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Effect of Pre and Post Emergence Herbicide on Chickpea Crop Production

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A B S T R A C T

A field experiment, entitled Effect of pre and post Emergence herbicide 0n Chickpea Crop Production was conducted at the Research Farm, Department of Agronomy, SAGE University, Indore (M.P.), during *rabi* 2019-20 The experiment was laid out in randomized block design with three replication having10 treatments [T_1 : Metribuzin 250 g/ha as PE, T_2 : Metribuzin 250 g/ha as PE + one hand weeding at 40 DAS, T_3 : Quizalofop-p-ethyle 40g/ha as PoE, T_4 : Quizalofop-p-ethyle 40g/ha (PoE) + one hand weeding at 40 DAS, T_5 : Oxyfluorfen 250 g/haas PE, T_6 : Oxyfluorfen 250 g/haas PE + one hand weeding at 40 DAS, T_7 : Stale seed bed followed by one hand weeding at 40 DAS, T_8 : Straw mulching (5cm) at 5 DAS, T_9: Two Hand weeding at 20 and 40 DAS, T_{10}: Control plot]. Chickpea variety "JG-130"(bold seed) 80 kg/ha was sown the with spacing 30 x 10 cm^2 apart. The recommended dose of fertilizer applied as basal 20:60:20 kg/ha, NPK through Urea, SSP and MOP. The crop was sown on 18thnov2018. and harvested on.30thmarch2019The results revealed that two hand weeding at 20 and 40 DAS produced maximum plant height, branches and no of nodules yield attributing characters, seed and stover yield kg/ha (2383 and 2193), protein content (20.14%) in seed and protein yield (480.08 kg/ha) followed by Quizalofop-p-ethyle 40g/ha as PoE+ one hand weeding at 40 DAS Net monetary returns (Rs. 69775/ha) and B:C ratio (3.5) was also found significantly, and two hand weeding at 20 and 40 DAS(3.2),Stale seed bed followed by one hand weeding at 40DAS, (3.0)and Quizalofop-p-ethyle 40g/ha(PoE)[2.9]. Whereas minimum net monetary returns (Rs.22646/ha) and B:C ratio (1.9) were recorded in control treatment.

Introduction

Pulses constitute one of the most important component of human diet and major source of protein particularly for the vegetarian population. By virtue of their higher nutritive value and capacity to restore soil productivity, pulses have been an important component of sustainable cropping systems. India has the distinction of being the top producer of pulses in the world accounting 25 percent of global output. Among pulses, chickpea *(Cicer arietinum* L.*)* is one of the most important *Rabi* pulse crop of India, occupying a premier position both in area and production. Weed management is an important key factor for enhancing the productivity of chickpea. Moreover, besides low yield of crop, weeds increase production cost, harbour insect-pest

and diseases, decreases quality of farm produce, reduce land value leading to reduction in crop production. But amongst the various factors, weed stand first in ranking the aim of Chemical weed management should be to minimize weed population at a manageable level. Timely control of weeds is essential to get higher yields. In this way Chemical weed management approach is advantageous because, one technique rarely achieve complete, long and effective control of all weeds during crop season and even a relatively few surviving weeds can produce sufficient number of seeds to perpetuate the species.

Chickpea, the world's third most important food legume, is used in salad and to cook various dishes. It is a good source of zinc and protein. The yield of chickpea has fallen due to various production constraints such as biotic and abiotic factors. Biotic constraints wilt, dry root rot and blight are the major. In addition to that the weeds also contributed major loss in yield by competing for space, nutrients, water and light. Chickpea is poor competitor to weeds because of slow growth rate and limited leaf development at early stage of crop growth and establishment, if weed management is neglected under these conditions, resulting in yield loss of 40 to 87per cent. Chickpea is generally grown on marginal and sub marginal soils under rainfed conditions with low inputs (Solh and Pala, 1990). The information on weed management in Krishna zone is negligible. Hence, this investigation was taken with an objective to find out most suitable Chemical weed management practice for control of weeds in chickpea. Crop - weed competition is critical during first 40 to 50 DAS (Chopra *et al.,* 2003). Generally, for the control of weeds farmers do manual weeding. But with the increase in labour cost and scarcity of labour, manual weed control has become a difficult task in chickpea, the higher cost of manual weeding and non-availability of labour during peak periods, made herbicides very useful for weed control. Pre-emergence herbicides offer weed control initially for 25 to 30 DAS. To control the weed flushes emerging later in the season, application of post emergence herbicides are necessary. The major weed flora of experimental site consisted of *Chenopodium album*, *Fumaria purviflora* and *Phalaris minor*. The other minor weed species infesting field were *Convolvulus arvensis, Anagalis arvensis, Melilotusalba, Coronopus didymus* and *Spergula arvensis.*

