seed yield and haulm yield which might be due to better control of weeds that have provided weed free conditions during the crop growth period and resulted in improved growth and yield parameters. These results are in conformity with findings of Razia (2017) [9].

Table 2: Seed yield and haulm yield of chickpea as influenced by different weed management practices

Treatments	Seed yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
T ₁ : Weedy check	518	1016
T ₂ : Two hand weedings at 20-25 DAS and 35-40 DAS	1386	2191
T ₃ : Intercultivation fb hand weeding at 20-25 DAS	903	1753
T ₄ : Alachlor 50 EC @ 1250 g a.i. ha ⁻¹ as PE fb hand weeding at 20-25 DAS.	1136	2004
T ₅ : Alachlor 50 EC @ 1250 g a.i. ha ⁻¹ as PE fb intercultivation at 20-25 DAS.	1045	1941
T ₆ : Alachlor 50 EC @ 1250 g a.i. ha ⁻¹ as PE fb intercultivation at 20-25 DAS fb hand weeding at 35-40 DAS.	1264	2156
T ₇ : Alachlor 50 EC @ 1250 g a.i. ha ⁻¹ as PE fb Fomesafen + Fluazifop-p-butyl @ 222 g a.i. ha ⁻¹ at 2-3 leaf stage of weeds.	843	1644
T ₈ : Fomesafen + Fluazifop-p-butyl @ 222 g a.i. ha ⁻¹ at 2-3 leaf stage of weeds fb hand weeding at 35-40 DAS.	1238	2148
S.Em±	52.0	61.3
CD (P=0.05)	158	186

DAS = Days after sowing, fb = followed by, PE = Pre-emergence

Conclusion

Various physical and chemical weed control methods tried in the experimentation during *rabi* revealed that two hand weedings at 20-25 DAS and 35-40 DAS (T₂) as well as alachlor 50 EC @ 1250 g a.i. ha⁻¹ as pre-emergence application fb intercultivation at 20-25 DAS fb hand weeding at 35-40 DAS (T₆) found superior in recording higher growth parameters and yields of chickpea.

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