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EFFECT OF DIFFERENT HERBICIDES ON WEEDS AND GROWTH OF BARLEY (*Hordeum vulgare* L.) IN CENTRAL PUNJAB

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ABSTRACT

An experiment was conducted during *Rabi* season of 2017 at Experimental Farm of Department of Agriculture, Mata Gujri College, Shri Fatehgarh Sahib, Punjab to study the efficacy of different herbicides in barley (*Hordeum vulgare* L.) in Central Punjab. The experiment was laid out in randomized block design with seven treatments and replicated thrice. On the basis of result summarized the minimum weed density, dry weight of weeds and weed index was recorded in application of herbicide sulfosulfuron @ 25g/ha + hand weeding at 45 DAS which was followed by clodinofop propargyl @ 60g/ha + hand weeding at 45 DAS, it was significantly inferior over rest of treatments at 60, 90 DAS and at harvest stage. The maximum growth parameters were maximum with the application of T_5 – sulfosulfuron @ 25 g/ha + hand weeding at 45 DAS followed by T_6 – clodinofop propargyl @ 60g/ha + hand weeding and T_7 – fenoxaprop p ethyl @ 100g/ha at 60, 90 DAS and at harvest stage.

Keywords: Fenoxaprop, Herbicides, Weeds and Weed index

Introduction

Barley (*Hordeum vulgare* L.) is an annual plant of Poaceae family. It is the third important cereal after rice and wheat in India. In 2016, barley production for India was 1.51 million tons. In 2016-17, barley was cultivated on 9 thousand hectare area with a production of 32 thousand metric tons in Punjab (*Anonymous*, 2017- 2018). Weed interference is one of the most important limiting factors which decrease crop yields and consequently global food production. Weeds are the most underestimated crop pests in tropical agriculture and cause maximum loss in the yields of crops than other pests and diseases. Yield reduction caused by weeds is directly proportional to the number of weeds present in the crop and in certain areas of the province this can result in losses of 10% (Paynter and Hills 2009). If the weeds are not controlled at the critical stages of crop, they may cause reduction in yield up to 66% (Kumar *et al.* 2011). They compete with crop plants for light, water and Nutrients. Weeds inflict huge nutrient and yield losses, suggesting adopt strong management strategies (Suresha *et al.* 2015). Therefore, weed management have been a major challenge for crop producers from the start of agriculture.

Materials and Methods

A field experiment was conducted at Experimental Farm of Department of Agriculture, Mata Gujri college, Shri Fatehgarh Sahib, Punjab during *Rabi* season of 2016-2017. The experiment laid out in randomized block design with three replicated. The treatment details are as T_1 – weedy check, T_2 – weed free, T_3 – sulfosulfuron @ 25g/ha , T_4 – clodinofop propargyl @ 60g/ha, T_5 – sulfosulfuron @ 25g/ha + hand weeding at 45 DAS, T_6 – clodinofop propargyl @ 60g/ha + hand weeding at 45 DAS, T_7 – fenoxaprop p ethyl @ 100g/ha. The soil of experiment field gangetic alluvial having clay loam texture with pH (7.4), medium in organic carbon (0.49%), electrical conductivity (0.56 dS/m at 25 °C), available P_2O_5 (14.41 kg/ha), K_2O (170.12 kg/ha) and N (285.12 kg/ha). The pre-treated seed variety PL 426 were sown by hand drilling in between the rows by using barley seed at the rate of 87.5 kg/ha with a spacing of 22.5 cm on 15th November, 2016. The recommended dose of fertilizers of NPK for wheat is 120, 60, 40 kg/ha. Applied 1/3 dose of nitrogen and full dose P_2O_5 and K_2O as basal and remaining dose of nitrogen was applied in two split at 30 DAS and 60 DAS. Post emergence herbicides were used which are applied at 30 DAS of the crop and hand weeding was done at 45 DAS. Regular biometric observations were recorded at periodic intervals of 30 DAS, 60 DAS, 90 DAS and at harvest stage of five selected plant. Yield attributes parameters were recorded just before harvesting of crop.

Statistical data were analysed by standard procedure by Panse and Sukhatme 1961).

