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# Performance of Cultivars and Sulfosulfuron against Weeds in Wheat

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## ABSTRACT

Based on two years' field investigation, it was found that sulfosulfuron at 25 g/ha reduced density and dry weight of total weeds to the extent of more than 70% at different growth stages of wheat. This led to a significant increase in the number of effective tillers, 1000-grain weight and ultimately grain of wheat. However, grain yields of wheat were significantly more in the plots kept weed free throughout the crop season. Among 10 wheat cultivars, PBW 343, WH 542 and HD 2687 being at par with each other proved more competitive against weeds and consequently produced more grain yield. Whereas WH 711, WH 533 and Raj 3765 turned out to be poor competitors and lower yielders. On an average, weeds reduced the grain yield of wheat to the tune of 22% over the years.



## INTRODUCTION

Crop species and cultivars are known to differ in their competitiveness with weeds (Lemerle *et al.*, 1995). Development of cultivars need to be targeted to shift the competition in favour of crop rather than weeds. Competitive cultivars can be adopted by the farmers as a part of integrated weed management at little or no additional cost. Rapid germination, early vigour and height gain with high tillering capacity and quick canopy cover are some of the characteristics of a good competitive wheat cultivar (Brar and Singh, 1997; Walia, 2002). Competitive wheat cultivar coupled with suitable herbicide may lead to recruitment of less seed bank. Keeping these points in view, the present investigation was planned to identify the most competitive wheat cultivar and also to evaluate the performance of sulfosulfuron against weeds.

## MATERIALS AND METHODS

To study the impact of different wheat cultivars and sulfosulfuron against weeds, a field experiment was conducted at Research Farm of CCS Haryana Agricultural University, Hisar, India during 2002-03 and 2004-05. During 2003-04, the experiment could not be conducted properly due to certain unavoidable circumstances and natural calamities. The soil of the experimental field was sandy loam in texture, slightly alkaline in reaction (pH 7.4), low in O.C. and available N, medium in $P_2O_5$ and high in $K_2O$. The experiment comprising three weed control treatments (sulfosulfuron 25 g/ha, weed free and weedy check) in main plots and 10 wheat cultivars (WH 711, WH 533, WH 147, WH 283, WH 542, WH 416, PBW 343, Raj 3765, UP 2338 and HD 2687) in sub-plots was laid out in split plot design with four replications. The crop was sown on 11 and 15 November during first and second year, respectively. The seed rate of 100 kg/ha and row to row spacing of 20 cm was kept uniform for all the cultivars. Sulfosulfuron (Leader, 75% WP, Monsanto) at 25 g/ha was sprayed at 32 to 35 DAS with the help of knapsack sprayer fitted with multiple flat fan nozzle boom in a spray volume of 600 l water/ha. The crop was raised with all recommended package of practices. The data on density and dry weight of weeds were recorded at 60, 90 and 120 DAS by randomly placing two quadrates/plot. All the weeds/plot were first counted and then oven dried to record dry matter accumulation. Effective tillers, 1000-grain weight and grain yield were also recorded to draw valuable conclusions.

## RESULTS AND DISCUSSION

### Effect on Weeds

The experimental field was infested with grassy (84%) as well as broad-leaf weeds (16%) during both the years. Grassy weeds comprised mainly little seed canary grass (*Phalaris minor*) 57% and wild oat (*Avena ludoviciana*) 27% of total weed flora. Among dicots, jangli palak (*Rumex maritimus*), krishanneel (*Anagallis arvensis*), bathu (*Chenopodium album*), pithpapra (*Coronopus didymus*), metha (*Melilotus alba*), hirankhuri (*Convolvulus arvensis*) and gajri (*Fumaria parviflora)* were the prominent broadleaf weeds.

Grassy weeds continued to increase upto 90 DAS and declined thereafter, while the broadleaf weeds increased upto 60 DAS and declined thereafter, and similar trend was reflected in case of population of total weeds (Table 1). Sulfosulfuron 25 g/ha reduced the density of total weeds to the extent of 72.3%. Among wheat cultivars, PBW 343 being at par with WH 542 and HD 2687 recorded significantly lower weed density. Next best or medium competitive group includes WH 147, WH 283, WH 416 and UP 2338. However, the cultivars like WH 711 closely followed by WH 533 and Raj 3765 proved least competitive. Similar results have been realized earlier also (Chauhan *et al.,* 2001; Malik *et al.,* 2002).

