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# Persistence of Herbicides Applied to Control *Phalaris minor* in Wheat

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The continuous adoption of rice-wheat cropping system in wheat growing regions has led to the problem of *Phalaris minor* as a troublesome weed of wheat (Brar and Walia, 1993). Isoproturon remained most popular with the farmers during last two decades. However, due to its long continuous use, it is not providing satisfactory control on the farmers' field due to the development of resistance (Walia *et al.*, 1997). Therefore, a study was conducted on management of herbicide resistance in *P. minor* in wheat using different herbicides. As persistence of herbicides is an important consideration of its use in arable farming, this study was undertaken to detect the persistence of herbicides at biologically active doses in soil of wheat crop at different time intervals using bioassay technique.

A field experiment was conducted at research farm of JNKVV campus, College of Agriculture, Gwalior in **rabi** seasons of 2003-04 and 2004-05 with 12 treatments (Table 1). The experimental soil was sandy loam (Inceptisol) having sand 55.2%, silt 19.4% and clay 25.4%. The crop was sown on 18 November and 26 December and harvested on 25 March and 4 April in the years 2003-04 and 2004-05, respectively. The variety MP 4010 was raised in both the years. All the treatments (Table 1) were applied at 30 DAS. The replicated soil samples from 0-15 cm depth from all the treatments were collected at 0, 15, 30, 45 and 60 days after application (DAA) of herbicides and after harvest of crop to study the persistence of herbicides in soil. The soils immediately after sampling were dried in shade, ground with morter and pestle and passed through 2 mm sieve. Cucumber was used as indicator plant. The soils were filled in pots of 500 g capacity and 10 seeds of cucumber were sown in each pot. After seven days of sowing, the plants were thinned to five plants in each pot. Pots were watered as and when required. The response of herbicides was evaluated 25 days after sowing by harvesting the shoot portion and obtaining plant height, fresh weight and dry weight of cucumber plants.

Plant height, fresh weight and dry weight of test plant reduced significantly due to herbicides upto 45 DAA (Table 1). At 0, 15 and 30 DAA, the plant height significantly reduced due to all the herbicides except isoproturon + 2, 4-D (isogourd) at 30 DAA. Fresh weight and dry weight of cucumber were also reduced significantly at 0 and 15 DAA due to all the herbicides except isoproturon at 15 DAA. At 30 DAA, maximum significant reduction in fresh and dry weight of test plant was recorded due to sulfosulfuron followed by metsulfuron, metsulfuron+isoproturon and metribuzin. Sulfosulfuron and metsulfuron significantly reduced all the growth parameters at 45 DAA. At 60 DAA and after harvest of wheat crop the effect due to all the herbicides was non-significant. From the above, it may be concluded that sulfosulfuron and metsulfuron applied to wheat persisted in soil upto 45 days, isoproturon, fenoxaprop-ethyl, metribuzin, metsulfuron+isoproturon, clodinafop and clodinafop+metribuzin persist for 30 days, while isoproturon+2,4-D (isogourd) persisted upto 15 days and degraded afterwards as depicted by cucumber bioassay.

## REFERENCES

Brar, L. S. and U. S. Walia, 1993. Bio-efficacy of substituted ureas against *Phalaris minor* Retz. in wheat. *Indian J Weed Sci.* **25** : 1-5.

Walia, U. S., L. S. Brar and B. K. Dhaliwas, 1997. Resistance in isoproturon in *Phalaris minor* Retz. in Punjab. *Plant Prot. Qtly.* **12** : 138-140.

