International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2023; 7(1): 35-38
www.biochemjournal.com
Received: 19-10-2022
Accepted: 28-11-2022

Rakesh Kumar
1. Agriculture Co-ordinator, Department of Agriculture, Siwan, Government of Bihar, Bihar, India
2. Department Agronomy, Institute of Agricultural Sciences, BHU, Varanasi, Uttar Pradesh, India

SK Prasad
Department Agronomy, Institute of Agricultural Sciences, BHU, Varanasi, Uttar Pradesh, India

Vimal Kumar
Technical Assistant, Department of Agriculture, Mirzapur, Govt. of Uttar Pradesh, Uttar Pradesh, India

Shishu Pal Singh
Assistant Development Officer, Department of Agriculture, Varanasi, Govt. of Uttar Pradesh, Uttar Pradesh, India

Corresponding Author:
Rakesh Kumar
1. Agriculture Co-ordinator, Department of Agriculture, Siwan, Government of Bihar, Bihar, India
2. Department Agronomy, Institute of Agricultural Sciences, BHU, Varanasi, Uttar Pradesh, India

Effect of weed management practices under irrigated condition growth and yield of field pea (*Pisum sativum* L.)

Rakesh Kumar, SK Prasad, Vimal Kumar and Shishu Pal Singh

DOI: https://doi.org/10.33545/26174693.2023.v7.i1a.159

Abstract
Field pea (*Pisum sativum* L.) crop was conducted at the Agricultural Research Farm of B. H. U. Varanasi, during *rabi* season of 2010-11. The experiment was conducted in randomized block design (RBD) with 10 weed control treatments *viz*., pendimethalin 1.0 kg ha^{-1} (PE), pendimethalin 1.0 kg (PE) + imazethapyr 75 g ha^{-1} (PoE), quizalofop- ethyl 60 g ha^{-1} (PoE), quizalofop- ethyl 50 g ha^{-1} (PoE), imazethapyr 75 g ha^{-1} (PoE), imazethapyr 50 g ha^{-1} (PoE), chlorimuron-ethyl 4 g ha^{-1} (PPI), pendimethalin 1 kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE) and weed free (HW at 30 and 60 DAS) were compared with weedy check and two irrigation were given to crop at critical stages of crop growth. The soil of experimental field application recommended dose of fertilizer at the time of sowing and soil sandy clay loam in texture, with slightly alkaline in reaction (pH 7.8). Field pea variety HUDP-15 was sown at row spacing of 30 cm apart on 11 November 2010. The observation on weed density and weed dry matter accumulations were recorded at 30, 60 and 90 DAS. Weed control efficiency was calculated at maximum weed dry weight stage (60 DAS) of crop growth. Among herbicidal treatments, sequential application of pendimethalin 1 kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE) was proved to be the most effective in reducing the weed density and dry weight. It also recorded maximum weed control efficiency and lower weed index. The Observation on plant height, and yield attributes *viz*., pods plant^{-1}, grains pod^{-1}, seed index (100-grain weight), grain and straw yield. The crop growth, yield attribute, grain and straw yield, were maximum in pendimethalin 1 kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE) treated plot followed by pendimethalin 1 kg ha^{-1} (PE) + imazethapyr 75 g ha^{-1} (PoE) and quizalofop- ethyl 60 g ha^{-1} (PoE).

Keywords: Field pea, weed management practices, plant growth and yield

Introduction
Pulses are the cheapest and most important source of dietary protein for human and animal feed. It also plays a vital role in improving soil health, by adding huge amounts of organic matter and fixing of biological nitrogen. It leaves about 30 kg N ha^{-1} into the soil which is useful for succeeding crop (Anonymous, 2006) [1]. Pulses are integral part of mixed and intercropping system because they are short in duration and suited under diverse agro-climatic conditions. They are not only rich source of protein, but it also has higher quantity of linolenic acid, which is generally lacking in cereals. Globally, pulses are cultivated over an area of 62 m ha with the production of 47 million tonnes and average productivity of 7.60 q ha^{-1} (FAO, 2011-2012). In India it is cultivated in 0.78 m ha with an annual production of 0.71 million tone and share 3.1 per cent of area and production in total pulse production (Anonymous, 2011) [2]. A gradual decrease in the per capita availability of pulses has been noticed; because of stagnate in their production and gradual increase in the human population. Weeds are the major threats in field pea which limits the productivity. However, the composition and density of weeds vary greatly and are closely linked to the cropping history of the field. Weed competition is a serious limitation in field pea, because it is less competitive to weeds due to its initial slow growth and short stature resulting in huge yield loss. If weeds are allowed to grow throughout the crop cycle resulted in the reduction in the yield up to 65.8% under control (Mishra 2006; Veres and Tyr, 2012) [17, 15]. For the control of weeds generally farmers adopted manual weeding, because it is very effective but, it is time taking, scarcity of labour, require more labour and ultimately increase the cost of production.

