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# Chemical weed control in barley

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**ABSTRACT**

A field experiment was conducted during the *Rabi* season of 2008-09 and 2009-10 on sandy loam soils of research farm of Regional Station, Bathinda to find out response of different varieties of barley and various combinations of herbicides on growth, weed dry matter and grain yield of barley under semi arid conditions of Punjab. The experiment was laid out in split plot design with two varieties in main plots and 12 different herbicide combinations in sub plots. The grain yield had no significant difference with respect to two varieties but it varied significantly with various combinations of herbicides. The maximum mean grain yield *i.e.* 3.46 t/ha was recorded in pinoxaden + metsulfuron 50 + 4 g/ha ($T_4$) followed by metsulfuron *fb* pinoxaden 4 + 50 g/ha, metsulfuron *fb* pinoxaden 4 + 45 g/ha and lowest (2.31 t/ha) in control. The dry weight of weed flora was significantly higher in control plots as compared to other treatments during both the years and no significant difference was observed in both the varieties with respect to dry weight of weed flora .

**Key words**: Barley, Chemical weed control, Yield

Barley (*Hordeum vulgare* L.) is an important crop which is grown for grain and malt purpose in Punjab on an area of 14 thousand ha with production of 47 thousand tonnes with average yield of 3.47 t/ha (Anonymous 2010). Most of the barley area is confined to semi-arid region having scarcity of water due to its low water requirement. Weed management is essential for better grain yield due to their competition for nutrients, water, space and sunlight. The yield reduction in barley depends upon the type and density of associated weed flora (Walia and Brar 2001). Among the grass weeds, wild oats (*Avena ludoviciana*) can cause yield reduction in irrigated barley from 15-50% (Gill and Brar 1975). Similarly, *Chenopodium album*, *Lepidium sativa*, *Anagallis arvensis* and other broadleaf weeds also compete with this crop causing yield reduction up to 25%. The application of 2,4-D for the control of broad-leaf weeds in wheat seems to be less effective against some broad-leaf weeds (Punia *et al*. 2006). The post-emergence herbicide pinoxaden at 40-60 g/ha was very effective against *Avena ludoviciana* and resistant population of *Phalaris minor* without any phytotoxicity to barley crop (Singh and Punia 2007, Chhokar *et al*. 2008). In Punjab, both grass and broad-leaf weeds are becoming problem in barley crop. Therefore, there was dire need to test some broad spectrum herbicides so that effective weed control can be achieved in barley.

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## MATERIALS AND METHODS

A field experiment was conducted during the *Rabi* season of 2008-09 and 2009-10 on sandy loam soils of research farm of Regional Station, Bathinda to find out the chemical weed control in barley. The treatments were laid out in split plot design with two varieties, *viz*. '*PL-426*' and '*DWRUB-52*' in main plots and different herbicide combinations, *viz*. pinoxaden 40 g/ha 35 DAS ($T_1$), pinoxaden 50 g/ha 35 DAS ($T_2$), pinoxaden + metsulfuron 40 + 4 g/ha 35 DAS ($T_3$), pinoxaden + metsulfuron 50 + 4 g/ha 35 DAS ($T_4$), metsulfuron *fb* pinoxaden 4 *fb* 40 g/ha ($T_5$), metsulfuron *fb* pinoxaden 4 *fb* 45 g/ha ($T_6$), metsulfuron *fb* pinoxaden 4 *fb* 50 g/ha ($T_7$), pinoxaden + carfentrazone 40 +20 g/ha ($T_8$), pinoxaden + carfentrazone 50 + 20 g/ha ($T_9$), carfentrazone 20 g/ha ($T_{10}$), weed free ($T_{11}$) and control ($T_{12}$) in sub plots with three replications. The observations for weed population and their dry matter accumulation were recorded at 90 DAS with the help of quadrat (0.5 x 0.5 m) at two random places in a plot and then converted into per $m^2$. These data were subjected to square root transformation to normalize their distribution before analysis. Data on yield attributes and grain yield of barley were recorded at harvest which were statistically analysed.