Materials and Methods

The present investigation, entitled "Effect pre and post emergence herbicide on chickpea crop production was carried out during the *Rabi* season of 2019-20 under the edaphic and climatic condition Indore (M.P.). The experiment was conducted on the Research Farm, SAGE University Indore (M.P.) Indore is located at $26^0$13' North latitude and $78^0$14' East longitude and 208 meter above mean sea level. It lies in northern tract of Madhya Pradesh, enjoying sub-tropical climate. The summer is hot and dry, May and June are the hottest months and their temperature varies from 37^0C to 49 ^{0}C respectively. December and January constitutes the cooler months of the year, temperature ranges from 0.6 ^{0}Cto 4.6^0C, Maximum temperature goes up to 49^0C during summer and minimum goes as low as to 0.6^0C during winter. The experiment was laid out in the randomized block design with 10 treatments and each treatment was replicated thrice. The unit plot size became 12 m2 (4 m × 3 m). Chickpea Variety JG 130 seeds were sown at the rate of 80 kg ha-1 within the furrow with 30 cm. and 10 cm. row to row and Plant to plant spacing respectively on 20th July, 2019. 20:60:20 kg NPK /ha^{-1} were applied as basal through urea, SSP and MoP respectively in all the experimental plots. The required quantity of fertilizers for

each plot was computed, weighed and placed in the furrows opened by *kudali* at the time of sowing at a depth of 4-5 cm below the seeds. Under the different treatment combination Metribuzin and Oxyfluorfen as a Post emergence herbicide and Quizalofab-p-ethyle herbicide used as Post emergence herbicide.

Results and Discussion

Density of narrow- leaved weeds, broad-leaved weeds, and sedges. Records on table- 1 showed that In the chickpea crop at 30 DAS, 60 DAS minimum population of *narrow leaved weeds* was recorded in T_9 followed by T_4, At 90 DAS The minimum population of recorded in T_7 which was at par with T_4 and at harvest stage the minimum population of recorded in T_9 although T_7 and T_4 was at par with T_9. In the chickpea field at 30 and 60 DAS minimum population of all broad leaved weeds was recorded in T_9. These results are in conformity with those obtained by Deva and kolhe (2015). Similarly at 90 DAS the minimum density of broad leaved weeds was found in T_9 (two hand weeding at 20 and 40 DAS) but statistically at par with T_7.

These results are in conformity with those obtained by Gore *et al.,* (2015). At harvest stage in the chickpea crop minimum density of broad leaved weeds was found in T_9 but statistically it was at par with T_2. Only one species of sedges was observed at 30, 60 90 DAS and harvest stage only one species of sedges was found in chickpea field *viz Cyperus rotundus.* The minimum population was recorded in. These results are in conformity with those obtained by Balwan *et al.,* (2017)and Gore *et al.*.

Dry weight of weeds (gm)

The extent of dry matter production of narrow- leaved weeds denotes the competition offered by them. Higher the dry matter production by weeds during crop growth period, greater is the competition between crop and weeds.

The yield reduction of the crop was directly related to the dry matter production of weeds rather than density of narrow leaved weeds alone. The data on dry weight of weeds at 30, 60, 90 DAS and at harvest, presented in Table.

On the basis of data presented in Table -2 At 30 DAS,60 DAS and 90 DAS the dry weight of broad leaved weeds was found significantly lower with T_9 followed by T_7, T_4, T_6 respectively at 30, 60 and 90 DAS. However significantly higher dry weight of broad leaved weeds was obtained with plot of T_{10} treatment as compared to all other treated plot. At 30, 60 and 90 DAS.

Data Presented in Table -2 and Table -3 shows that The dry weight of Narrow –leaved Weeds and sedge was recorded significantly lower with T_9 followed by T_4, However significantly higher dry weight of narrow leaved weeds and sedge was obtained with plot of T_{10} treatment as compared to all other treated plot. these results are in conformity with those obtained by Deva and kolhe (2015), Kumar *et al.,* (2010), by Kumar *et al.,* (2015), Dewangan *et al.,* (2016).At 30, 60 and 90 DAS, the dry weight of total weeds was recorded significantly lower with T_9 followed by T_7, T_4, T_7 However significantly higher dry weight of total weeds was obtained with plot of T_{10} treatment as compared to all other treated plot.

