



Assessment of Premix Broad Spectrum Herbicides for Weed Management in Wheat (*Triticum aestivum* L.)

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ABSTRACT

The study was conducted at the farmer's field in village Fatehgarh adopted by KVK Mandsaur (Madhya Pradesh), during Rabi 2015-16, 2016-17 and 2017-18 to assess the effect of weed management treatments on weed infestation and wheat yield. The experiment consisted of three treatments namely T1: farmers' practice (hand weeding at 25 and 45 DAS), T2: sulfosulfuron 75% + metsulfuron methyl 5% @ 32 g a.i./ha at 25 DAS as post emergence and T3: clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha at 25 DAS as post emergence. Application of clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha resulted in significant reduction in the weed count and weed dry matter as compared to rest of the treatments. Clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha registered 27.87 percent higher grain yield as compare to farmers' practice. Further, application of clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha as post emergence registered significantly higher net return and B:C as compared to all other treatments and in addition to increased grain yield of improved technology. The technological gap, extension gap and technology index existed which were 7.47 q/ha, 10.36 q/ha and 13.58 %, respectively.

Key Words: B:C, Grain yield, Net returns, Weed management

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the second most important cereal crop in India after paddy both in terms of area and production. It is cultivated in an area of 305.97m ha with an annual production of 98.38 MT and productivity of 3216 kg/ha; whereas in Madhya Pradesh, it is cultivated in 6421.1 thousand hectares of land with an annual production of 21918 thousand tonnes and productivity of 3413 kg/ha (Anon, 2016). Weeds emerge after germination of crop and if not controlled in the early stages of crop growth these may cause reduction in yield up to 10 to 40 per cent depending upon the intensity and kind of weeds present in the field. The wheat fields are mostly infected by monocot weeds like *Phalaris minor*, *Avena fatua*, *Polypogon monspiliensis*, *Cyperus rotundus* and *Cynodon dactylon* and broad leaves weeds like *Rumex retroflexus*, *Chenopodium*

murale, *Chenopodium album*, *Malwa parviflora* and *Convolvulus arvensis*. Due to continuous use of herbicides coupled with mono-cropping of wheat, resistance has been evolved against the particular herbicide. Further, due to effective control of any single predominating weed, a shift in weed flora in favour of broad-leaved weeds or narrow leaf weeds was observed. Hence, it is essential to identify alternative herbicide molecules with broad spectrum activity for sustainable weed management in wheat. Therefore, an on farm trial was conducted to check the effectiveness of post-emergence herbicides in weed control in wheat in Mandsaur district of Madhya Pradesh.

MATERIALS AND METHODS

An experiment was conducted in village Fatehgarh adopted by Krishi Vigyan Kendra,

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Mandsaur in *Rabi* 2015-16, 2016-17 and 2017-18. This trial was conducted at 10 farmer's fields using HI 1544 variety of wheat. Each treatment was laid out in 2000 sqm area using randomized block design technique. The treatments were T1: farmers' practice (hand weeding at 25 and 45 DAS), T2: sulfosulfuron 75% + metsulfuron methyl 5% @ 32 g a.i./ha at 25 DAS as post emergence and T3: clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha at 25 DAS as post emergence. All the herbicides were applied manually by knapsack sprayer fitted with flat fan nozzle using spray volume of 500 L/ha. Wheat was sown in the first week of November and harvested in second week of March. Recommended package of practices were followed to raise the crop. The observation on weed dry matter and weed count were recorded at 60 DAS using quadrat (0.5 m X 0.5 m). Quadrat was randomly placed at two places in each plot. The yield data, thus generated in trial were utilized for calculating the technology index, technology and extension gap using the following formulae.