Table 1: Effect of herbicide application on weeds

Treatments	Weed density				Weed dry matter				Weed control efficiency (%)				Weed index
	30 DAS	60 DAS	90 DAS	harvest stage	30 DAS	60 DAS	90 DAS	Harvest stage	30 DAS	60 DAS	90 DAS	Harvest stage	
T_1- Weedy check	6.9 (46.5)	4.1 (16.3)	4.3 (18.5)	5.07 (25.3)	18.89 (356.4)	26.20 (685.9)	31.79 (1010.2)	39.13 (1530.7)	0.00	0.00	0.00	0.00	39.71
T_2- Weed free	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	100.0	100.0	100.0	100.0	0.00
T_3- ulfosulfuron @ 25g/ha	6.60 (43.1)	3.59 (12.5)	3.82 (14.2)	4.74 (22.0)	18.60 (345.5)	5.95 (34.9)	17.67 (311.9)	24.77 (613.2)	3.03	94.91	69.13	59.93	16.59
T_4- Clodinofop propargyl @ 60g/ha	6.61 (43.3)	3.77 (13.8)	4.08 (16.2)	4.77 (22.3)	18.70 (349.6)	5.99 (35.4)	17.75 (314.5)	24.87 (618.2)	1.90	94.84	68.87	59.60	18.59
T_5- ulfosulfuron @ 25g/ha + hand weeding at 45 DAS	6.50 (41.8)	2.94 (8.2)	3.33 (10.6)	3.89 (14.7)	18.43 (339.4)	4.97 (24.2)	17.25 (297.2)	24.50 (599.8)	4.8	96.5	70.6	60.8	4.38
T_6- Clodinofop propargyl @ 60g/ha + hand weeding at 45 DAS	6.59 (43.0)	3.20 (9.8)	3.44 (11.4)	3.99 (15.4)	18.57 (344.3)	5.50 (29.8)	17.51 (306.2)	24.68 (608.8)	3.37	95.66	69.68	60.22	7.20
T_7- Fenoxaprop p ethyl @ 100g/ha	6.71 (44.5)	3.42 (11.3)	3.56 (12.2)	4.35 (18.4)	18.58 (344.9)	5.72 (32.2)	17.56 (307.9)	24.75 (611.9)	3.21	95.30	69.52	60.02	13.65
SEm±	1.53	1.34	1.27	1.24	3.95	2.95	3.20	2.61	1.12	0.14	1.93	1.60	3.81
C.D. at 5%	4.72	4.13	3.91	3.83	12.19	9.10	9.87	8.04	3.45	0.44	5.95	4.94	11.75

Table 2: Effect of herbicide application on growth attributes of barley

Treatments	Plant height (cm)				No. of tillers in running meter				Dry matter accumulation (g)				Leaf area index		
	30 DAS	60 DAS	90 DAS	harvest stage	30 DAS	60 DAS	90 DAS	Harvest stage	30 DAS	60 DAS	90 DAS	Harvest stage	30 DAS	60 DAS	90 DAS
T_1- Weedy check	29.14	40.69	70.01	78.17	41.04	51.78	54.71	44.78	10.69	23.66	28.00	32.75	0.84	2.23	2.67
T_2- Weed free	39.78	60.76	91.92	100.75	51.73	83.69	89.40	77.87	15.88	29.80	35.17	43.95	0.93	4.00	4.07
T_3- Sulfosulfuron @ 25g/ha	35.62	52.55	81.33	90.25	49.41	72.00	75.55	65.19	14.44	25.65	31.60	39.23	0.90	2.93	3.22
T_4- Clodinofop propargyl @ 60g/ha	36.34	50.74	79.51	88.69	48.88	70.78	71.85	60.39	14.34	25.44	31.16	38.98	0.91	2.73	3.23
T_5- Sulfosulfuron @ 25g/ha + hand weeding at 45 DAS	35.57	57.03	88.76	96.58	51.22	80.10	85.40	73.99	15.53	27.44	32.71	41.96	0.92	3.80	3.87
T_6- Clodinofop propargyl @ 60g/ha + hand weeding at 45 DAS	36.75	56.52	87.59	95.22	50.12	78.51	83.58	71.46	15.25	27.13	32.17	41.24	0.92	3.57	3.73
T_7- Fenoxaprop p ethyl @ 100g/ha	36.35	53.28	82.55	90.29	49.59	73.41	78.88	64.15	14.48	25.86	31.47	39.45	0.91	3.07	3.27
SEm±	1.45	2.42	2.98	3.26	1.73	2.53	2.67	2.28	0.43	0.94	1.11	1.38	0.02	0.16	0.23
C.D. at 5%	4.46	7.47	9.18	10.04	5.32	7.79	8.23	6.75	1.35	2.90	3.41	4.25	0.06	0.49	0.72