Weed biomass after harvesting (gm)-

The effect of Chemical weed management practices on weed biomass in ($kgplot^{-1}$) was recorded after harvesting and data presented in table 4 the total weed biomass production was higher it means the competition between

crop and weeds was high. The yield reduction of the crop was directly related to the weed biomass.

The weed biomass was recorded significantly lower with T_9 followed by T_4 However significantly higher weed biomass was obtained with plot of T_{10} treatment as compared to all other treated plot.

Weed control efficiency (%)

The weed control efficiency in per cent denotes the efficiency of applied herbicide or treatment affect in reducing the dry weight of weeds or weed population. It was computed by utilizing the dry matter production data of weeds on the basis of data presented in table 5- The maximum weed control efficiency was recorded in T_9 followed by T_4

Herbicide use efficiency (%)

The Herbicide use efficiency in per cent is listed in Table 5 -Herbicide use efficiency denotes the efficiency of applied herbicide in chickpea field.

The Herbicide use efficiency was recorded significantly higher with T_4 However significantly lower Herbicide use efficiency was obtained with plot of T_{10} treatment as compared to all other treated plot.

Weed persistence index(%)

Effect of Chemical weed management practices on Weed persistence index in per cent presented in Table 5 The weed persistence index was recorded significantly lower with T_9 However significantly higher weed persistence index was obtained with plot of T_{10} treatment as compared to all other treated.

Number of pods plant^{-1} and seeds/pod $^{-1}$

Records on table- 6 showed that The number of pods plant^{-1}and seeds pod $^{-1}$was recorded at harvest stage, The maximum number of pods plant^{-1}and seeds pod $^{-1}$was found on T_9 (two hand weeding at 20 and 40 DAS) followed by T_4 (quizalofop-p-ethyle 40g/ha as PoE + one hand weeding at 40 DAS) and T_7,(stale seed bed followed by one hand weeding at 40 DAS) the minimum number of pods per plant and seeds pod $^{-1}$was recorded in T_8 (straw mulching (5cm) at 5 DAS).

Yield (kgha-1) characters

A critical examination of the data Table 7 was revealed that the higher Biological yield, grain yield, Straw yield, Test Weight of 100 seed and harvest Index was recorded with the treatment T_9 where two hand weeding was done at 20 and 40 DAS.

The cumulative effect of the yield attributing characters was reflected in terms of grain yield. Control treatment recorded significantly lower seed yield (1045 kg ha^{-1}) as compared to all other treatments and it accounted for 56.15 per cent reduction when compared to two hand weeding at 20 and 40 DAS.

This might be due to higher weed density and dry matter production with the weedy check, which depleted the nutrients and moisture from soil, which were the most limiting factors of growth, yield attributing characters and yield of crop.

B: C Ratio

A critical examination of the data Table 7 was revealed that the maximum benefit cost ratio (3.5) calculated in quizalofop-p-ethyle 40gha^{-1}as PoE+ one hand weeding at 40 DAS.

Table.1 Effect of Common weed management practices on Population of narrow- leaf weeds, Broad Leaf Weeds and Sedges at 30, 60, 90 DAS and at harvest stage

Treatment	Narrow Leaf weeds				Broad Leaf Weeds				Sedges			
	30 DAS	60 DAS	30 DAS	At Harvest	90 DAS	At harvest	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
T_1 - Metribuzin 250 g ha^{-1} (PE)	5.11	5.84	5.52	3.69	2.86	3.58	3.75	4.91	6.55	5.98	4.81	3.98
T_2 - Metribuzin250 g ha^{-1} (PE) + one hand weeding at 40 DAS	4.41	4.18	4.81	3.03	2.9	3.24	3.01	4.37	6.41	4.81	4.49	3.24
T_3 - Quizalofop-p-ethyle 40gha^{-1} (PoE)	4.78	4.38	3.12	3.11	1.74	2.46	3.18	2.85	8.21	5.32	5.55	6.57
T_4 - Quizalofop-p-ethyle 40 g ha^{-1} (PoE) + one hand weeding at 40 DAS	4.85	3.11	3.03	2.64	1.76	1.74	2.47	2.24	8.27	3.52	5.12	5.21
T_5 - Oxyfluorfen 250 g ha^{-1} (PE)	6.52	9.26	4.1	5.08	3.5	2.97	5.46	3.89	7.73	6.91	5.93	4.7
T_6 - Oxyfluorfen 250 g ha^{-1} (PE) + one hand weeding at 40 DAS	6.04	6.59	4.06	3.7	3.13	2.85	5.17	3.43	7.65	6.27	4	3.97
T_7 - Stale seed bed followed by one hand weedingat 40 DAS	4.52	3.82	4.8	2.65	2.68	2.97	2.52	2.59	6.04	4.2	4.98	3.8
T_8 -Straw mulching (5cm) at 5 DAS	8.22	10.5	4.33	5.2	3.88	3.94	6.59	6.51	9.67	8.33	7.62	7.24
T_9 - Two Hand weeding at 20 and 40 DAS	1.34	1.34	2.11	2.38	2.09	1.58	2.27	1.66	2.64	1.46	3.98	2.79
T_{10} - Control plot	11.57	11.85	7.06	7.37	5.21	5.21	7.14	7.07	10.96	11.48	8.41	8.13
SEm ±	0.101	0.236	0.174	0.332	0.25	0.141	0.182	0.208	0.206	0.265	0.138	0.152
CD(P=0.05)	0.297	0.691	0.508	0.972	0.733	0.412	0.533	0.609	0.603	0.777	0.405	0.446

