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RESEARCH PAPER

Effect of chickpea (*Cicer arietinum* L.) varieties and weed management practices on quality parameters, nutrient content and uptake by crop and weed

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Abstract : A field experiment was carried out at the Navsari agricultural university, Navsari during 2011-2012 to study the effect of chickpea (*Cicer arietinum* L.) varieties and weed management practices on quality parameters, nutrient content and uptake by crop. The result indicated that significantly maximum protein content (21.35 %) and protein yield (385 kg ha^{-1}) as well as nutrient content in seed N (3.42%), P (0.72%) and K (0.87 %), in stover N (1.41 %), P (0.25 %) and K (1.42 %) and uptake of nutrient by seed N (61.65 kg ha^{-1}), P_2O (13.06 kg ha^{-1}) and K_2O (15.76 kg ha^{-1}) were recorded by treatment W_2 (Weed free upto harvest- H.W. 20, 40 and 60 DAS) as compared to unweeded (control), respectively. All varieties of chickpea found equally suitable for cultivation.

Key Words : Chickpea, Quality parameters, Nutrient content, Uptake

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INTRODUCTION

Chickpea (*Cicer arietinum* L.) is an important pulse crop of India. It occupies prime position among pulses by virtue of its short growth period, huge tonnage capacity and outstanding nutrient value as food, feed, and forage. Weed competition for qualitative growth and nutrient in general and for nitrogen in particular has been reported to be most serious factor in limiting the crop yield reported from crop weed competition studies in chickpea, weeds removed 132.2 kg nitrogen, 17.6 kg phosphours and 130.1 kg potassium/ha in unweeded control, whereas the crop could utilize only 12.4 kg nitrogen, 5.3 kg phosphours and 10.3 kg potassium/ha (Kumar, 1985). Fertilizers being warrent their judicious use for obtaining maximum efficiency. Control of weeds can increase fertilizer use efficiency of the crop by way of checking wasteful removal of nutrients by weeds. The present investigation, was, therefore, carried out to study the effect of various weed management practices such as manual weeding, chemical weeding and cultural practices in chickpea on protein and nutrient utilization by the crop and associated weeds.

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MATERIAL AND METHODS

A field experiment was conducted during *Rabi* season of 2011-2012 at the College Farm, Navsari Agricultural University, Navsari entitled response of chickpea (*Cicer arietinum* L.) cultivars to weed management practices under South Gujarat conditions. The soil of the experimental field was clayey in texture, low in available nitrogen (254.00 kg ha^{-1}), medium in available phosphorus (P_2O) (32.83 kg ha^{-1}) and fairly rich in available potash (K_2O) (349.00 kg ha^{-1}).

Eighteen treatment combinations consisting of three varieties *viz.*, Dahod yellow (V_1), GG-2 (V_2) and BGD-72 (V_3) and six weed management treatments *viz.*, unweeded control (W_1), weed free upto harvest (H.W. at 20, 40 and 60 DAS) (W_2), pendimethalin @ 1.00 kg ha^{-1} (W_3), pendimethalin @ 0.75 kg ha^{-1} + 1 H.W. at 45 DAS (W_4), imazythapyr @ 0.1 kg ha^{-1} at 15 DAS (W_5), and quizalofop-p-ethyl @ 0.05 kg ha at 15 DAS (W_6) were tested by employing Factorial Randomized Block Design (FRBD) with three replications. Chickpea varieties were sown at 30 cm apart from rows during third week of October. The crop was fertilized with recommend dose of 25-50-0 kg NPK/ha. Herbicide spraying was done through a flat fan nozzle attached with the hood of sprayer. Depletion of nutrient elements (nitrogen, phosphorus and potassium) by weed and crop was worked out on the basis of concentration of weeds and final grain and haulm yield of the crop.

RESULTS AND DISCUSSION

The experimental field was infested by predominant monocot weeds *viz.*, *Echinochloa crusgalli* (L.) Beauv, *Digitaria sanguinalis* (L.) Scop., *Sorghum halepense* (L.) Pers., *Cynodon dactylon* (L.) Pers. and *Bracharia* spp., dicot weeds, *viz.*, *Amaranthus viridis* L., *Alternanthera sessilis*, *Digera arvensis* Forsk, *Convolvulus arvensis* L., *Trianthema portulacastrum*, *Euphorbia hirta* L., *Euphorbia maduraspiensis* and *Physalis minima* L. and sedges *Cyperus rotundus* L. were predominantly present in unweeded control plot during the course of experimentation.