## RESULTS AND DISCUSSION

The field had infestation of both grasses and broad-leaf weeds, with the dominance of *Phalaris minor, Avena ludoviciana, Melilotus indica*, *Chenopodium album, Chenopodium murale, Euphorbia helioscopa, Anagallis arvensis, Spergula arvensis, Convolvulus arvensis, Coronopus didymus, Rumex dentatus, Asphodelus tenuifolius, Cirsium arvense, Lathyrus aphaca* and *Vicia sativa.*

The plant height varied significantly with varieties and herbicide combinations. Significantly higher plant height was recorded in '*PL 426*' as compared to '*DWRUB 52*'. The highest plant height was recorded where metsulfuron *fb* pinoxaden 4 *fb* 50 g/ha ($T_7$) was applied and it was at par with other herbicide combinations during 2008-09. During 2009-10, metsulfuron *fb* pinoxaden 4 *fb* 50 g/ha ($T_7$) recorded higher plant height which was at par with pinoxaden + metsulfuron 50 + 4 g/ha ($T_4$), metsulfuron *fb* pinoxaden 4 *fb* 45 g/ha ($T_6$) and pinoxaden + carfentrazone 50 + 20 g/ha ($T_9$) and significantly higher than other treatments (Table 1).

The two varieties had no significant effect on number of tillers/m length, but herbicides combination had significant effect on it during both years. The number of tillers/m length were recorded to be higher in pinoxaden + carfentrazone 40 + 20 g/ha ($T_8$), metsulfuron *fb* pinoxaden 4 *fb* 45 g/ha ($T_6$), pinoxaden + metsulfuron 40 + 4 g/ha ($T_3$), pinoxaden 50 g/ha ($T_2$) and significantly higher than control ($T_{12}$). During 2008-09 and during 2009-10, application of metsulfuron *fb* pinoxaden 4 *fb* 50 g/ha ($T_7$) gave maximum number of tillers/m length which was significantly higher than application of Pinoxaden 50 g/ha ($T_2$) and pinoxaden+ metsulfuron 40 + 4 g/ha ($T_3$).

The number of grains/spike did not vary significantly in both the varieties during both the years of study, but herbicide combinations had significant effect on it. Metsulfuron *fb* pinoxaden 4 *fb* 50 g/ha ($T_7$) gave maximum number of grains/spike which was significantly higher than Pinoxaden 40 g/ha ($T_1$), metsulfuron *fb* pinoxaden 4 *fb* 40g/ha ($T_5$), pinoxaden + carfentrazone 40 + 20 g/ha ($T_8$) and unweeded control ($T_{12}$) during 2008-09. The number of grains/spike was maximum with the application of pinoxaden + metsulfuron 50 + 4 g/ha ($T_4$) and significantly higher than application of pinoxaden + carfentrazone 40 + 20 g/ha ($T_8$), pinoxaden + carfentrazone 50 + 20 g/ha ($T_9$), weed free ($T_{11}$) and control ($T_{12}$) and statistically at par with other herbicide combinations during 2009-10 (Table 1).

The grain yield had no significant difference with respect to two varieties but it varies significantly with various combinations of herbicides. The maximum grain yield (3.39 t/ha) was recorded in pinoxaden + metsulfuron 50 + 4 g/ha ($T_4$), which was at par with pinoxaden+ metsulfuron 40 + 4 g/ha ($T_3$), pinoxaden 50 g/ha ($T_2$), pinoxaden + metsulfuron 50 + 4 g/ha ($T_4$), metsulfuron *fb* pinoxaden 4 *fb* 45 g/ha ($T_6$), metsulfuron *fb* pinoxaden 4 *fb* 50 g/ha ($T_7$), carfentrazone 20 g/ha ($T_{10}$) and weed free ($T_{11}$), but significantly higher than pinoxaden 40 g/ha ($T_1$), metsulfuron *fb* pinoxaden 4 *fb* 40 g/ha ($T_5$), pinoxaden + carfentrazone 40 + 20 g/ha ($T_8$), pinoxaden +