Table.2 Effect of Chemical weed management practices on Total dry weight of Narrow leaved weeds and broad leaved weeds (g) at 30, 60 and 90 DAS

Treatment	Narrow Leaf weeds			Broad Leaf Weeds		
	30DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T_1 - Metribuzin 250 g ha^{-1} (PE)	5.13	11.22	37.00	3.56	17.00	45.33
T_2 - Metribuzin250 g ha^{-1} (PE) + one hand weeding at 40 DAS	3.80	5.67	26.00	3.39	11.33	39.33
T_3 - Quizalofop-p-ethyle 40gha^{-1} (PoE)	4.47	6.33	29.00	5.58	12.00	60.67
T_4 - Quizalofop-p-ethyle 40 g ha^{-1} (PoE) + one hand weeding at 40 DAS	4.60	3.11	17.00	5.67	6.00	51.33
T_5 - Oxyfluorfen 250 g ha^{-1} (PE)	8.40	13.78	88.00	4.94	23.83	69.33
T_6 - Oxyfluorfen 250 g ha^{-1} (PE) + one hand weeding at 40 DAS	7.20	14.33	79.00	4.83	19.50	31.33
T_7 - Stale seed bed followed by one hand weedingat 40 DAS	4.00	4.78	18.00	3.00	8.67	48.67
T_8 -Straw mulching (5cm) at 5 DAS	13.40	37.00	129.00	7.75	33.83	115.33
T_9 - Two Hand weeding at 20 and 40 DAS	0.27	0.44	14.00	0.56	0.83	30.67
T_{10} - Control plot	26.67	46.00	152.00	9.97	63.83	140.67
SEm ±	0.042	0.271	0.381	0.054	0.183	0.197
CD(P=0.05)	0.124	0.793	1.114	0.158	0.536	0.576

Table.3 Effect of Chemical weed management practices on Total dry weight of sedges and Total weeds (g) at 30, 60 and 90 DAS

Treatment	Sedges			Dry weight of Total weeds		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T_1 - Metribuzin 250 g ha^{-1} (PE)	1.00	3.87	4.00	12.29	32.09	83.67
T_2 - Metribuzin250 g ha^{-1} (PE) + one hand weeding at 40 DAS	0.76	1.87	4.00	10.29	18.87	71.33
T_3 - Quizalofop-p-ethyle 40gha^{-1} (PoE)	0.31	1.87	1.33	12.33	20.20	89.67
T_4 - Quizalofop-p-ethyle 40 g ha^{-1} (PoE) + one hand weeding at 40 DAS	0.29	1.33	1.33	12.46	10.44	75.67
T_5 - Oxyfluorfen 250 g ha^{-1} (PE)	0.54	5.07	6.00	14.71	42.68	158.67
T_6 - Oxyfluorfen 250 g ha^{-1} (PE) + one hand weeding at 40 DAS	0.53	9.47	4.67	13.75	43.30	114.33
T_7 - Stale seed bed followed by one hand weedingat 40 DAS	0.76	1.33	3.33	9.83	14.78	68.00
T_8 -Straw mulching (5cm) at 5 DAS	0.61	5.33	7.33	22.29	76.17	249.00
T_9 - Two Hand weeding at 20 and 40 DAS	0.13	1.07	2.00	1.50	2.34	48.67
T_{10} - Control plot	1.64	10.80	13.33	37.79	121.30	306.00
SEm ±	0.024	0.282	0.170	0.063	0.258	0.312
CD(P=0.05)	0.069	0.826	0.498	0.184	0.756	0.912

