International Archive of Applied Sciences and Technology
Int. Arch. App. Sci. Technol; Vol 11 [3] September 2020 : 91-97
© 2020 Society of Education, India
[ISO9001: 2008 Certified Organization]
www.soeagra.com/iaast.html

IAAST
ONLINE ISSN 2277- 1565
PRINT ISSN 0976 - 4828

CODEN: IAASCA **ORIGINAL ARTICLE**

DOI: .10.15515/iaast.0976-4828.11.3.9197

Efficacy of Different Herbicides On Yield And Nutrient Uptake Of Chickpea (*Cicer arietinum* L.)

Naveen Kumar, Santosh Kumar and Sushampreet Sharma
Department of Agriculture (Agronomy), Mata gujri College, Fatehgarh Sahib, Punjab
Email: chnaveenkulria@gmail.com

ABSTRACT
The present research "Efficacy of different herbicides on yield and nutrient uptake of chickpea (Cicer arietinum L.)"was conducted at Experimental Farm, Department of Agriculture, Mata Gujri College, Fatehgargh Sahib during rabi season of 2017-18,2018-19. The experiment was laid out in Randomized Block Design with tentreatment and replicated thrice. Among herbicidal treatments, maximum yield was recorded in T_5- pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POEwhich was statistically at par with T_7- pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE and T_6- oxyflourfen @ 125 g/ha as PRE + quizalofop @ 60 g/ha as POE. In case ofnutrient uptake by crop, the highestuptake was observedin T_5- pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POE which wasstatistically at par with T_7- pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE and T_6- oxyflourfen @ 125 g/ha as PRE + quizalofop @ 60 g/ha as POE and superior to rest of the treatments.In case ofnutrient depletionby weeds, the lowest depletion was observed in T_5- pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POEwhich was statistically at par with T_7- pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE and T_6 -oxyflourfen @ 125 g/ha as PRE + quizalofop @ 60 g/ha as POE and inferior to rest of the treatments during both the years.Weedfree recorded significantly higher nutrient uptake and and yields over rest of the treatments.
KEYWORDS: *Chickpea (bengal gram),Herbicide, Nutrient depletion, Weed, Yield*

Received 25.05.2019 Revised 22.06.2019 Accepted 11.07.2019

CITATION OF THIS ARTICLE
Naveen Kumar, Santosh Kumar and Sushampreet Sharma. Efficacy of Different Herbicides On Yield And Nutrient Uptake Of Chickpea (*Cicer arietinum* L.). Int. Arch. App. Sci. Technol; Vol 11 [3] September 2020: 91-97

INTRODUCTION

The botanical name of Chickpea is *Cicer arietinum* L. occupies prime position among pulses by virtue of its short growth period, huge tonnage capacity and outstanding nutrient value as food, feed and forage. It is commonly known as 'gram' or 'bengal gram' and locally known as 'chana' is belonging to family 'Leguminosae'. It is an important and unique food legume, because of people consume it as processed whole seed (boiled, roasted, parched, fried, steamed and sprouted), dal and besan, while unripe grains eaten as a raw snack ([10]. It is also considered to have some medicinal effects and used for blood purification. Chickpea is known for high source of protein (21.1%), carbohydrate (61.5%), fat (4.5%), minerals and vitamins. Among important minerals, phosphorus (340 mg), iron (7mg) and zinc (3 mg/100g) are present [10]. According to FAO [4] chickpea is the third most important pulse crop in the world after french bean and field peas. Leading countries in area and production of chickpea are Pakistan, Turkey, Mexico, Canada and Australia. India is the major producing country for chickpea. It alone has nearly 52.5 % of the world acreage and production of chickpea. Weed competition for qualitative growth and development concurring with depletion of nutrient is the major concerns that limiting the crop yield [3]. This is a short stature crop with slow initial growth and therefore, heavily infested with wide spectrum of weeds. The prevalence of monocot weed were found with relative density of

68.2% as compared to dicot weeds (24.2%). Among the monocots, *Cyperus rotundus* had the highest relative density (33.1%) followed by *Cynodondactylon* (27.8 %), while among dicots *Launea pinnatifolia* registered the highest relative density of 13.3% followed by *Chenopodim album* (6.0%) and *Anagallisa rvensis*(4.8%) [9]. Chickpea is an important crop of *rabi* crop besides limited moisture crop has to compete with weeds. Timely weed management practices play an important role in the successful cultivation of the crop. Chickpea suffers severely due to competition stress of weeds with yield reduction to the tune of 20 to 49.5 % depending on nature and density of weeds. Weed infestation is one of the major limiting factors in the productivity of the crops both under rainfed and irrigated situations. On an average, the reduction in crop yield to the tune of 20-40% has been reported in weed infested crops which calls for effective weed control measures. Control of weeds is vitally important not only to check the losses, caused by them but also to increase the fertilizer use efficiency. The lowest uptake of nutrients by weed observed in treatments T_{10}-2 hand hoeing at 15 and 40 DAS + 1 hand weeding at 30 DASfollowed by T_8 - pendimethalin @ 1000 g ha PE + 1 at 40DAS, whichmay be due to lowest weed count [2].