**Table 1. Effect of different varieties and herbicides on weed dry weight, growth and yield of barley**

| Treatment | Plant height (cm) | | No. of tillers/m length | | No. of grains/ spike | | Biomass yield t/ha | | Weed dry weight (t/ha) | | Grain yield (t/ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 08-09 | 09-10 | 08-09 | 09-10 | 08-09 | 09-10 | 08-09 | 09-10 | 08-09 | 09-10 | 08-09 | 09-10 | Mean |
| Varieties | | | | | | | | | | | | | |
| $V_1$ | 70.3 | 64.5 | 73.9 | 71.6 | 57.1 | 35.4 | 6.96 | 7.20 | 0.10 | 0.10 | 3.05 | 3.25 | 3.15 |
| $V_1$ | 88.4 | 71.4 | 77.9 | 73.1 | 59.7 | 41.8 | 7.10 | 8.31 | 0.10 | 0.10 | 3.13 | 3.16 | 3.15 |
| LSD (p=0.05) | 4.5 | 3.7 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | |
| Herbicide treatment | | | | | | | | | | | | | |
| $T_1$ | 78.4 | 67.4 | 74.2 | 75.5 | 57.0 | 39.2 | 7.14 | 7.05 | 0.10 | 1.00 | 2.80 | 2.83 | 2.83 |
| $T_2$ | 80.9 | 63.5 | 74.4 | 63.3 | 58.7 | 41.2 | 6.84 | 7.58 | 0.10 | 1.02 | 3.16 | 3.26 | 3.21 |
| $T_3$ | 81.2 | 68.3 | 75.3 | 64.8 | 58.7 | 40.8 | 7.23 | 8.26 | 0.10 | 1.00 | 3.25 | 3.30 | 3.34 |
| $T_4$ | 79.4 | 73.5 | 77.6 | 73.5 | 60.2 | 41.8 | 7.41 | 8.11 | 0.10 | 1.00 | 3.39 | 3.52 | 3.46 |
| $T_5$ | 78.1 | 68.8 | 77.0 | 71.9 | 57.3 | 39.3 | 6.93 | 7.82 | 0.10 | 1.02 | 2.91 | 3.54 | 3.23 |
| $T_6$ | 78. 2 | 72.7 | 75.3 | 74.7 | 61.5 | 40.3 | 7.37 | 8.25 | 0.10 | 1.01 | 3.36 | 3.43 | 3.40 |
| $T_7$ | 82.6 | 75.1 | 80.6 | 76.6 | 63.0 | 41.0 | 7.52 | 8.10 | 0.10 | 1.00 | 3.23 | 3.57 | 3.40 |
| $T_8$ | 80.2 | 68.8 | 76.0 | 72.3 | 57.2 | 34.8 | 7.08 | 8.59 | 0.10 | 1.02 | 2.85 | 3.02 | 2.94 |
| $T_9$ | 81.7 | 70.5 | 76.5 | 71.5 | 59.3 | 36.3 | 7.23 | 7.37 | 0.10 | 1.00 | 3.02 | 3.20 | 3.11 |
| $T_{10}$ | 80.0 | 68.2 | 72.2 | 71.0 | 60.2 | 35.7 | 6.64 | 8.70 | 0.10 | 1.03 | 3.19 | 3.24 | 3.22 |
| $T_{11}$ | 76.9 | 61.2 | 78.7 | 71.7 | 58.7 | 38.5 | 6.93 | 7.34 | 0.30 | 4.00 | 3.06 | 3.01 | 3.03 |
| $T_{12}$ | 74.6 | 58.0 | 70.4 | 71.7 | 56.7 | 33.8 | 6.05 | 5.90 | 1.10 | 1.00 | 2.24 | 2.38 | 2.31 |
| LSD (P=0.05) | 6.9 | 5.8 | 4.5 | 9.1 | 4.5 | 4.2 | NS | NS | 0.03 | 0.2 | 0.36 | 0.45 | |

carfentrazone 50 + 20 g/ha ($T_9$) and control ($T_{12}$) during 2008-09. However, during 2009-10, metsulfuron *fb* pinoxaden 4 *fb* 50 g/ha ($T_7$) recorded maximum grain yield (3.57 t/ha) which was significantly higher than pinoxaden 40 g/ha ($T_1$), pinoxaden + carfentrazone 40 +20 g/ha ($T_8$), weed free ($T_{11}$) and control ($T_{12}$) and at par with other herbicide combinations (Table 1). Biomass yield (t/ ha) did not vary significantly in varieties and various herbicides combinations during both the years of study. The highest biomass yield was recorded with the application of pinoxaden + metsulfuron 50 + 4 g/ ha ($T_4$) and pinoxaden + carfentrazone 40 + 20 g/ha ($T_8$) during 2008-09 and 2009-10 respectively. The dry weight of weed flora was significantly higher in control plots than other treatments during both the years and did not vary significantly due to varieties.

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