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Effect of Pre and Post Emergence Herbicides on Yield and Economics of Chickpea (*Cicer arietinum* L.)

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ABSTRACT: *An agronomic investigation on "Effect of pre and post emergence herbicides on yield and economics of chickpea (*Cicer arietinum *L)" was carried out on research farm of Agronomy Department, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during* Rabi *2011-12. Results revealed that Weed free (weeding at 20 days interval up to 80-90 DAS) recorded highest yield and yield attributing characters of chickpea. It was found at par with of Pendimethalin (PE) @ 0.75 a.i. kg ha^{-1}+ 1HW, Pendimethalin (PE) @ 1.00 a.i. kg ha^{-1}, 1 Hoeing (30 DAS) + (2 hand weedings) and Mechanical weedings (2 hand weedings) and significantly superior over rest of the treatments.Among the chemical weed control treatment application of Pendimethalin (PE) @ 0.75 a.i. kg ha^{-1}+ 1 HW was found beneficial higher yield and highest net monetary returns and B:C ratio and found most effective and economical in controlling weeds and increasing the yield of chickpea.*

Keywords*: Chickpea, Herbicide, Pre-emergence, Post-emergence, Economics*

INTRODUCTION

Chickpea is an important pulse crop of the semi-arid tropics, particularly in the rainfed ecology of the Indian subcontinent. In the last decade, this crop has experienced an export-driven expansion in new riches such as Australia and Canada. Globally, chickpea is cultivated on about 10.4 million ha area adding 8.57 million tonnes of seeds to the global food market, with an average productivity of 826 kg ha^{-1}. As many as 45 countries grow chickpea. India grows chickpea on about 8.56 million ha producing 7.35 million tonnes seeds with productivity 858 kg ha^{-1} which represents 37 per cent and 50 per cent of the national pulse acreage and production respectively. The important chickpea growing states are Madhya Pradesh, Rajasthan, Uttar Pradesh, Maharashtra, Karnataka and Haryana. In Maharashtra state the area was 13.95 lack ha and production was 13.01 lack tonnes with productivity of 933 kg ha^{-1} during the year 2011-12. (Anonymous., 2011).

The average yield of this crop is very much which may be due to many factors but among these infestation of weeds is very important. (Surjit Singh *et al*, 2008). Chickpea, being slow in its early growth and short stature plant, is highly susceptible to weed competition and often considerable losses may occur if weeds are not controlled at proper time. Weeds are serious constraint to increase production and easy harvesting in chickpea. Yield losses as due to weeds were observed to vary between 40-90 per cent. *Chenopodium album* also one of the dominant weed in chickpea and causes maximum reduction in grain yield. (Mailk and Balyan.,1988). Moreover potential yield losses in chickpea due to weeds range between 22 to 100 per cent. Weeds reduce grain yield of chickpea up to an extent of 60 per cent (IIPR., 2004).

Hand weeding is practiced in traditional production areas, but is impractical in the impractical in the extensive production areas. Hand weeding is labour-intensive and therefore an expensive operation when done by hired labour and, if delayed, the operation does not prevent adverse effect of the weeds on crop yield. The use of appropriate herbicides can eliminate this early weed competition and prevent yield losses Herbicides are selective, cost effective, easy to apply, and offer flexibility in application time. (Peterson *et al*., 2001 or Hoseiny *et al*., 2011). When properly used, pre-emergence herbicides accomplish effective and economic weed control, and consequently chickpea seed yields as similar to or only lightly smaller than those of weed free treatments are

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resulted (Gul Hassan *et al.*, 2007). New pre and post emergence weedicides are available in market for effective control of weeds. It is therefore felt necessary to study the efficacy of these new weedicides for control of weeds in gram and also to compare these herbicides with the exiting cultural weed control methods.