Materials and Methods

The experiment was laid out during the *rabi* seasons of 2010-2011 at the Agricultural Research Farm Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India. In climatic variation May and June are hottest months with mean maximum temperature ranging from 39° to 43°C. However, the coldest month is January with mean minimum temperature varying from 9° to 10 °C. The mean relative humidity remains 68%, which rises up to 89% during July-September and falls down during April to June. Physical properties of experimental soil have the Sand 48.63%, Silt 28.52% and Clay 21.62% with the textural class Sandy clay loam and Soil pH 7.8. The EC of the experimental plot is 0.25, OC (%) 0.45, Available N is 163 kg ha^{-1}, Available P_2O_5 (kg ha^{-1}) 39 and Available K_2O (kg ha^{-1}) is 297. Treatment-wise pre and post-emergence herbicides were applied by knapsack sprayer fitted with flat-fan nozzle using water volume of 300 L/ha. Crop was harvested at full physiological maturity, sun-dried for a week and threshed manually. Weed and crop samples were collected from each individual plot for studying various crop and weed characters. Weed samples were collected by placing a quadrate (0.5 × 0.5 m) randomly at two places in each plot. The data on weed density and weed biomass were subjected to square root transformation before statistical analysis to obtain homogeneity of variances.

Results and Discussion

Total weed density

The total weeds (m^{-2}) as affected by different weed management practices are presented in (Table 1). It is clear from the data that at 60 DAS, sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE) significantly reduced the total weed population (25.66 g m^{-2}) over imazethapyr 50 g ha^{-1} (52.66 g m^{-2}), chlorimuron- ethyl 4 g ha^{-1} (57.33 g m^{-2}) and pendimethalin 1 kg ha^{-1} (69.33 g m^{-2}) and it were at par with pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1} (28.67 g m^{-2}), quizalofop- ethyl 50 g ha^{-1} (40.32 g m^{-2}), quizalofop- ethyl 60 g ha^{-1} (36.67 g m^{-2}) imazethapyr 75 g ha^{-1} (43.98 g m^{-2}). None of the treatments were comparable to weed free situation (HW at 30 and 60 DAS) in reducing total weed population. However, all the herbicides were significantly superior over weedy check. Similar results also reported by (Upadhya and Bhalla 2002; Sikkema *et al*. 2005; Buttar *et al*. 2008) [14, 16, 4].

Total dry matter of weeds

The effect total dry matter accumulation by weeds at 30, 60 and 90 DAS as affected by different weed management practices are presented in (Table 1). At 60 DAS, sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1}(PoE) was significantly reduced the total weed dry matter (6.50 g m^{-2}) over imazethapyr 50 g ha^{-1} (35.42 g m^{-2}), chlorimuron- ethyl 4 g ha^{-1} (40.90 g m^{-2}) and pendimethalin 1 kg ha^{-1} (42.09 g m^{-2}) and it was at par with pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1}(11.25 g m^{-2}), quizalofop-ethyl 50 g ha^{-1}(13.0 g m^{-2}), quizalofop- ethyl 60 g ha^{-1}(12.70 g m^{-2}) and imazethapyr 75 g ha^{-1}(14.10 g m^{-2}). None of the treatments were comparable to hand weeding at 30 and 60 DAS in controlling total weeds. However, all the herbicides were significantly superior to weedy check.

Weed control efficiency

The effect of weed control efficiency (%) as affected by different weed management practices are presented in (Table 1). It is evident from the data that at 60 DAS, sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 gha^{-1} (PoE) recorded highest weed control efficiency (89.1%) followed by pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1} (81.2%), quizalofop- ethyl 50 g ha^{-1}(78.3%), quizalofop- ethyl 60 g ha^{-1} (78.8%) and imazethapyr 75 g ha^{-1} (76.4%), imazethapyr 50 g ha^{-1} (40.8%), chlorimuron- ethyl 4 g ha^{-1}(31.7%) and pendimethalin 1 kg ha^{-1} (29.7%), respectively. None of the weed management treatments as effective as weed free condition regarding weed control efficiency. These findings established support from (Chopra *et al*. 2001; Singh *et al*. 2004; Rana *et al*. 2004) [7, 12, 11].