The results (Table 1) revealed that various weed management practices significantly influenced the protein content and protein yield of chickpea. The higher protein content (21.35 %) was noted under treatment W_2 (Weed free upto harvest- H.W. 20, 40 and 60 DAS) being at

Table 1 : Protein content in seed (%), protein yield (kg ha^{-1}), seed yield (kg/ha) and dry weight of weeds as influenced by various treatments in chickpea

Treatments	Protein content in seed (%)	Protein yield (kg ha^{-1})	Seed yield (kg/ha^{-1})	Dry weight of weeds (kg/ha)	
				60 DAS (kg/ha^{-1})	At harvest (kg/ha^{-1})
Varieties (V)					
V_1 = Dahod yellow	19.98	309	1534	19.33	24.35 (593.17)
V_2 = GG-2	20.31	324	1585	18.93	23.81 (567.17)
V_3 = BGD-72	20.18	316	1545	19.17	24.15 (583.33)
S.E. ±	0.31	6.90	41	12.88	14.50
C.D. (P=0.05)	NS	NS	NS	NS	NS
Weed management (W)					
W_1 = Unweeded control	18.31	209	1140	26.13	31.39 (985.67)
W_2 = Weed free up to harvest (H.W. 20, 40 and 60 DAS)	21.35	385	1804	10.14	16.15 (261.00)
W_3 = Pendimethalin @ 1.00 kg/ha (PE)	20.44	343	1680	15.15	20.40 (416.33)
W_4 = Pendimethalin @ 0.75 kg/ha (PE) +1 H.W. at 45 DAS	20.94	360	1720	12.91	17.67 (312.33)
W_5 = Imazethapyr @ 0.1 kg/ha at 15 DAS	19.77	289	1461	23.62	27.67 (765.67)
W_6 = Quizalofop-p-ethyl @ 0.05 kg/ha at 15 DAS	20.07	311	1545	21.43	26.19 (686.33)
S.E. ±	0.43	9.75	57.99	18.22	20.50
C.D. (P=0.05)	1.25	28.02	166.63	52.36	58.91
Interaction					
V × W	NS	NS	NS	NS	NS
C. V. %	6.47	9.25	11.16	14.91	10.58

H.W. = Hand weeding; H.H. = Hand hoeing; DAS = Days after sowing; NS=Non-significant; Data of weed dry weight are after √x transformed value, the data in parentheses indicate original value

par with W_4 (pendimethalin @ 0.75 kg ha^{-1} + H.W. at 45 DAS) and W_3 (pendimethalin @ 1.00 kg ha^{-1}). While significantly the lowest protein content was observed in W_1 (unweeded control). Significantly higher protein yield was recorded under treatment W_2 (weed free upto harvest- H.W. 20, 40 and 60 DAS) being at par with W_4 (pendimethalin @ 0.75 kg ha^{-1} + H.W. at 45 DAS) than unweeded control. The increase in protein content and yield with these treatments might be due to better nourishment reputed from effective reduction in

Table 2 : N, P and K content (%) by seed and stover of chickpea and weeds as influenced by various treatments

Treatments	Chickpea seed			Chickpea stover			Weeds		
	N	P	K	N	P	K	N	P	K
Varieties (V)									
V_1 = Dahod yellow	3.20	0.60	0.75	1.25	0.20	1.29	1.40	0.26	1.63
V_2 = GG-2	3.25	0.63	0.77	1.29	0.21	1.30	1.37	0.25	1.61
V_3 = BGD-72	3.23	0.61	0.76	1.26	0.20	1.29	1.38	0.24	1.62
S.E. ±	0.03	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.03
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Weed management (W)									
W_1 =Unweeded control	2.93	0.43	0.66	1.04	0.14	1.20	1.81	0.36	1.81
W_2 =Weed free up to harvest (H.W. 20, 40 and 60 DAS)	3.42	0.72	0.87	1.41	0.25	1.42	0.82	0.17	1.23
W_3 =Pendimethalin @ 1.00 kg/ha (PE)	3.27	0.66	0.79	1.31	0.21	1.30	1.35	0.23	1.62
W_4 = Pendimethalin @ 0.75 kg/ha (PE) +1 H.W. at 45 DAS	3.35	0.69	0.81	1.35	0.23	1.33	1.33	0.20	1.58
W_5 = Imazethapyr @ 0.1 kg/ha at 15 DAS	3.16	0.57	0.71	1.22	0.19	1.25	1.52	0.28	1.72
W_6 =Quizalofop-p-ethyl @ 0.05 kg/ha at 15 DAS	3.22	0.60	0.72	1.28	0.20	1.27	1.48	0.25	1.75
S.E. ±	0.05	0.01	0.02	0.03	0.01	0.03	0.03	0.01	0.04
C.D. (P=0.05)	0.14	0.04	0.06	0.08	0.02	0.09	0.09	0.02	0.12
Interaction									
V × W	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. (%)	4.47	7.30	8.70	6.85	9.95	7.19	6.97	9.89	7.54

NS = Non-significant, HW = Hand weeding, PE = Pre emergence DAS = Days after sowing.