MATERIAL AND METHODS

An agronomic investigation on "Evaluation of pre and post emergence herbicides in irrigated chickpea (*Cicer arietinum* L.) on black cotton soils of Marathwada region." was carried out on research farm of Agronomy Department, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *Rabi* 2011-12 to evaluate pre and post emergence herbicides in irrigated chickpea for effective and economical weed control in chickpea. The experiment was conducted on vertisols, in a randomized block design with twelve treatments four pre emergence herbicides *viz*,Pendimethalin (PE) @ 0.75 a.i kg ha^{-1}+ 1 HW, Pendimethalin (PE) @ 1.00 a.i kg ha-Trifluralin(PE) @ 1.0 a.i. kg ha^{-1}, Oxyfluorfen @ 0.125 a.i. kg ha^{-1}, and Metribuzin @ 0.75 a.i. kg ha^{-1} and three post-emergence herbicides viz,Imazethapyr(POE) @ 0.75 a.i. kg ha^{-1},Quizalofop-p-ethyl (POE) @ 40 a.i. g ha^{-1}, Propaquizafop (POE) @ 0.75 a.i. kg ha^{-1} andthree cultural treatments *viz*,1 Hoeing (30 DAS) + (2 hand weedings), Mechanical weedings (2 hand weedings), Weed free (weeding at 20 days for up to 80-90 DAS), and Weedy check. They were replicated three times. The gross and net plot sizes were 5.4 m x 4.5 m and 4.5 m x 3.6 m, respectively. The seeds of variety Vijay were sown by dibbling method at spacing 45 cm x 10 cm. Observations on growth, weed parameter were recorded periodically at an interval of 30 days. Whereas the observation on yield attributing characters and yield were recorded at harvest.

RESULT AND DISCUSSION

Data in respect of yield and yield attributes of chickpea as influenced by various treatments are presented in Table 1.

Data furnished in Table 1indicate that seed yield, straw yield and biological yield of chickpea was significantly influenced by various weed control treatments.

Weight of pods $plant^{-1}$, number of seeds pod^{-1}, number of seeds $plant^{-1}$ and 100 grain weight were found significantly improved with Weed free treatment and it was followed by the application of 1 Hoeing (30 DAS) + (2 hand weedings), Mechanical weedings (2HWs) and Pendimethalin (PE) @ 0.75 kg ha^{-1}. This might be due to less crop-weed competition throughout the growing period of crop. Moreover due to less competition for nutrients, moisture, sunlight, it resulted into strengthening of individual plants and later on it was reflected in improving various yield attributing characters in above treatments.

Treatment weed free (weeding at 20 days interval up to 80-90 DAS) recorded significantly higher seed yield (2976 kg ha^{-1}) , straw yield (3247kg ha^{-1}) and biological yield(6223kg ha^{-1}) of chickpea and it was found at par with1Hoeing (30DAS) + (2 HWs), Mechanical weedings (2 hand weedings), and Pendimethalin (PE) @ 0.75 kg ha^{-1}. Whereas it was found significantly superior over rest of the weed control treatments and weedy check.Thus the effective weed control achieved in the earlier mentioned treatments resulted in enhancing various

Table 1
Yield and yield attributes of chickpea as influenced by various weed management treatments

Treatments	*Weight of Pods plant^{-1} (g)*	*Number of Seeds pod^{-1}*	*Number of Seeds plant^{-1}*	*Hundred seed weight (g)*	*Grain yield (Kg ha-^{1})*	*Straw yield (Kg ha-1)*	*Biological yield (Kg ha-1)*
T_1: Pendimethalin (PE) @ 0.75 a.i. kg ha^{-1}	19.7	1.48	90.5	18.3	2796	3048	5844
T_2 : Trifluralin (PE) @ 1.0 a.i. kg ha^{-1}	16.2	1.2	85.33	17.96	2450	2726	5176
T3: Metribuzin (PE) @ 0.75 a.i. kg ha^{-1}	13.66	0.9	61.2	17.1	2010	2413	4423
T_4 :Oxyfluorfen (PE) @ 0.125 a.i. kg ha^{-1}	15.23	0.96	66.2	17.46	2223	2516	4739
T_5: Mechanical Weedings (2 hand weedings)	20	1.5	93.16	18.26	2813	3083	5896
T_6:Imazethapyr (POE)@ 0.75 a.i. kg ha^{-1}	14.36	0.95	61.3	17.3	2153	2490	4643
T_7:Quizalofop-p-ethyl (POE) 40 a.i. g ha^{-1}	15.46	1.1	80.33	17.76	2435	2719	5154
T_8 :Propaquizafop(POE) @ 0.75 a.i. kg ha^{-1}	15.33	0.97	68	17.66	2394	2683	5077
T_9 : 1 Hoeing(30DAS) + (2hand weedings)	20.5	1.6	93.66	18.33	2950	3233	6183
T_{10} : Weed free (weeding at 20 days interval up to 80-90 DAS)	21.46	1.73	95.76	19.43	2976	3247	6223
T_{11} : Weedy check	13.53	0.85	58.73	15.8	1540	1870	3410
S.E. ±	0.6	0.16	3.76	0.39	137	175	336
C.D. at 5 %	1.8	0.5	11.88	1.17	412	525	1008
GM	16.85	1.18	77.65	17.76	2440	2739	5160

growth and yield attributing characters of chickpea and finally gave significantly higher grain and straw yield over Weedy check. Low yield in Weedy check may be due to poor root growth and higher weed population could have competed with chickpea crop for space, water and nutrients, there by adversely affecting grain and straw yield, Similar trend was observed Pooniya *et al.* (2009) and Ratnum *et al.* (2011).