Weed index

It is clear that the lowest weed was recorded under the sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE, 8.44%), (Table 1) followed by pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1} (10.19%), quizalofop- ethyl 60 g ha^{-1} (14.62%), quizalofop- ethyl 50 g ha^{-1} (19.05%), and imazethapyr 75 g ha^{-1} (19.70%), imazethapyr 50 g ha^{-1} (26.85%), chlorimuron- ethyl 4 g ha^{-1} (27.68%) and pendimethalin 1 kg ha^{-1} (23.44%), respectively. Maximum weed index were recorded under weedy check (37.10%).

Plant height

Among herbicidal treatments, plant height was significantly the highest (Table 2) under the sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE, 89.41 cm) over imazethapyr 50 g ha^{-1} (84.74 cm), chlorimuron- ethyl 4 g ha^{-1} (84.28 cm) and pendimethalin 1 kg ha^{-1} (82.43 cm) and it were at par with the application of pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1} (89.44 cm), quizalofop- ethyl 50 g ha^{-1} (86.62 cm), quizalofop- ethyl 60 g ha^{-1} (87.48 cm) and imazethapyr 75 g ha^{-1} (87.25 cm). Two hand weeding (at 30 and 60 DAS) treatments produced taller plant (95.0 cm) than all the herbicidal treatments, at all the stages of observation. However, all the weed management practices recorded significantly taller plant than weedy check. These results are corroborated with research findings of (Buttar *et al*. 2008; Singh *et al*. 2008) [4, 13].

Yield attributes

The yield attributing (Table 3) characters *viz*, pods $plant^{-1}$, grains pod^{-1} and seed index (100-grain weight), were significantly influenced by the different weed management practices treatments. All the weed control treatments significantly influenced the yield attributes as compared to weedy check. Among, herbicidal treatments, sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE) resulted into significantly the highest number of pods (19.31) $plant^{-1}$, number of grains (6.08) pod^{-1} and seed index (100-grain weight) (17.95) over imazethapyr 50 g ha^{-1}, chlorimuron- ethyl 4 g ha^{-1} and pendimethalin 1 kg ha^{-1} and it were at par with the application of pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1}, quizalofop- ethyl 50 g ha^{-1}, quizalofop- ethyl 60 g ha^{-1} and imazethapyr 75 g ha^{-1}. Higher yield attributes under these treatments may be due to lesser crop-weed competition, which gave better environment for crop growth and development of crop. These treatments weed population and their growth was abstracted during initial as well as latter stage of crop

growth by sequential application of herbicides. It confirms the conclusion drawn by (Chaudhary *et al*., 2009) [6] from the results of their experiments on weed control in pulses. PoEergence application of imazethapyr at 30-35 DAS were also found equally effective in increasing yield attributes of field pea (Sikkema *et al*., 2005) [16]. Yield attributes *viz*., branches plant^{-1}, Pods plant^{-1}, seeds pod^{-1} and seed weight plant^{-1} was significantly increased under weed free environment (Munakamwe *et al*., 2008) [9].

Grain yield and Straw yield (kg ha^{-1})

The sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE) recorded significantly (Table 3) highest grain yield (1984 kg ha^{-1}) over imazethapyr 50 g ha^{-1} (1585 kg ha^{-1}), chlorimuron- ethyl 4 g ha^{-1} (1567 kg ha^{-1}) and pendimethalin 1 kg ha^{-1} (1659 kg ha^{-1}) and it were at par with pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1} (1946 kg ha^{-1}), quizalofop- ethyl 50 g ha^{-1} (1754 kg ha^{-1}), quizalofop- ethyl 60 g ha^{-1} (1850 kg ha^{-1}) and imazethapyr 75 gha^{-1} (1740 kg ha^{-1}), respectively. Two hand weeding (weed free) recorded significantly highest grain yield (2167 kg ha^{-1}) over other weed management practices. However, significantly lowest grain yield was recorded under weedy check.