MATERIALS AND METHODS

The experiment was carried out at Experimental Farm, Department of Agriculture, Mata Gujri College, Shamsher Nagar, Fatehgarh Sahib, Punjab, during *rabi* season of two consecutive years (2017-18 and 2018-19). The experiment was laid out in Randomized Block Design with tentreatment and replicated thrice.The treatments details are T_1 - weedy check, T_2 - weed free, T_3 - pendimethalin @ 1 kg/ha as PRE, T_4- oxyflourfen @ 125 g/ha as PRE, T_5 - pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POE, T_6 - oxyflourfen @ 125 g/ha as PRE + quizalofo @ 60 g/ha as POE, T_7 - pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE, T_8 - oxyflourfen @ 125 g/ha as PRE + imazethapyr @ 40 g/ha as POE, T_9 -quizalofop @ 60 g/ha as POE, T_{10} - imazethapyr @ 40 g/ha as POE. The soil of experimental site was clay loam in texture with low organic carbon (0.79 %) andmedium in nitrogen (340kg/ha), phosphorus (16.75 kg/ha) and potassium (174kg/ha). The chickpea variety PBG-7 was used. The seed rate of 50 kg/hain chickpea was used and sowing was done in line with 30 × 10 cm^2 spacing in 2.7 × 2.5 m^2 gross plot size on November 09, 2017 and 2018. Crop was raised with recommended package of practices for the region. A basal dose of 15 kg N and 20 kg P_2O_5/hawere drilled uniformly before sowing through urea and diammonium phosphate, respectively in individual plot at the depth of 7 to 8 m below the seed. Herbicides were applied as per treatments with hand sprayer fitted with flat fan nozzle and the spray volume was 500 litters/ha.After sowing of the crop, one irrigation was applied at pod fillingstage for proper growth and development during the growing season Data on weed dry matter was recorded from an area enclosed in the quadrate of 0.5m^2 randomly throwntwo places per plot and then converted into per square meter. The data on weeds were subjected to square root transformation. Weed species were separately counted from each sample and their density was recorded as average number/m^2. Oven dry weight of weeds was recorded at 65°C for 48 hours and expressed as dry matter accumulation/m^2. Crop was harvested when pod began to turn yellow and leaf start shedding on 6 April during both the years. Crop was sun dried and biological yield were recorded separately for each treatment. Data collected on various parameters were analyzed statistically for valid conclusion.

RESULTS AND DISCUSSION

Weed flora

The major weeds in experimental crop were *Melilotus alba*, *Chenopodium album*, *Cynodon dactylon*, *Phalaris minor,Phylanthus niruri, Portulaca oleracea, Digera arvensis,* and *Anagallis arvensis* during both the years of study. Similar weed species in chickpea during winter season also reported by Gupta *et al.* (2012)[5] and Butter *et al.* (2008)[1]. Rathod *et al.* (2017)[8] conducted trial in two consecutive years at Gulbarga (Karnataka) to study the dominated weed flora in chickpea. They reported that *Panicum* spp. and *Cynodon dactylon* among grasses, *Cyperusrotundus* among sedges and *Amaranthesviridis*, *Physalis minima*, *Chrozophora rottleri*, *Phyllanthus niruri*, *Aristolochia bracteata*, *Trianthema portulacastrum*, *Portulaca oleracea* and *Digera arvensis* among broad leaf weeds were highly infested the field.

Effect of different herbicides on yield and harvest index

Significantly improvement in yield attributing characters due to employed herbicide under particular treatment significantly increases seed yield and stover yield of chickpea. The various treatmentswere influenced significantly on crop (Table 1). The maximum seed yield, stover yield and biological yield was observed in T_5 - pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POE which was at par with T_7 - pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE and T_6 - oxyflourfen @ 125 g/ha as PRE + quizalofo @ 60 g/ha as POE. However, the maximum harvest index was recorded in T_5 - pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POE.This was due toeffective control of weeds by thistreatment which resulting into better plant growth due to less competition regarding nutrient, space, CO_2 etc.In these treatments higher nutrient availability to crop and finally highestseed and straw yield. The results are corroborated with the research finding of Gupta *et al.* [5], Singh *et al.*[11] and Yadav *et al.*[12].