Table.4 Effect of pre and post emergence herbicide on chickpea crop production practices on weed biomass at 30 DAS, 60 DAS and 90 DAS

Treatment	30 DAS	60 DAS	90 DAS
T_1 - Metribuzin 250 g ha^{-1} (PE)	12.29	32.09	83.67
T_2 - Metribuzin250 g ha^{-1} (PE) + one hand weeding at 40 DAS	10.29	18.87	71.33
T_3 - Quizalofop-p-ethyle 40gha^{-1} (PoE)	12.33	20.20	89.67
T_4 - Quizalofop-p-ethyle 40 g ha^{-1} (PoE) + one hand weeding at 40 DAS	12.46	10.44	75.67
T_5 - Oxyfluorfen 250 g ha^{-1} (PE)	14.71	42.68	158.67
T_6 - Oxyfluorfen 250 g ha^{-1} (PE) + one hand weeding at 40 DAS	13.75	43.30	114.33
T_7 - Stale seed bed followed by one hand weedingat 40 DAS	9.83	14.78	68.00
T_8 -Straw mulching (5cm) at 5 DAS	22.29	76.17	249.00
T_9 - Two Hand weeding at 20 and 40 DAS	1.50	2.34	48.67
T_{10} - Control plot	37.79	121.30	306.00
SEm ±	0.063	0.258	0.312
CD(P=0.05)	0.184	0.756	0.912

Table.5 Effect of pre and post emergence herbicide on chickpea crop production practices on WCE (%), HUE (%) and WPI (%)

Treatment	Weed control efficiency (%)	Herbicide use efficiency (%)	Weed persistence index (%)
T_1 - Metribuzin 250 g ha^{-1} (PE)	82.94	3.06	0.55
T_2 - Metribuzin250 g ha^{-1} (PE) + one hand weeding at 40 DAS	88.62	5.70	0.40
T_3 - Quizalofop-p-ethyle 40gha^{-1} (PoE)	85.94	4.02	0.40
T_4 - Quizalofop-p-ethyle 40 g ha^{-1} (PoE) + one hand weeding at 40 DAS	90.21	10.78	0.30
T_5 - Oxyfluorfen 250 g ha^{-1} (PE)	67.39	1.12	0.99
T_6 - Oxyfluorfen 250 g ha^{-1} (PE) + one hand weeding at 40 DAS	81.42	2.45	0.79
T_7 - Stale seed bed followed by one hand weedingat 40 DAS	88.82	0.00	0.71
T_8 -Straw mulching (5cm) at 5 DAS	54.48	0.00	0.63
T_9 - Two Hand weeding at 20 and 40 DAS	97.44	0.00	0.23
T_{10} - Control plot	0.00	0.00	1.00
SEm ±	0.206	0.108	0.073
CD(P=0.05)	0.605	0.316	0.214

Table.6 Effect of pre and post emergence herbicide on Number of pods plant^{-1} and seeds/pod $^{-1}$ in chickpea crop production practices

Treatment	No of pods /plant	No of Seeds per pod
T_1 - Metribuzin 250 g ha^{-1} (PE)	59.33	1.63
T_2 - Metribuzin250 g ha^{-1} (PE) + one hand weeding at 40 DAS	66.33	1.67
T_3 - Quizalofop-p-ethyle 40gha^{-1} (PoE)	66.33	1.67
T_4 - Quizalofop-p-ethyle 40 g ha^{-1} (PoE) + one hand weeding at 40 DAS	69.33	1.74
T_5 - Oxyfluorfen 250 g ha^{-1} (PE)	49.67	1.63
T_6 - Oxyfluorfen 250 g ha^{-1} (PE) + one hand weeding at 40 DAS	50.33	1.63
T_7 - Stale seed bed followed by one hand weedingat 40 DAS	66.67	1.70
T_8 -Straw mulching (5cm) at 5 DAS	40.00	1.48
T_9 - Two Hand weeding at 20 and 40 DAS	72.67	1.93
T_{10} - Control plot	39.67	1.48
SEm ±	0.364	0.037
CD(P=0.05)	1.066	0.108

Table.7 Effect of pre and post emergence herbicide on Yield in chickpea crop production practices