It is evident from the that sequential application of pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE) recorded significantly (Table 3) highest straw yield (6150 kg ha^{-1}) over imazethapyr 50 g ha^{-1}(5275 kg ha^{-1}), chlorimuron-ethyl 4 g ha^{-1} (5200 kg ha^{-1}) and pendimethalin 1 kg ha^{-1} (5058 kg ha^{-1}) and it were at par with pendimethalin 1 kg ha^{-1} + imazethapyr 75 g ha^{-1} (6056 kg ha^{-1}), quizalofop- ethyl 50 g ha^{-1} (5750 kg ha^{-1}), quizalofop- ethyl 60 g ha^{-1} (5900 kg ha^{-1}) and imazethapyr 75 g ha^{-1} (5546 kg ha^{-1}), respectively. Two hand weeding (weed free) recorded significantly highest straw yield (6487 kg ha^{-1}) over herbicidal treatments. However, all the weed management practices recorded significantly highest straw yield over weedy check. These results are corroborated with the research results of (Bhyan *et al*. 2004; Rajeev *et al*. 2006) [3, 10].

Table 1: Effect of weed management practices on yield attributes yields and harvest index

Treatment	Weed density			Weed dry matter			WCE (%)	Weed index (%)
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS		
T_1 – Weed free (H W at 30 and 60 DAS)	0.00	0.00	0.00	0.00	0.00	0.00	100.0	0
T_2 – Pendimethalin 1.0 kg ha^{-1} (pre-em)	51.00	69.33	64.67	20.06	42.09	30.91	29.7	23.44
T_3 – Pendimethalin 1kg (pre-em) + imazethapyr 75 g ha^{-1} (post- em)	26.34	28.67	22.33	5.25	11.25	9.50	81.2	10.19
T_4 – Quizalofop- ethyl 60 g ha^{-1} (post-em)	31.50	36.67	24.75	6.95	12.70	11.50	78.8	14.62
T_5 – Quizalofop- ethyl 50 g ha^{-1} (post-em)	33.66	40.32	27.99	8.35	13.00	12.50	78.3	19.05
T_6 – Imazethapyr 75 g ha^{-1} (post-em)	36.65	43.98	30.65	9.80	14.10	13.50	76.4	19.70
T_7 – Imazethapyr 50 g ha^{-1} (post- em)	41.00	52.66	46.99	17.65	35.42	26.00	40.8	26.85
T_8 – Chlorimuron- ethyl 4 g ha^{-1} (PPI)	45.00	57.33	56.00	19.24	40.90	29.37	31.7	27.68
T_9 – Pendimethalin 1kg ha^{-1} (pre-em) + imazethapyr 50 g ha^{-1} (post- em)	22.33	25.66	18.00	2.65	6.50	4.75	89.1	8.44
T_{10} – Weedy check	57.67	78.00	76.67	28.07	59.85	38.80	0.0	37.10
S.Em ±	4.10	6.11	3.67	2.5	2.90	3.00	-	-
CD (P=0.05%)	14.32	18.32	12.50	6.75	7.75	8.50	-	-

Table 2: Effect of weed management practices on plant height at different stages

Treatment	Plant height (cm)			
	30 DAS	60 DAS	90 DAS	At harvest
T_1 – Weed free (H W at 30 and 60 DAS)	16.63	26.34	57.58	95.00
T_2 – Pendimethalin 1.0 kg ha^{-1} (PE)	12.27	21.53	49.96	82.43
T_3 – Pendimethalin 1.0 kg (PE) + imazethapyr 75 g ha^{-1} (PoE)	14.89	24.86	54.21	89.44
T_4 – Quizalofop- ethyl 60 g ha^{-1} (PoE)	14.12	23.63	53.02	87.48
T_5 –Quizalofop- ethyl 50 g ha^{-1} (PoE)	13.81	23.10	52.50	86.62
T_6 –Imazethapyr 75 g ha^{-1} (PoE)	13.91	23.20	52.88	87.25
T_7 –Imazethapyr 50 g ha^{-1} (PoE)	12.46	22.47	51.36	84.74
T_8 – Chlorimuron- ethyl 4 g ha^{-1} (PPI)	12.38	21.99	51.08	84.28
T_9 –Pendimethalin 1kg ha^{-1} (PE) + imazethapyr 50 g ha^{-1} (PoE)	15.13	24.96	54.19	89.41
T_{10} –Weedy check	9.43	17.53	44.52	73.45
S.Em ±	0.45	0.63	0.59	0.97
CD (P=0.05%)	1.33	1.87	3.31	5.46

Table 3: Effect of weed management practices on yield attributes yields and harvest index