Table 1. Persistence of herbicides in wheat soil in terms of plant height, fresh weight and dry weight of cucumber (Pooled data of two seasons)

| Treatment | Dose (g ha$^{-1}$) | 0 DAA | | | 15 DAA | | | 30 DAA | | | 45 DAA | | | 60 DAA | | | After harvest | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Plant height (cm) | Fresh weight (g) | Dry weight (mg) | Plant height (cm) | Fresh weight (g) | Dry weight (mg) | Plant height (cm) | Fresh weight (g) | Dry weight (mg) | Plant height (cm) | Fresh weight (g) | Dry weight (mg) | Plant height (cm) | Fresh weight (g) | Dry weight (mg) | Plant height (cm) | Fresh weight (g) | Dry weight (mg) |
| Isoproturon | 750 | 6.9 | 0.30 | 81 | 8.8 | 0.78 | 83 | 7.9 | 0.97 | 85 | 9.5 | 0.93 | 91 | 12.7 | 0.94 | 93 | 9.6 | 0.88 | 128 |
| Fenoxaprop-ethyl | 120 | 6.3 | 0.30 | 85 | 8.8 | 0.75 | 78 | 7.8 | 0.94 | 79 | 9.7 | 0.88 | 83 | 15.5 | 0.94 | 95 | 9.4 | 0.89 | 117 |
| Metsulfuron-methyl | 6 | 7.7 | 0.32 | 86 | 5.1 | 0.40 | 55 | 5.8 | 0.59 | 54 | 7.6 | 0.69 | 70 | 13.7 | 0.65 | 81 | 9.6 | 0.89 | 117 |
| Sulfosulfuron | 25 | 4.3 | 0.20 | 65 | 4.9 | 0.30 | 42 | 5.2 | 0.54 | 41 | 6.3 | 0.48 | 50 | 13.8 | 0.60 | 79 | 8.9 | 0.83 | 117 |
| Metribuzin | 250 | 6.1 | 0.27 | 75 | 7.3 | 0.64 | 74 | 7.4 | 0.73 | 75 | 11.2 | 1.03 | 83 | 14.0 | 0.91 | 98 | 9.6 | 0.85 | 115 |
| Metribuzin+25 kg ha$^{-1}$ more wheat seed | 250 | 7.1 | 0.39 | 92 | 9.4 | 0.65 | 71 | 7.5 | 0.80 | 78 | 9.5 | 0.91 | 75 | 13.3 | 0.86 | 93 | 10.8 | 0.89 | 119 |
| Metsulfuron-methyl+Isoproturon | 4+750 | 4.8 | 0.24 | 70 | 7.0 | 0.56 | 63 | 6.5 | 0.70 | 62 | 10.4 | 0.82 | 74 | 13.7 | 0.91 | 93 | 10.7 | 0.91 | 123 |
| Isoproturon+2, 4-D (Isogourd) | 1000 | 9.8 | 0.47 | 90 | 7.4 | 0.72 | 71 | 8.6 | 1.14 | 78 | 9.4 | 0.81 | 74 | 13.7 | 0.85 | 92 | 10.3 | 0.92 | 122 |
| Clodinafop | 60 | 4.5 | 0.27 | 76 | 8.4 | 0.71 | 75 | 7.5 | 1.09 | 78 | 10.0 | 0.76 | 75 | 13.0 | 0.85 | 90 | 9.6 | 0.94 | 129 |
| Clodinafop+ Metribuzin | 60+150 | 6.5 | 0.34 | 86 | 7.7 | 0.63 | 70 | 7.7 | 0.86 | 78 | 10.7 | 0.83 | 85 | 14.2 | 0.90 | 87 | 10.4 | 0.92 | 130 |
| Hand weeding | - | 12.5 | 0.63 | 100 | 11.0 | 0.93 | 97 | 10.0 | 0.93 | 92 | 11.5 | 0.94 | 89 | 13.4 | 0.98 | 92 | 10.3 | 0.97 | 133 |
| Weedy | - | 13.0 | 0.66 | 104 | 11.0 | 0.98 | 94 | 9.7 | 0.93 | 94 | 11.6 | 0.94 | 88 | 13.6 | 0.99 | 93 | 10.5 | 1.00 | 128 |
| LSD (P=0.05) | | 0.8 | 0.03 | 9.4 | 1.8 | 0.16 | 17 | 1.7 | 0.15 | 19 | 2.9 | 0.23 | 26 | NS | NS | NS | NS | NS | NS |

NS–Not Significant.