Table1.Efficacyof Different Herbicides on crop yield and harvest index

Treatments	Seed yield (q/ha)		Stover yield (q/ha)		Biological yield (q/ha)		Harvest index (%)	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1 - Weedy check	10.17	11.49	15.54	17.95	25.71	29.44	39.33	39.15
T_2 - Weed free	22.67	23.54	27.50	30.43	50.17	53.96	45.19	43.73
T_3 - Pendimethalin @ 1 kg/ha as PRE	14.19	15.29	18.10	21.86	32.29	37.15	43.94	41.26
T_4 - Oxyflourfen @ 125 g/ha as PRE	13.87	14.72	17.71	21.65	31.58	36.37	44.34	40.45
T_5 - Pendimethalin @ 1 kg/ha as PRE + Quizalofop @ 60 g/ha as POE	21.74	22.73	25.80	27.72	47.54	50.45	45.66	45.13
T_6 - Oxyflourfen @ 125 g/ha as PRE + Quizalofop @ 60 g/ha as POE	19.85	20.97	24.32	25.96	44.17	46.93	44.88	44.44
T_7 - Pendimethalin @ 1 kg/ha as PRE + Imazethapyr @ 40 g/ha as POE	20.29	21.54	24.63	26.46	44.92	48.00	45.14	44.76
T_8 - Oxyflourfen @ 125 g/ha as PRE + Imazethapyr @ 40 g/ha as POE	15.88	16.86	21.58	23.32	37.47	40.18	42.39	41.97
T_9 - Quizalofop @ 60 g/ha as POE	15.45	16.54	20.27	23.06	35.72	39.60	43.27	41.70
T_{10} - Imazethapyr @ 40 g/ha as POE	14.80	15.75	19.54	22.60	34.34	38.36	42.91	41.10
Sem ±	1.14	1.22	1.23	1.33	1.70	1.67	2.42	2.32
CD @ 5%	3.38	3.64	3.65	3.96	5.05	4.96	NS	NS

Effect of different herbicides on nutrient content by crop

Nutrient content in seed and stover was non significantly affected by different herbicide treatmentsas shown in Table 2. The maximum nutrient content was observed in T_5 - pendimethalin @ 1 kg/ha as PRE+ quizalofop @ 60 g/ha as POE followed by T_7 - pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE. This is due to more availability of nutrient to crop. The similar result was reported byreported by Bhutada and Bhale [2].

Table2. Efficacy of different herbicides on N, P, K content (%)in chickpea crop

Treatments	N content in seed		N content in stover		P content in seed		P content in stover		K content in stover		K content in stover	
	2017-18	2018-19	2017-18	2017-18	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1 - Weedy check	2.92	3.08	0.43	0.18	0.43	0.44	0.18	0.20	0.80	0.81	0.99	1.01
T_2 - Weed free	3.94	3.95	0.69	0.34	0.69	0.68	0.34	0.35	1.18	1.20	1.39	1.41
T_3 - Pendimethalin @ 1 kg/ha as PRE	3.31	3.32	0.48	0.23	0.48	0.49	0.23	0.24	0.87	0.88	1.14	1.16
T_4 - Oxyflourfen @ 125 g/ha as PRE	3.22	3.23	0.46	0.22	0.46	0.47	0.22	0.23	0.84	0.85	1.13	1.15
T_5 - Pendimethalin @ 1 kg/ha as PRE + Quizalofop @ 60 g/ha as POE	3.66	3.68	0.67	0.33	0.67	0.68	0.33	0.35	1.18	1.19	1.34	1.36
T_6 - Oxyflourfen @ 125 g/ha as PRE + Quizalofop @ 60 g/ha as POE	3.51	3.60	0.58	0.29	0.58	0.60	0.29	0.30	1.03	1.05	1.23	1.24
T_7 - Pendimethalin @ 1 kg/ha as PRE + Imazethapyr @ 40 g/ha as POE	3.59	3.65	0.64	0.32	0.64	0.65	0.32	0.33	1.16	1.17	1.25	1.26
T_8 - Oxyflourfen @ 125 g/ha as PRE + Imazethapyr @ 40 g/ha as POE	3.29	3.28	0.51	0.28	0.51	0.52	0.28	0.29	0.97	1.01	1.20	1.22
T_9 - Quizalofop @ 60 g/ha as POE	3.26	3.26	0.50	0.28	0.50	0.50	0.28	0.29	0.97	1.01	1.18	1.20
T_{10} - Imazethapyr @ 40 g/ha as POE	3.19	3.21	0.49	0.28	0.49	0.50	0.28	0.29	0.94	0.95	1.17	1.20
Sem ±	0.27	0.24	0.06	0.03	0.06	0.06	0.03	0.03	0.11	0.10	0.12	0.09
CD @ 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Effect of different herbicides on nutrient uptake by crop and depletion by weeds