Treatment	Yield attributes			Yield (kg ha^{-1})	
	Number of pods plant^{-1}	Number of grains pod^{-1}	100- Seed weight (g)	Grain	Straw
T_1 – Weed free (H W at 30 and 60 DAS)	21.01	6.41	22.04	2167.0	6487.0
T_2 – Pendimethalin 1.0 kg ha^{-1} (pre-em)	12.00	5.05	14.77	1659.0	5058.0
T_3 – Pendimethalin 1kg (pre-em) + imazethapyr 75 g ha^{-1} (post- em)	18.93	5.88	17.50	1946.0	6056.0
T_4 – Quizalofop- ethyl 60 g ha^{-1} (post-em)	17.98	5.75	15.99	1850.0	5900.0
T_5 – Quizalofop- ethyl 50 g ha^{-1} (post-em)	16.98	5.66	16.06	1754.0	5750.0
T_6 – Imazethapyr 75 g ha^{-1} (post-em)	17.79	5.72	15.58	1740.0	5546.0
T_7 – Imazethapyr 50 g ha^{-1} (post- em)	15.43	5.24	15.60	1585.0	5275.0
T_8 – Chlorimuron- ethyl 4 g ha^{-1} (PPI)	12.00	6.08	15.46	1567.0	5200.0
T_9 – Pendimethalin 1kg ha^{-1} (pre-em) + imazethapyr 50 g ha^{-1} (post- em)	19.31	5.50	17.95	1984.0	6150.0
T_{10} – Weedy check	10.84	3.77	13.06	1363.0	3516.0
S.Em ±	0.82	0.80	0.74	83.0	202.0
CD (P=0.05%)	2.44	0.25	2.29	245.0	605.0

References

1. Anonymous. Handbook of agriculture. Indian Council of Agricultural Research, New Delhi; c2006. p. 911-918.
2. Anonymous. Directorate of Economics and Statistics. Department of Agricultural Cooperation; c2011.
3. Bhyan BS, Batra VK, Jitender Singh, Thakral KK. Effect of weed competition on quality of pea seed. Haryana Journal of Horticultural Science. 2004;33(1&2):130-131.
4. Buttar GS, Aggarwal N, Singh S. Efficacy of different herbicides in field pea (*Pisum sativum* L.) under irrigated conditions of Punjab. Indian Journal of Weed Science. 2008;40(3&4):169-171.
5. Bharat R, Dawson J, Singh SS. Effect of different weed control methods on weed density, weed dry weight and yield of field pea (*Pisum sativum* L.). Environment and Ecology. 2006;24S(3A):839-841.
6. Chaudhary S, Rathi JPS, Chaudhary DK, Singh OP. Weed management in field pea (*Pisum sativum*) through agronomic manipulations. International Journal of Plant Science. 2009;4(2):524-526.
7. Chopra N, Singh HP, Chopra NK. Effect of herbicides and weeding on weeds in field pea. Indian Journal of Weed Science. 2001;33(3&4):194-197.
8. Garamu T. Effect of different sources and rates of biochar application on the yield and yield components of mungbean on the acidic soil in western Ethiopia. International Journal of Research in Agronomy. 2020;3(1):01-07.
9. Munakamwe Z, Hill GD, McKenzie BA. Effect of sowing date on weed spectrum in field peas. Agronomy Journal of New Zealand. 2008;38(17):51-60.
10. Rajeev B, Dawson J, Singh SS. Effect of different weed control methods on weed density, weed dry weight and yield of field pea (*Pisum sativum* L.) Environment and Ecology. 2006;24(3):839-841.
11. Rana MC, Naveen K, Akhilesh S, Rana SS. Management of Complex Weed flora in Pea with Herbicide Mixtures under Lahaul Valley Conditions of Himachal Pradesh. Indian Journal of Weed Science. 2004;36(1&2):68-72.
12. Singh G, Singh VP, Singh M. Bio-efficasy of chlorimuron-ethyl in soybean. Indian Journal of Weed Science. 2004;36(1&2):79-82.
13. Singh P, Kulbir S, Kanwar JS, Singh J. Seed quality as affected by planting patterns and weed control treatments in garden pea. Seed Research. 2008;36(1):73-75.
14. Upadhyaya VB, Bhalla CS. Efficacy of cultural, mechanical weed control in pea. Indian Journal of Weed Science. 2002;34(1&2):141-142.
15. Veres T, Tyr S. Temporal dynamics of weed infestation in the pea for grain canopies in the years 2000-2010. Research Journal of Agricultural Science. 2012;44(2):123-126.
16. Sikkema P, Deen W, Vyas S. Weed control in pea with reduced rates of imazethapyr applied pre-emergence and post-emergence. Weed Technology. 2005;19(1):14-18.
17. Mishra JS. Efficacy of post-emergence herbicides against wild oat in field pea. Indian Journal of Weed Science. 2006;38:140-142.