Treatment	Biological yield (kg/ha)	seed yield (Kg/ha)	Stover yield (kg/ha)	Test weight (g)	Harvest index	B: C Ratio
T_1 - Metribuzin 250 g ha^{-1} (PE)	3333	1573	1760	20.33	47.32	2.8
T_2 - Metribuzin250 g ha^{-1} (PE) + one hand weeding at 40 DAS	3567	1707	1860	21.43	47.83	2.7
T_3 - Quizalofop-p-ethyle 40gha^{-1} (PoE)	3400	1603	1797	20.93	47.42	2.9
T_4 - Quizalofop-p-ethyle 40 g ha^{-1} (PoE) + one hand weeding at 40 DAS	4280	2127	2153	22.17	49.66	3.5
T_5 - Oxyfluorfen 250 g ha^{-1} (PE)	3066	1413	1653	19.73	46.14	2.4
T_6 - Oxyfluorfen 250 g ha^{-1} (PE) + one hand weeding at 40 DAS	3200	1477	1723	20.23	46.22	2.3
T_7 - Stale seed bed followed by one hand weedingat 40 DAS	3767	1810	1957	21.50	48.10	2.9
T_8 -Straw mulching (5cm) at 5 DAS	2800	1280	1520	19.17	46.07	1.9
T_9 - Two Hand weeding at 20 and 40 DAS	4576	2383	2193	24.60	52.10	3.2
T_{10} - Control plot	2533	1045	1488	18.93	41.28	1.9
SEm ±	0.826	0.552	1.346	0.108	0.154	
CD(P=0.05)	2.417	1.615	3.940	0.317	NS	

Fig.1

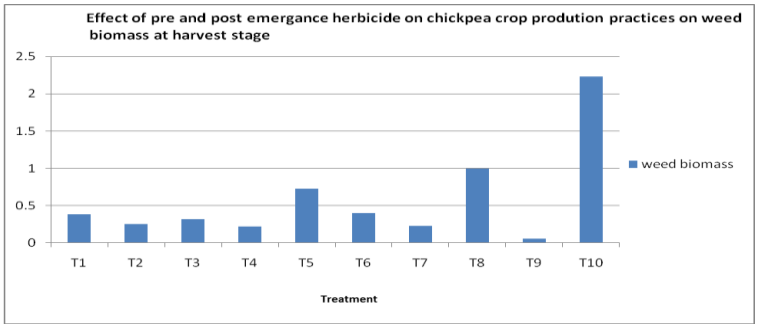


Fig.2

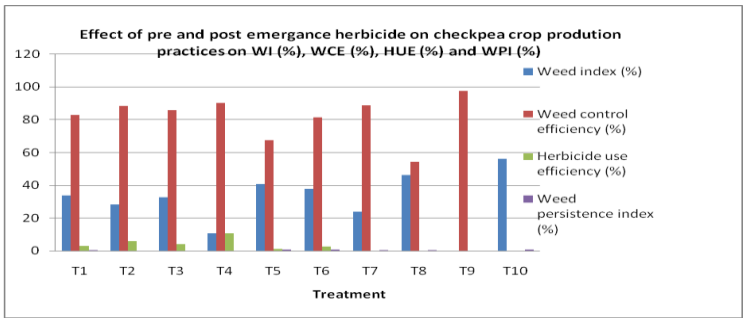


Fig.3

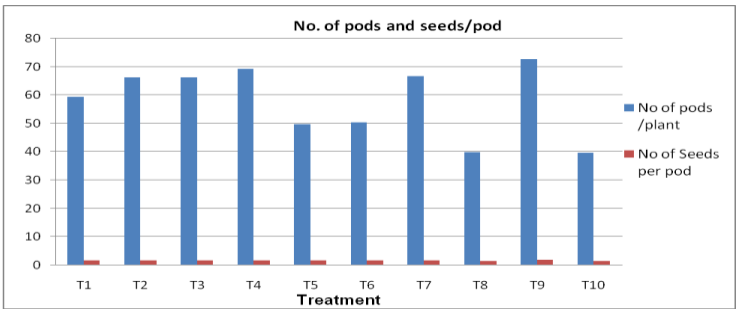
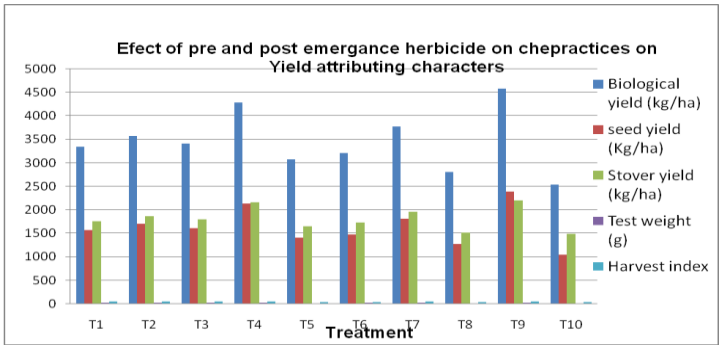