As we see the effect of chemical weed control methods, the application of Pendimethalin (PE) @ 0.75 kg ha^{-1} recorded significantly higher grain yield (2796 Kg ha^{-1}) , straw yield (3048 Kg ha^{-1}) and biological yield (5844 Kg ha^{-1}) which was found at par with Trifluralin (PE) @ 1.0kg/ha^{-1}, Quizalofop-p-ethyl (PE) @ 40 g ha^{-1} and Propaquizafop (PE) @ 0.75 kg ha^{-1} and it was found significantly superior over rest of chemical weed control treatment and weedy check.Similar trend was observed Pooniya*et al.* (2009) and Ratnum *et al.* (2011).

The data presented in Table 2 reveal that maximum gross monetary returns (GMR) were observed in Weed free treatment because growth of crop was favoured in better partitioning of assimilates and their relative accumulation which finally results into higher yields. While highest net monetary returns (NMR) and B: C ratios were recorded with the application of Pendimethalin (PE) @ 0.75 kg ha^{-1} may be due to higher yield and comparatively lower cost of cultivation as compared to Weed free treatment. These results are in conformity with Surjitsingh *et al.* (2008).

Table 2
Economics of chickpea cultivation as influenced by various treatments

Treatments	*Gross monetary returns (Rs ha^{-1})*	*Cost of cultivation (Rs ha^{-1})*	*Net monetary returns (Rs ha^{-1})*	*B:C ratio*
T_1 : Pendimethalin (PE) @ 0.75 a.i. kg ha^{-1}	72000	19770	52230	3.64
T_2 : Trifluralin (PE) @ 1.0 a.i. kg ha^{-1}	63976	19770	44206	3.23
T 3: Metribuzin (PE) @ 0.75 a.i. kg ha-1	52668	19320	33348	2.72
T_4 : Oxyfluorfen (PE) @ 0.125 a.i. kg ha^{-1}	58091	18820	39271	3.08
T_5: Mechanical Weedings (2 hand weedings)	73408	21570	51838	3.4
T_6: Imazethapyr (POE) @ 0.75 a.i. kg ha^{-1}	56315	19657	36658	2.86
T_7: Quizalofop-p-ethyl (POE) @ 40 a.i. g ha^{-1}	63594	19650	43944	3.23
T_8 : Propaquizafop (POE) @ 0.75 a.i. kg ha^{-1}	62533	20036	42497	3.12
T_9 : 1 Hoeing (30DAS) + (2 hand weedings)	74350	22270	52080	3.33
T_{10} : Weed free (weeding at 20 days interval up to 80-90 DAS)	76250	24570	51680	3.1
T_{11} : Weedy check	40370	18570	21800	2.17
S.E. ±	1971.86	-	1757.8	0.13
C.D. at 5%	5915.6	-	5214.8	0.38
GM	63050	20363	42686	3.08