Nutrient uptake by seed and stover was significantly affected by different herbicides (Table 3 and 4). Maximum nutrient uptake by seed and stover was recorded in T_5 - pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POE which was at par with T_7 - pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE and T_6 - oxyflourfen @ 125 g/ha as PRE + quizalofo @ 60 g/ha as POE. Significantly lowest nutrient depletion by weeds was recorded in T_5 - pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POE which was at par with T_7 - pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE and T_6 -

oxyflourfen @ 125 g/ha as PRE + quizalofo @ 60 g/ha as POE.It can be explained in the light of the facts that these treatments controlled the weeds effectively, might be made more nutrients available to crop and consequently encouraged higher concentration of nutrients and more yield and thereby higher uptake of nutrients by crop. These findings corroborate with the reports of Mani [7] and Kaur *et al.* [6].

Table 3. Efficacy of different herbicides on N, P, uptake (kg/ha) in chickpea crop

Treatments	N uptake by seed		N uptake by stover		Total N uptake by crop		P uptake by seed		P uptake by stover		Total P uptake by crop	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1 - Weedy check	30.27	35.45	17.60	20.44	47.87	55.89	4.61	5.10	2.74	3.63	7.34	8.72
T_2 - Weed free	89.47	92.79	44.86	49.66	134.33	142.45	15.67	15.93	9.38	10.73	25.05	26.65
T_3 - Pendimethalin @ 1 kg/ha as PRE	46.52	50.46	24.73	30.33	71.26	80.79	6.89	7.51	4.19	5.31	11.08	12.82
T_4 - Oxyflourfen @ 125 g/ha as PRE	44.41	47.77	23.03	28.77	67.45	76.53	6.41	6.91	3.98	4.96	10.39	11.87
T_5 - Pendimethalin @ 1 kg/ha as PRE + Quizalofop @ 60 g/ha as POE	79.28	83.42	40.72	44.09	120.01	127.51	14.62	15.51	8.60	9.86	23.22	25.37
T_6 - Oxyflourfen @ 125 g/ha as PRE + Quizalofop @ 60 g/ha as POE	69.53	75.59	37.62	40.50	107.15	116.09	11.45	12.48	7.14	7.82	18.60	20.30
T_7 - Pendimethalin @ 1 kg/ha as PRE + Imazethapyr @ 40 g/ha as POE	72.93	79.03	38.51	41.84	111.44	120.87	12.89	13.84	7.77	8.55	20.66	22.40
T_8 - Oxyflourfen @ 125 g/ha as PRE + Imazethapyr @ 40 g/ha as POE	52.40	55.64	31.20	34.00	83.59	89.64	8.19	8.72	6.02	6.89	14.21	15.61
T_9 - Quizalofop @ 60 g/ha as POE	50.65	54.48	29.02	32.95	79.67	87.43	7.88	8.40	5.69	6.64	13.57	15.04
T_{10} - Imazethapyr @ 40 g/ha as POE	47.36	50.40	27.26	31.81	74.61	82.21	7.49	7.88	5.47	6.56	12.96	14.44
Sem ±	6.36	6.74	2.81	2.90	7.20	8.49	1.31	1.13	0.87	0.93	1.51	1.53
CD @ 5%	18.89	20.02	8.35	8.62	21.38	25.22	3.88	3.36	2.57	2.76	4.47	4.54

Table 4. Efficacy of different herbicides on Kuptake by crop and N, P, K depletion (kg/ha)by weed