Fig.4



Density of narrow- leaved weeds

In the chickpea crop at 30 DAS minimum population of *narrow –ieaved weeds* recorded in T_9(two hand weeding at 20 and 40 DAS). These results are in conformity with those obtained by Kumar *et al.,* (2010) and Ratnam *et al.,* (2011). At 60 DAS the minimum population *was* recorded in T_9 (two hand weeding at 20 and 40 DAS) followed by T_4 (quizalofop-p-ethyle 40gha^{-1}as PoE+ one hand weeding at 40 DAS) These results are in conformity with those obtained by Balwan *et al.,* (2017). At 90 DAS in chickpea field. The minimum population recorded in T_7 (stale seed bed followed by one hand weeding at 40 DAS) which was at par with poat-emergence (T_4quizalofop-p-ethyle 40gha^{-1} + one hand weeding at 40 DAS).

These results are in conformity with those obtained by Gore *et al.,* (2015) and at harvest stage the minimum population recorded in T_9 although T_7 and T_4 (quizalofop-p-ethyle 40gha^{-1}as PoE + one hand weeding at 40 DAS) was at par with T_9(two hand weeding at 20 and 40 DAS).These results are in conformity with those obtained by Balwan *et al.,* (2017).

Density of broad-leaved weeds

In the chickpea field at 30 and 60 DAS minimum population of all broad leaved weeds was recorded in T_9 (two hand weeding at 20 and 40 DAS). These results are in conformity with those obtained by Deva and kolhe (2015). Similarly at 90 DAS the minimum density of broad leaved weeds was found in T_9 (two hand weeding at 20 and 40 DAS) but statistically at par with T_7(stale seed bed followed by one hand weeding at 40 DAS).

These results are in conformity with those obtained by Gore *et al.,* (2015). At harvest stage in the chickpea crop minimum density of broad leaved weeds was found in T_9 (two hand weeding at 20 and 40 DAS) but statistically it was at par with T_2 (metribuzin 250 gha^{-1}as PE+ one hand weeding at 40 DAS) These results are in conformity with those obtained by Balwan *et al.,* (2017).

Density of sedges

Only one species of sedges was observed at 30, 60 90 DAS and harvest stage only one species of sedges was found in chickpea field. The minimum population was recorded in T_9 (Two Hand weeding at 20 and 40 DAS).These results are in conformity with those obtained by Balwan *et al.,* (2017).

Dry weight of weeds (gm)

At 30 and 90 DAS, significantly reduced the dry weight of total weeds. The minimum dry weight was recorded in the pre-emergence treatment T_2 (Metribuzin 250 gha^{-1}as PE+ one hand weeding at 40 DAS) these results are in conformity with those obtained by Deva and kolhe (2015) Kumar *et al.,* (2010).

The data on dry weight of total weeds at 60 DAS indicated that dry weight of total weeds was significantly influenced by all treatments. Minimum dry weight of weeds was recorded in T_4 (quizalofop-p-ethyle 40g/ha as PoE + one hand weeding at 40 DAS) and T_7(stale seed bed followed by one hand weeding at 40 DAS) these results are in conformity with those obtained by Kumar *et al., (*2015).

The data on dry weight of total weeds at 90 DAS indicated that dry weight of weeds was significantly influenced by all treatments. The minimum dry weight of total weeds was recorded in T_2 (metribuzin250 gha^{-1}as PE+ one hand weeding at 40 DAS) these results are in conformity with those obtained by Dewangan *et al.,* (2016).

Weed biomass after harvesting (gm)

The effect of Chemical weed management practices on weed biomass in (kgplot^{-1}) was recorded after harvesting and data presented in table 16 the total weed biomass production was higher it means the competition between crop and weeds was high. The minimum weed biomass was recorded in T_9 (two hand weeding at 20 and 40 DAS) and these results are in conformity with those obtained by Dhuppar *et al.,* (2013) and Kumar *et al*., (2015)

Weed control efficiency (%)

The weed control efficiency in per cent denotes the efficiency of applied herbicide or treatment affect in reducing the dry weight of weeds or weed population. It was computed by utilizing the dry matter production data of weeds. The maximum weed control efficiency was recorded in T_9 (two Hand weeding at 20 and 40 DAS) followed by T_4(quizalofop-p-ethyle 40g/ha as PoE+ one hand weeding at 40 DAS) and these results are in conformity with those obtained by Kumar *et al., (*2015) and Singh and Jain (2017) and Dubey *et al.,* (2018).

