

## Research Article

# Effect of Chemical Herbicides and Mechanical Practices on Yield, Yield Attributes and Economics of Barley (*Hordeum vulgare* L.) in Valley Conditions of Dehradun

Kuldeep Kumar, Anil Kumar, Mayank Sharma, Abhishek Kumar Tyagi, Arnab Khanda\* and C. S. Pandey

Department of Agriculture, Dolphin (P.G.) Institute of Biomedical & Natural Sciences, Manduwala, Dehradun - 248007

## Abstract

The field study was taken on barley cv. RD-2035 at Dolphin (P.G.) Institute of Biomedical & Natural Sciences, Manduwala (Dehradun) during *Rabi* season 2020-21 using 8 treatments viz. Clodinafop @ 50 gm a.i./ha at 25 DAS (T<sub>1</sub>), Clodinafop @ 50 gm a.i./ha at 25 DAS + 1 hand weeding at 50 DAS (T<sub>2</sub>), 2,4 D @ 500 gm a.i./ha at 25 DAS (T<sub>3</sub>), 2,4 D @ 500 gm a.i./ha at 25 DAS + 1 hand weeding at 50 DAS (T<sub>4</sub>), Metribuzin @ 180 gm a.i./ha at 25 DAS (T<sub>5</sub>), Metribuzin @ 180 gm a.i./ha at 25 DAS + 1 hand weeding at 50 DAS (T<sub>6</sub>), Two hand weeding at 25 DAS and 50 DAS taken as weed free (T<sub>7</sub>) and weedy check (T<sub>8</sub>) in Randomized Block Design replicated thrice. Results interpreted that treatment T<sub>7</sub> had superior results in yield & yield parameters viz. number of spikes meter<sup>-2</sup>, ear length, grains ear<sup>-1</sup>, test weight, grain yield, straw yield, biological yield, harvest index and economics viz. gross returns, net returns and benefit cost ratio than other treatments.

**Keywords:** Chemical Herbicides, Mechanical Practices, Barley

## \*Correspondence

Author: Arnab Khanda  
Email: arnabkhanda@gmail.com

## Introduction

Barley (*Hordeum vulgare* L.) is an agricultural commodity farmed around the world in subtropical and temperate climates. Barley is one of the earliest cultivated grain crops, and it currently ranks fourth in terms of land and crop global production, behind rice, wheat and maize. It is primarily grown in areas with harsh climate and soil factors. It can endure unfavourable agro-environments such as droughts, alkalinity, salinity, diverse terrain such as flat and hills, rainfed and irrigated conditions due to its hardy nature [1]. Weeds are well known pests that diminish agricultural productivity by competing for nutrients, moisture, light and space with crops. [2] found that depending on the extent of weed infestation, barley yield decreased from 20.9 percent to 58.3 percent in experimental results. The weed flora is altering in a very way that several different forms of weeds are infesting crops at the same time. Because of higher dose required for raising the weed death spectrum, just no herbicide will just able to suppress many different kinds of weeds without causing crop injury. Some weeds like *Cirsium arvense* and *Convolvulus arvensis* are resistant to herbicides that kill grasses, and the use of isoproturon has inflated the intensity of *Anagallis arvensis* in the treated fields [3]. Herbicides combined with mechanical techniques like as hand weeding aid in crop quality management as well. During the *Rabi* season of 1999 and 2000, [4] carried out a 2-year field study to evaluate the effectiveness of two barley genotype and their responses to hand-weeding and spraying of the 2,4-dichlorophenoxy acetic acid (2,4-D) at critical growth stages. In both seasons, there were vast variations in weed quantity and fresh weight among the treatments. Weeding by hand was found to be the most effective way of weed management. Hand-weeding treatment was more effective than 2,4-D applications in suppressing weed growth. Keeping the above facts in view, the present study was conducted to study the effect of chemical herbicides and mechanical practices on yield, yield attributes and economics of barley crop.

## Methods and Material

The field trail was conducted during winter (*Rabi*) season 2020-21 at experimental field of Dolphin (P.G.) Institute of Biomedical & Natural Sciences, Manduwala (Dehradun) Uttarakhand on barley cv. RD-2035 with 8 treatments viz. Clodinafop @ 50 gm a.i./ha at 25 DAS (T<sub>1</sub>), Clodinafop @ 50 gm a.i./ha at 25 DAS + 1 hand weeding at 50 DAS (T<sub>2</sub>), 2,4 D @ 500 gm a.i./ha at 25 DAS (T<sub>3</sub>), 2,4 D @ 500 gm a.i./ha at 25 DAS + 1 hand weeding at 50 DAS (T<sub>4</sub>), Metribuzin @ 180 gm a.i./ha at 25 DAS (T<sub>5</sub>), Metribuzin @ 180 gm a.i./ha at 25 DAS + 1 hand weeding at 50 DAS (T<sub>6</sub>), Two hand weeding at 25 DAS and 50 DAS taken as weed free (T<sub>7</sub>) and weedy check (T<sub>8</sub>). It was conducted in Randomized Block Design and replicated thrice. The climate of Dehradun is moderate with cool winters, warm summers, rainy monsoon and balmy spring due to hilly reason or cooler with increase with altitude. Crop was sown

by Kera method with 100 kg/ha seed rate with spacing of 20×5 cm in plot size of 5×3 m<sup>2</sup>. Both the cultural and nutritional management procedures were completed on time. No major insects and diseases were seen during the experiment and periodical observations were made in order to evaluate the impact of various treatments on yield & yield studies viz. number of spikes meter<sup>-2</sup>, ear length, grains ear<sup>-1</sup>, test weight, grain yield, straw yield, biological yield, harvest index and economics viz. gross returns, net returns and benefit cost ratio as per schedule and yield was calculated on plot basis.