Treatments	K uptake by seed		K uptake by stover		Total K uptake by crop		N uptake by weed		P uptake by weed		K uptake by weed	
	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1 - Weedy check	8.08	9.24	15.25	18.22	23.33	27.47	12.91	12.34	3.20	2.96	8.11	7.97
T_2 - Weed free	26.77	28.25	38.59	43.43	65.36	71.68	0.00	0.00	0.00	0.00	0.00	0.00
T_3 - Pendimethalin @ 1 kg/ha as PRE	12.48	13.54	20.43	25.64	32.90	39.17	5.86	5.60	1.23	1.12	3.67	3.33
T_4 - Oxyflourfen @ 125 g/ha as PRE	11.47	12.43	20.13	24.82	31.60	37.24	7.43	7.29	1.79	1.68	4.67	4.28
T_5 - Pendimethalin @ 1 kg/ha as PRE + Quizalofop @ 60 g/ha as POE	25.69	27.12	34.47	37.79	60.16	64.91	1.27	1.07	0.16	0.12	0.75	0.63
T_6 - Oxyflourfen @ 125 g/ha as PRE + Quizalofop @ 60 g/ha as POE	20.63	21.89	29.87	32.16	50.50	54.04	1.91	1.77	0.33	0.30	1.21	1.15
T_7 - Pendimethalin @ 1 kg/ha as PRE + Imazethapyr @ 40 g/ha as POE	23.40	24.83	30.70	33.28	54.10	58.11	1.72	1.49	0.24	0.18	1.05	0.93
T_8 - Oxyflourfen @ 125 g/ha as PRE + Imazethapyr @ 40 g/ha as POE	15.15	17.15	25.87	28.33	41.02	45.48	3.34	3.16	0.60	0.50	2.07	1.95
T_9 - Quizalofop @ 60 g/ha as POE	14.80	16.49	24.09	27.50	38.90	43.99	4.58	4.45	0.85	0.73	2.89	2.70
T_{10} - Imazethapyr @ 40 g/ha as POE	13.77	15.08	22.71	26.95	36.48	42.03	5.02	4.91	0.99	0.86	3.16	2.98
SEm ±	1.91	1.82	3.16	2.95	3.48	2.89	0.58	0.58	0.10	0.11	0.36	0.28
CD @ 5%	5.68	5.40	9.40	8.77	10.34	8.59	1.71	1.73	0.31	0.34	1.07	0.82

CONCLUSION

Weed management treatments showed significantly profound effecton crop yield and nutrient uptake by crop and weeds during both the years. Among weed management, Application of pendimethalin @ 1 kg/ha as PRE + quizalofop @ 60 g/ha as POE as pre and

post-emergence showed significantly lowest nutrient depletion by weeds, highest nutrient uptake by crop and highest crop yield and the second-best treatment was pendimethalin @ 1 kg/ha as PRE + imazethapyr @ 40 g/ha as POE.

REFERENCES

1. Buttar GS, Aggarwal N and Singh S. (2008). Efficacy of different herbicides in chickpea under irrigated condition of Punjab. *Indian Journal of Weed Science***40**: 169-171.
2. Bhutada P O and Bhale V M. (2015). Effect of herbicides and cultural practices on nutrient uptake by chickpea and weed. *Journal Crop and Weed***11**(1):232-235.
3. Chandrakar S, Sharma A and Thakur D K.(2015). Effect of chickpea (*Cicerarietinum* L.) varieties and weed management practices on quality parameters, nutrient content and uptake by crop and weed. *International Journal of Agricultural Sciences***11**(2):217-220.
4. FAO. (2016). FAOSTAT production statistics. Food and agriculture organization, Rome.
5. Gupta V, Singh BN, Kumar J, Singh M and Jamwal BS. (2012). Effect of imazethapyr on weed control and yield in chickpea under Kandi belt of low altitude sub-tropical zone of Jammu. *Madras Agriculture Journal***99**:81-86.
6. Kaur R, Sharma B C, Kumar A and Kaur P. (2013.) Nutrient uptake by chickpea + mustard intercropping system as influenced by weed management. *Indian Journal of Weed Science***45**(3): 183-188.
7. Mani V S, Malla M C, Gautam K C and Bhagwandas. (1975). Weed Killing chemicals in potato cultivars. *Indian Farming* **32**(8): 17-18.
8. Rathod P S, Patil D H and Dodamani B M. (2017). Evaluation of time and dose of imazethapyr in controlling weeds of chickpea (*Cicerarietinum* L.). *Legume Research***40**(5):906-910.
9. Singh A and Jain N. (2017). Integrated weed management in chickpea. *Indian Journal of Weed Science***49**(1): 93-94.
10. Singh C, Singh P and Singh S. (2012). *Modern techniques of raising field crops*. 2nd *Edition*. Oxford & INB Publishing Company Pvt. Ltd. 113-B shahpurJat, Asian Games Village side, New Delhi, India.
11. Singh R P, Verma S K and Singh R K. (2016). Effects of herbicides on growth and yield of *Cicerarietinum*L. under rainfed condition. *Bangladesh Journal of Botany***45**(2): 305-311.
12. Yadav V L, Shukla U N, Raiger P R and Mandiwal M. (2019). Efficacy of pre and post-emergence herbicides on growth and yield of chickpea (*Cicerarietinum* L.) *Indian Journal of Agricultural Research* (53): 112-115.