Number of pods plant^{-1}and seeds/pod $^{-1}$

The number of pods plant^{-1}and seeds pod $^{-1}$was recorded at harvest stage, The maximum number of pods plant^{-1}and seeds pod $^{-1}$was found on T_9(two hand weeding at 20 and 40 DAS)followed by T_4 (quizalofop-p-ethyle 40g/ha as PoE + one hand weeding at 40 DAS) and T_7, (stale seed bed followed by one hand weeding at 40 DAS) the minimum number of pods per plant and seeds pod $^{-1}$was recorded in T_8 (straw mulching (5cm) at 5 DAS)these results are in conformity with those obtained bykachhadiya *et al.,* (2009), Poonia and Pithia (2013), Singh *et al.,* (2008) and Chaudhary *et al.,* (2005).

Seed yield (kg ha-1)

A critical examination of the data was revealed that the higher grain yield (2383 kgha^{-1}) was recorded with the treatment where two hand weeding was done at 20 and 40 DAS. The cumulative effect of the yield attributing characters was reflected in terms of grain yield. Control treatment recorded significantly lower seed yield (1045 kgha^{-1}) over all other treatments. These results are in conformity with those obtained by Singh and Jain (2017) Kachhadiya *et al.,* (2009) and Malik *et al.,* (2005).

B: C Ratio

The maximum benefit cost ratio (3.5) calculated in quizalofop-p-ethyle 40gha^{-1}as PoE+ one hand weeding at 40 DAS. These results are in conformity with those obtained by Kumar *et al.,* (2011) but Kumar applied only one hand weeding with pendimethalin.

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In conclusion the observations on the species wise weed density and total weed density, total dry matter were recorded at 30, 60, 90, DAS and at harvest and statistically analyzed. The Plant number of pods, number of seeds, 100-seed weight, seed yield and straw yield of chickpea crop were recorded at harvest and statistically analyzed. Harvest index, weed index, herbicide use efficiency, weed persistence index, weed control efficiency and economics of chickpea as a net returns, gross returns and benefit cost ratio were also worked out. The Effect of pre and post emergance herbicide on chickpea crop prodution practices on the Population of the narrow- leaved weeds, the results revealed that the density of the narrow leaves, broad leaves and sedges weeds are reduced significantly by the T_9(two hand weeding at 20 and 40 DAS) and it was at par with T_4(quizalofop-p-ethyle 40 g ha^{-1}as PoE + one hand weeding at 40 DAS), followed by T_7(stale seed bed followed by one hand weeding at 40 DAS) Maximum narrow-leaved weed was recorded in T_{10}(Control plot) but it was found statistically at par with T_8 (straw mulching (5cm) at 5 DAS). Among these all narrow-leaved, broad leaves and sedges weeds were effectively controlled by quizalofop-p-ethyle and oxyfluorfen herbicidal treatments.

Yield reduction of 56 percent was recorded in control over T_9 (two hand weeding at 20 and 40 DAS). followed by T_7 (stale seed bed followed by one hand weeding at 40 DAS. the minimum yield recorded in T_{10} (Control plot).However, test weight was significant with various treatments under investigation and maximum test weight was recorded in T_9(two hand weeding at 20 and 40 DAS), whereas higher returns per rupee of investment was obtained with the application of T_4(quizalofop-p-ethyle 40 kg ha^{-1} as PoE + one hand weeding at 40 DAS) and found to be the more profitable treatments. From this study it is concluded that different treatments has positive effect on yield of chickpea. Application of the cultural operation where two hand weeding was applied gave maximum yield (2383kg ha^{-1}) followed by Quizalofop -p-ethyle with one hand weeding at 40 DAS (2127 kg ha^{-1}) as well as reduced the weed density and dry weight of weeds. The maximum BC ratio was also found in quizalofop-p-ethyle with one hand weeding at 40 DAS (3.5), followed by T_9 (3.2) two hand weeding at 20 and 40 DAS and T_7 (2.9)(stale seed bed followed by one hand weeding at 40 DAS).

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