During 2002-03, sulfosulfuron at 25 g/ha reduced the dry matter accumulation of total weeds upto the extent of 63.5, 71.4 and 70.3% at 60, 90 and 120 DAS, respectively (Table 2). Almost identical trend in this respect was preserved in 2004-05 also. Sulfosulfuron has been reported to be very effective against grassy weeds (Malik and Yadav, 1997) and to some extent against broadleaf weeds (Malik *et al.,* 2000). Impact of different wheat cultivars on dry matter accumulation of total weeds followed similar trend as in case of weed density. Wheat cultivars with more number of tillers and consequently more dry matter accumulation allowed lower intensity, thereby lowering dry matter accumulation of weeds (Table 2).

**Effect on Crop**

Number of effective tillers per metre row length, 1000-grain weight and grain yield of wheat were found to be maximum and minimum in weed free and weedy check plots, respectively. Sulfosulfuron 25 g/ha significantly improved yield and yield attributes compared to untreated check during both the years (Table 2). PBW 543, WH 542 and HD 2687 being at par with each attained more number of spikes/m. r. l., whereas WH 711 and WH 533 proved inferior in this respect. The trend in terms of 1000-grain weight among wheat cultivars was WH 711 > WH 283 > PBW 343 > Raj 3765 > WH 416 > WH 147 > HD 2687 > WH 542 > WH 533 > UP 2338 during first year and more or less similar trend was observed in second year.

The highest grain yields of 5605 and 5971 kg/ha were recorded in weedy check (Table 2). Weeds allowed to grow throughout the crop season caused around 22% reduction in the grain yield of wheat. Sulfosulfuron increased the grain yield of wheat to the

Table 1. Effect of weed control treatments and wheat cultivars on density (No./$m^2$) of total weeds in wheat at different growth stages

| Treatment | Days after sowing | | | | | |
|---|---|---|---|---|---|---|
| | 60 | | 90 | | 120 | |
| | 2002-03 | 2004-05 | 2002-03 | 2004-05 | 2002-03 | 2004-05 |
| **Weed control** | | | | | | |
| Sulfosulfuron 25 g/ha | 7.1 (50.8) | 6.4 (40.7) | 7.0 (48.5) | 6.4 (40.2) | 6.7 (44.6) | 6.3 (38.8) |
| Weed free | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) |
| Weedy check | 13.2 (176.0) | 12.1 (146.8) | 12.9 (167.9) | 12.1 (146.1) | 12.7 (160.9) | 12.2 (149.8) |
| LSD (P=0.05) | 0.8 | 0.4 | 0.5 | 0.2 | 0.5 | 0.2 |
| **Wheat cultivars** | | | | | | |
| WH 711 | 8.1 (100.4) | 7.3 (78.8) | 7.8 (89.3) | 7.0 (72.1) | 7.6 (85.3) | 6.9 (71.6) |
| WH 533 | 7.9 (93.7) | 7.0 (72.8) | 7.6 (84.4) | 6.9 (68.8) | 7.4 (81.2) | 6.8 (68.0) |
| WH 147 | 6.9 (70.0) | 6.3 (58.4) | 6.8 (69.0) | 6.2 (56.3) | 6.6 (65.3) | 6.2 (56.4 |
| WH 283 | 7.1 (74.4) | 6.4 (60.5) | 6.9 (70.9) | 6.1 (54.5) | 6.7 (67.1) | 6.3 (59.2) |
| WH 542 | 6.3 (59.0) | 6.0 (53.0) | 6.3 (58.2) | 5.9 (51.3) | 6.1 (54.5) | 5.9 (51.7) |
| WH 416 | 7.2 (75.6) | 6.5 (61.6) | 7.0 (72.1) | 6.4 (61.1) | 6.8 (68.1) | 6.5 (61.8) |
| PBW 343 | 6.2 (56.2) | 5.9 (50.8) | 6.2 (57.3) | 6.8 (49.6) | 6.0 (54.1) | 6.0 (54.2) |
| Raj 3765 | 7.6 (87.1) | 6.9 (71.6) | 7.4 (84.2) | 7.1 (75.9) | 7.3 (80.4) | 7.0 (74.6) |
| UP 2338 | 7.3 (80.5) | 6.6 (64.4) | 7.1 (74.6) | 6.9 (71.5) | 6.9 (71.0) | 6.9 (71.0) |
| HD 2687 | 6.4 (59.1) | 6.0 (53.4) | 6.4 (61.3) | 6.4 (59.8) | 6.2 (58.0) | 6.4 (60.3) |
| LSD (P=0.05) | 0.7 | 0.4 | 0.6 | 0.5 | 0.6 | 0.5 |

Original data given in parentheses were subjected to square root transformation before analysis.