## Results and Discussion

### Yield & Yield attributes

Yield and yield attributes are the resultant of the vegetative and reproductive development of the plants. The entire yield & yield attributes viz. number of spikes meter<sup>-2</sup>, ear length, grains ear<sup>-1</sup>, test weight, grain yield, straw yield, biological yield, harvest index increased with weed management practices over weed check (T<sub>8</sub>). The significantly highest values were recorded with two hand weeding at 25 DAS and 50 DAS (T<sub>7</sub>) over other treatments shown in **Tables 1** and **2**. This might be due to better availability of nutrient moisture, space, nutrients and light which resulted better growth and development of plants and less competition for different resources resulted more translocation of food from source to sink relationship. These results are more or less in accordance with [5-8] and they reported the similar results of weed management practices in wheat crop and [9, 10] on barley.

**Table 1** Effect of Chemical and mechanical weed control on Yield attributes

Treatments	Number of spikes / m <sup>2</sup>	Ear length (cm)	Grain ear <sup>-1</sup>	Test weight (g)	Biological yield (q/ha)	Harvest index (%)
T <sub>1</sub>	381.48	8.97	42.67	34.93	92.77	42.23
T <sub>2</sub>	385.47	9.37	43.70	36.13	99.83	43.06
T <sub>3</sub>	373.31	8.10	41.53	33.93	84.94	41.48
T <sub>4</sub>	383.19	9.27	43.20	35.27	94.98	42.41
T <sub>5</sub>	377.36	8.50	41.87	34.07	87.80	41.90
T <sub>6</sub>	384.97	9.33	43.63	35.50	97.77	42.71
T <sub>7</sub>	391.78	9.97	46.67	36.57	102.05	43.60
T <sub>8</sub>	368.05	6.93	37.03	33.63	76.30	41.45
C.D (5%)	3.97	0.60	2.33	1.27	2.91	0.95
S.E.(m)	1.29	0.20	0.76	0.41	0.95	0.31

**Table 2** Effect of Chemical and mechanical weed control on Yield and Economics

Treatments	Grain Yield (q/ha)	Straw Yield (q/ha)	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio
T <sub>1</sub>	39.17	53.60	34725.00	97306	62581	1.80
T <sub>2</sub>	42.98	56.84	37650.00	105784	68134	1.81
T <sub>3</sub>	35.23	49.70	34825.00	88264	53439	1.53
T <sub>4</sub>	40.28	54.71	37825.00	99859	62034	1.64
T <sub>5</sub>	36.79	51.01	35125.00	91727	56602	1.61
T <sub>6</sub>	41.76	56.01	37725.00	103173	65448	1.73
T <sub>7</sub>	44.50	57.55	42125.00	108875	66750	1.58
T <sub>8</sub>	31.62	44.68	33625.00	79256	45631	1.36
C.D.	1.41	1.99	-	-	-	-
SE(m)	0.46	0.65	-	-	-	-

### Economics

The maximum gross return of (Rs 108875 /ha) was obtained with two hand weeding at 25 DAS and 50 DAS (T<sub>7</sub>) followed by Clodinafop @50 g a.i./ha at 25 DAS + 1 hand weeding at 50 DAS against lowest gross income of (Rs 79256 /ha) of weedy check. Post- emergence application of Clodinafop @50 g a.i./ha at 25 DAS + 1 hand weeding at 50 DAS recorded the highest net return (Rs 68134/ha) closely followed by two hand weeding at 25 DAS and 50 DAS (Rs 66750 /ha) and against lowest net return (Rs 45631 /ha) noted with weedy check treatment (T<sub>8</sub>). Clodinafop @50 g a.i./ha at 25 DAS + 1 hand weeding at 50 DAS (T<sub>2</sub>) recorded the highest benefit cost ratio of (1.81), followed by Clodinafop @50 g a.i./ha at 25 DAS (1.80) while minimum under as weedy check of (1.36). The weed free (T<sub>7</sub>) was not found to be economical in comparison to other herbicidal treatments because of its high expenditure involved in

keeping the plots free from weeds. In the herbicides, the better net return and net return per rupee investment was mainly due to less increase in cost of cultivation with these treatments compare to weed free. These findings are more or less similar with the findings of [11, 12] in wheat crop under various chemical herbicide applications.

## Conclusion

One season data showed that two hand weeding at 25 DAS and 50 DAS gave maximum economic yield and other yield attributes but maximum net income and benefit cost ratio was obtained in Clodinafop @50 g a.i./ha at 25 DAS + 1 hand weeding at 50 DAS due to chemical application cost is low and hand weeding cost of labour is very high. It showed that chemical herbicide application can be good practice to save time and economic value.

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