Table 3 : N, P and K uptake (kg ha^{-1}) by seed and stover of chickpea and weeds as influenced by various treatments

Treatments	Chickpea seed			Chiakpea stover			Weeds		
	N	P	K	N	P	K	N	P	K
Varieties									
V_1 = Dahod yellow	49.57	9.32	11.66	29.45	4.65	30.15	9.23	1.66	10.22
V_2 = GG-2	51.86	10.14	12.38	32.04	4.97	32.12	8.67	1.51	9.69
V_3 = BG-72	50.55	9.66	11.95	30.30	4.84	30.93	8.97	1.55	9.97
S.E. ±	0.99	0.25	0.27	0.99	0.16	0.88	0.30	0.06	0.31
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Weed management (W)									
W_1 = Unweeded control	33.43	4.95	7.49	20.19	2.67	23.21	17.84	3.52	17.87
W_2 = Weed free up to harvest (H.W.20, 40 and 60 DAS)	61.65	13.06	15.76	39.15	6.82	39.42	3.46	0.49	3.99
W_3 = Pendimethalin @ 1.00 kg/ha (PE)	54.94	11.15	13.22	34.19	5.21	33.75	5.62	0.93	6.76
W_4 = Pendimethalin @ 0.75 kg/ha (PE) +1 H.W. at 45 DAS	57.96	11.58	13.99	36.00	5.81	35.46	5.03	0.77	5.93
W_5 = Imazethapyr @ 0.1 kg/ha at 15 DAS	46.22	8.28	10.33	25.95	4.00	26.58	11.67	1.89	13.17
W_6 = Quizalofop-p-ethyl @ 0.05 kg/ha at 15 DAS	49.77	9.22	11.18	28.11	4.43	27.96	10.14	1.85	12.03
S.E. ±	1.40	0.36	0.39	1.40	0.23	1.25	0.43	0.08	0.43
C.D. (P=0.05)	4.01	1.03	1.11	4.01	0.67	3.60	1.23	0.24	1.25
Interaction									
V × W	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	8.27	11.13	9.69	13.70	14.41	12.08	14.36	15.78	13.09

NS = Non-significant, HW = Hand weeding, PE = Pre emergence DAS = Days after sowing

competition reflected in higher protein content in seed and their yield under respective weed management treatments. Similar findings were also reported by Balyan (1987); Gediya *et al.* (1989); Lalakiya (1990) and Chauhan (2000).

W_2 (weed free upto harvest- H.W. 20, 40 and 60 DAS) recorded significantly the highest content and uptake of major nutrients *i.e.* N, P and K but it remained at par with treatment W_4 (pendimethalin @ 0.75 kg ha^{-1} + H.W. at 45 DAS) in nitrogen, phosphorus and potassium content and nitrogen uptake by seed and stover. This might be due to better development of crop and lesser crop weed competition. Further, the higher dry matter production (seed and stover) of crop under these treatments boosted the nutrient content and uptake. These results are in line with those reported by Singh *et al.* (2004); Vengris *et al.* (1953); Gediya *et al.* (1989); Balyan (1987); Bhutada *et al.* (2014); Lalakiya (1990) and Chauhan (2000).

Significantly the highest removal of major nutrients by weeds were registered under W_1 (unweeded control) (Table 2 and 3), whereas significantly the lowest nutrient depletion was noted under treatment W_2 (weed free upto harvest-H.W.20, 40 and 60 DAS.) in content and uptake of major nutrients *i.e.* N, P and K. This might be due to reduced crop weed competition under these treatments which resulted in lesser dry matter production by weeds and ultimately nutrient content and uptake. Similar results were also reported by Singh *et al.* (2004); Legere *et al.* (1989); Nath *et al.* (2012) and Vengris *et al.* (1953) in chickpea crop.

The results clearly indicated that effective weed management under W_2, W_3 and W_4 resulted in minimum depletion of nutrients by weeds and maximum content and uptake by chickpea crop, which reflected in better growth and development ultimately higher seed and stover yield of chickpea crop. The results concluded that higher profitable and qualitative yield of chickpea on *Vertisols* of South Gujarat can be obtained by using either Dahod yellow, GG-2 or BGD-72 variety of chickpea and by keeping them weed free by hand weeding at 20, 40 and 60 DAS interval or by pre-emergence application of pendimethalin @ 0.75 kg ha^{-1} coupled with one hand hoeing at 45 days after sowing.

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