Table 2. Effect of weed control treatments and wheat cultivars on dry weight of total weeds, yield components and yield

| Treatment | Dry weight of weeds ($g/m^2$) | | | | | | Effective tillers (No./m. r. l.) | | 1000-grain weight (g) | | Grain yield (kg/ha) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 DAS | | 90 DAS | | 120 DAS | | | | | | | |
| | 2002-03 | 2004-05 | 2002-03 | 2004-05 | 2002-03 | 2004-05 | 2002-03 | 2004-05 | 2002-03 | 2004-05 | 2002-03 | 2004-05 |
| **Weed control** | | | | | | | | | | | | |
| Sulfosulfuron 25 g/ha | 30.3 | 24.1 | 62.1 | 54.6 | 71.6 | 63.1 | 99.4 | 100.4 | 40.6 | 42.7 | 5228 | 5399 |
| Weed free | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 104.5 | 105.1 | 41.0 | 43.4 | 5605 | 5971 |
| Weedy check | 81.8 | 57.1 | 218.2 | 196.6 | 241.3 | 217.1 | 86.2 | 87.7 | 38.7 | 42.0 | 4387 | 4601 |
| LSD (P=0.05) | 5.4 | 7.0 | 8.6 | 9.4 | 9.4 | 12.4 | 4.8 | 5.1 | 1.8 | 0.5 | 247 | 126 |
| **Wheat Cultivars** | | | | | | | | | | | | |
| WH 711 | 45.4 | 40.6 | 109.1 | 96.2 | 120.6 | 107.3 | 81.6 | 83.7 | 44.0 | 43.2 | 4829 | 5108 |
| WH 533 | 42.6 | 37.4 | 104.3 | 91.4 | 115.5 | 101.3 | 84.3 | 85.7 | 38.0 | 41.1 | 4743 | 4813 |
| WH 147 | 35.8 | 29.8 | 90.1 | 75.8 | 101.1 | 85.4 | 99.5 | 101.7 | 38.4 | 41.6 | 4860 | 5297 |
| WH 283 | 36.1 | 30.5 | 93.0 | 79.2 | 104.1 | 89.8 | 97.3 | 99.0 | 43.9 | 43.3 | 4880 | 4934 |
| WH 542 | 32.8 | 27.7 | 79.8 | 67.6 | 89.6 | 76.7 | 104.8 | 106.0 | 38.1 | 41.9 | 5605 | 5933 |
| WH 416 | 36.6 | 31.0 | 94.8 | 82.8 | 105.4 | 96.6 | 97.0 | 98.3 | 39.3 | 42.5 | 5025 | 5207 |
| PBW 343 | 31.5 | 25.6 | 78.0 | 67.1 | 88.8 | 66.7 | 107.8 | 107.7 | 43.1 | 44.0 | 5713 | 6018 |
| Raj 3765 | 41.5 | 35.5 | 103.3 | 100.6 | 114.4 | 111.8 | 91.2 | 92.0 | 40.0 | 43.6 | 4548 | 4821 |
| UP 2338 | 38.8 | 32.9 | 98.5 | 95.5 | 108.3 | 106.0 | 98.3 | 99.0 | 37.4 | 42.4 | 4975 | 5177 |
| HD 2687 | 32.8 | 26.5 | 83.7 | 80.8 | 95.1 | 92.6 | 103.5 | 104.3 | 38.2 | 43.2 | 5557 | 5927 |
| LSD (P=0.05) | 4.2 | 3.6 | 9.0 | 8.9 | 9.8 | 9.7 | 8.1 | 5.3 | 1.8 | 1.1 | 420 | 125 |

tune of 28-30% over weedy check.

Wheat cultivars showed a significant difference in grain yield (Table 2) due to differential competing ability and their yield potentials. The grain yield ranking of various cultivars was observed as PBW 343 > WH 542 > HD 2687 > WH 416 > UP 2338 > WH 283 > WH 147 > WH 711 > WH 533 > Raj 3765 resistering that PBW 343 (5713 and 6018 kg/ha) was the best yielder, while Raj 3765 (4548 and 4821 kg/ha) was the poor yielder. These results are in close conformity of earlier findings (Chauhan *et al.,* 2001; Malik *et al.,* 2002).

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