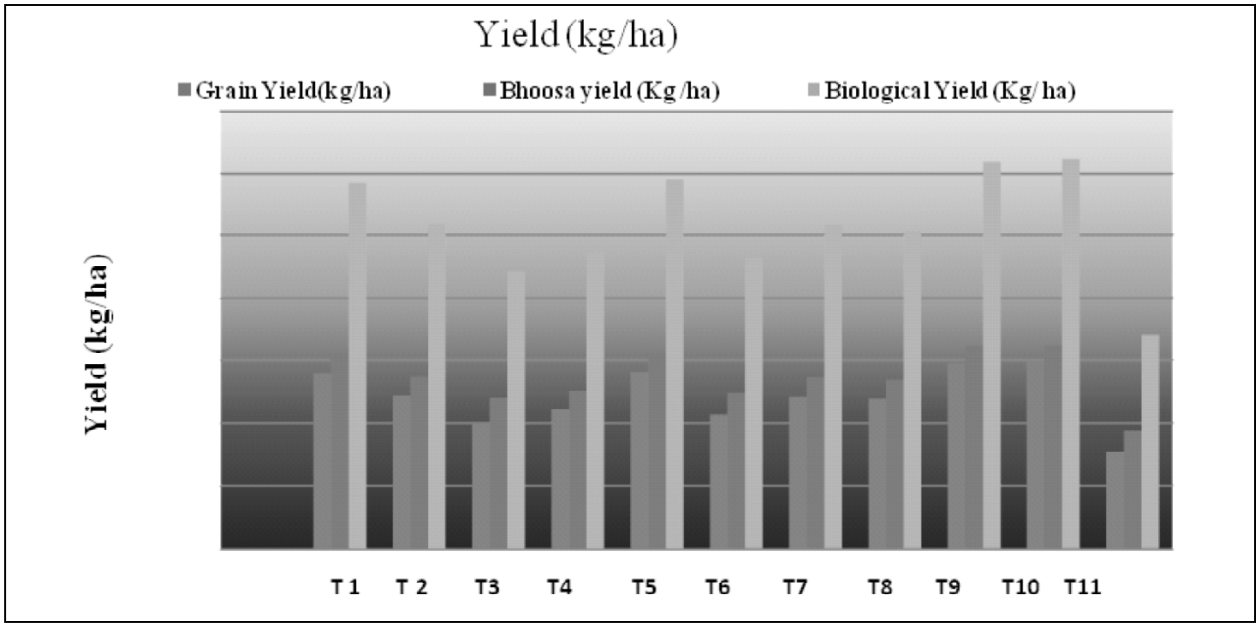

Figure 1: Grain yield kg ha^{-1} , Bhoosa yield kg ha^{-1} , and Biological yield kg ha^{-1} as influenced by various treatments

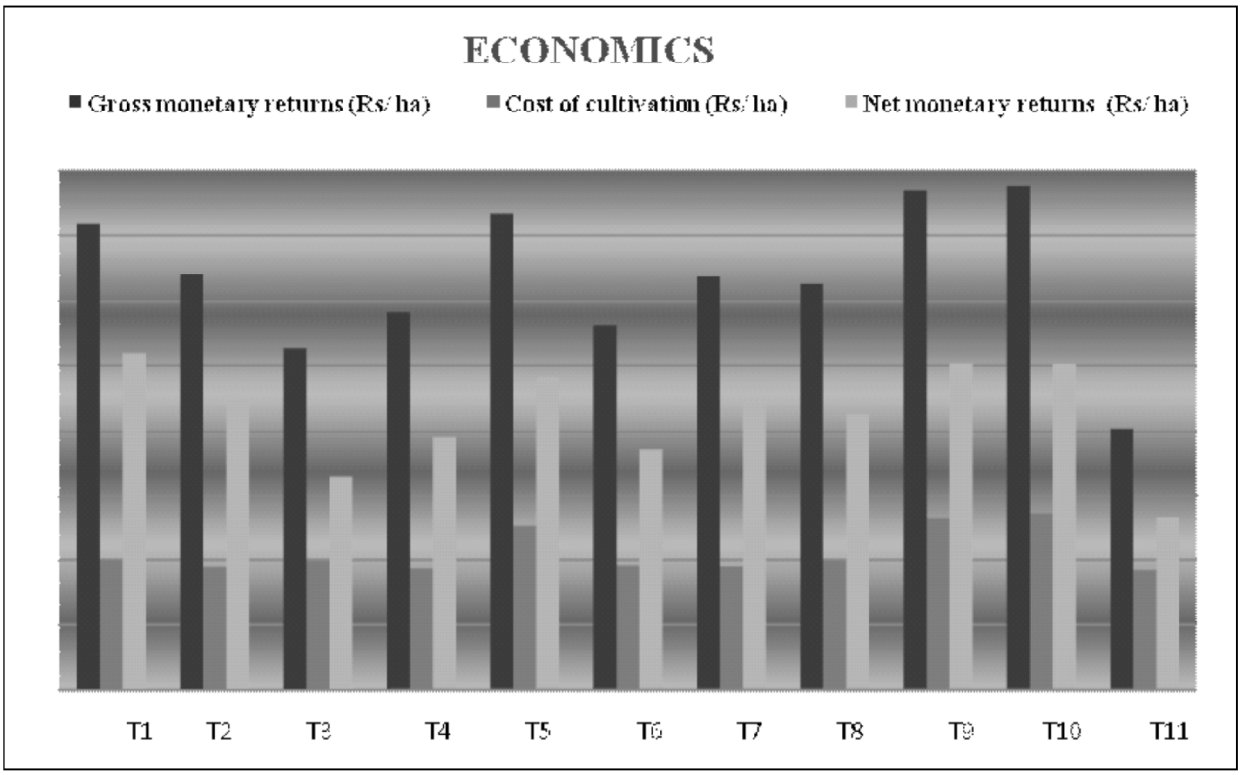

Figure 2: Economics of chickpea as influenced by various treatments

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