Result and Discussion

The result of the present study indicated that weed density and weed dry matter and growth parameters of plant such as plant height, number of tillers in running meter, dry matter accumulation, leaf area index of barley crop showed positive correlation with yield and were significantly influenced by different herbicide application (Table 1 and Table 2).

Effect of herbicides on weeds

All the weed control treatments reduce the density of weeds, dry weight of weeds and weed index in comparison to weedy check. Minimum weed density, dry weight of weeds and weed index was recorded in application of herbicide sulfosulfuron @ 25g/ha + hand weeding at 45 DAS which was followed by clodinofop propargyl @ 60g/ha + hand weeding at 45 DAS, it was significantly inferior over rest of treatments at 60, 90 DAS and at harvest stage. The maximum weed density and dry weight of weeds was observed in alone application of clodinofop propargyl @ 60 g/ha among various weed control treatments. However, there was no significantly difference among various weed control treatments at 30 DAS. Post emergence herbicides were used in the treatments, therefore there was no significant difference among weed control treatments before 30 DAS. In the herbicidal treatment of sulfosulfuron @ 25g/ha + hand weeding, it gave best result because sulfosulfuron control both grassy as well as broad leaf weeds and it inhibits ALS enzyme. Herbicidal treatments of clodinofop propargyl reduce minimum weeds because it control only grassy weeds and it inhibits synthesis of Acetyl co enzyme. Similar findings were reported by Hamada *et al.* (2013) and Chaudhary *et al.* (2016)

The various weed control treatments, maximum weed control efficiency was observed in herbicidal treatment of sulfosulfuron @ 25g/ha + Hand weeding at 45 DAS which was closely followed by clodinofop propargyl @ 60 g/ha + Hand weeding at 45 DAS, it was significantly inferior over rest of treatments at 60, 90 DAS and at harvest stage (Table no.4.3). However, there was no significant difference among various weed control treatments at 30 DAS. The minimum weed control efficiency was recorded in alone application of clodinofop propargyl @ 60 g/ha among various weed control treatments. But it is higher than weedy check. The higher WCE might be due to better weed control, which was associated with reduction in weed density and weed dry weight. The application of clodinofop propargyl and sulfosulfuron gave high weed control efficiency. Similar findings were reported by Brar and Walia (2010) and Kumari *et al.* (2013

Effect of herbicide on growth attributes

Among the application of herbicidal treatments, maximum growth attributes were recorded in sulfosulfuron @ 25g/ha + hand weeding at 45 DAS which was followed by clodinofop propargyl @ 60g/ha + hand weeding at 45 DAS and fenoxaprop p ethyl @ 100g/ha, which was significant over all at all the growth stages except 30 DAS. At 30 DAS, there was no significant difference among various weed control treatments. The minimum plant height was observed in weedy check and maximum in weed free. The minimum growth attributes were observed in application of clodinofop propargyl @ 60g/ha among herbicidal treatments. The boosted root and shoot growth parameters due to low weed growth and their competition with crop for several growth factors with the use of herbicides. Hence it increased plant height, number of tillers and dry matter. Also nutrients to these plants were easily available. Due to which plant and number of branches increased, which ultimately increased the dry matter of plants. The reason for higher values of growth parameter can be discussed in the light of fact that crop under these treatments had comparatively less weed competition for growth factors and thereby more availability of growth factors such as light, space, water, nutrients etc which are necessary for the growth and development of crop than other treatments, that resulted in better crop growth and ultimately more dry matter accumulation. Weedy check produced significantly lower plant height and dry matter of barley. This was due to less availability of nutrients thereby reduction in dry

matter of plants. And the reason for lower values of growth parameters incase of alone application of clodinofop propargyl @ 60 g/ha was that it only reduce grassy weeds and have no effect on second flux of weeds. Similar results were also reported by Brar and Walia (2010) and Chaubey *et al*. (2014)

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