- i) Technology gap: (Potential yield) - (Demonstration yield)
- ii) Extension gap : (Demonstration yield) - (Farmer fields yield)
- iii) Technology index : (Technology gap/ Potential yield) x 100

RESULTS AND DISCUSSION

Effect on weed dry matter (g) and weed density (/m²)

Scrutiny of data revealed that post emergence application of clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha resulted in significantly lower weed dry matter as compared to sulfosulfuron 75% + metsulfuron methyl 5% WP @ 32 g a.i./ha and control. Highest weed dry matter was recorded in farmers' practice. Similar results were recorded in terms of weed density where farmers' practice had significantly higher weed infestation in comparison to herbicide treatments. For instance, clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha

as post emergence treatment significantly reduced the weed count from 24 to 4.13 and weed dry matter recorded at 60 DAS from 23.58 to 3.25 g/m². The predominant weed flora controlled by the above herbicides were narrow leaves weeds like *Phalaris minor*, *Avena fatua*, *Cyperus rotundus* and *Cynodon dactylon* and broad leaves weeds like *Rumex retroflexus*, *Chenopodium murale*, *Chenopodium album*, *Malva parviflora* and *Convolvulus arvensis*. The higher weed control efficiency due to clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha might be due to effective control of grassy and broad leaves weeds which resulted in decreased biomass of weeds and thereby increased weed control efficiency. Similar results were reported by Kumar *et al* (2011), Singh *et al* (2012), Malik *et al* (2013), Singh *et al* (2017), Patel *et al* (2017) and Chaudhari *et al* (2017).

Effect on tillers/plant and wheat grain yield

Analysis of data showed that application of clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha resulted in highest number of tillers per plant (4.80) which was statistically at par with sulfosulfuron 75% + metsulfuron methyl 5% WP @ 32 g a.i./ha (4.53) but reached the level of significance as compared to farmers' practice (2.47). Results of tillers/plant were in consonance with Kaur *et al* (2017) who reported a gradual and significant reduction in tillers/plant in wheat with increase in infestation of *Malva neglecta* from 3 to 12 plants/m². Combined analysis of yield data depicted that clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha registered highest grain yield of wheat (47.53q/ha) which was found 4.85 and 27.87 per cent higher and significantly different from clodinafop 15% + metsulfuron methyl 5% WP @ 32 g a.i./ha and farmers' practice, respectively. Furthermore, application of clodinafop 15% + metsulfuron methyl 5% WP @ 32 g a.i./ha also resulted in significantly higher grain yield (45.33q/ha) relative to farmers' practice (37.17q/ha). Similar results were earlier reported by Kumar *et al* (2011), Singh *et al* (2012), Malik *et al* (2013), Singh *et al*

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Table 1. Effect of weed management practices on weed dry matter and weed count at 60 DAS.

| Treatment | Weed dry matter (g/m ²) | | | | Weed count (Nos./m ²) | | | |
|--|-------------------------------------|---------|---------|-------|-----------------------------------|---------|---------|-------|
| | 2015-16 | 2016-17 | 2017-18 | Pool | 2015-16 | 2016-17 | 2017-18 | Pool |
| Farmers' Practice (Hand weeding at 25 and 55 DAS) | 13.80 | 29.21 | 27.74 | 23.58 | 25.0 | 22.00 | 25.00 | 24.00 |
| Sulfosulfuron 75% + metsulfuron methyl 5% @ 32 g a.i./ha at 25 DAS | 3.06 | 3.13 | 6.80 | 4.33 | 6.00 | 7.20 | 6.80 | 6.67 |
| Clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha at 25 DAS | 2.35 | 2.18 | 5.23 | 3.25 | 4.20 | 4.00 | 4.40 | 4.13 |
| SE _m (±) | 0.19 | 0.36 | 0.27 | 0.15 | 0.22 | 0.19 | 0.29 | 0.13 |
| CD 5% | 0.55 | 1.06 | 0.79 | 0.42 | 0.66 | 0.58 | 0.89 | 0.37 |

Table 2: Effect of weed management treatments on tillers/plant and grain yield of wheat

| Treatments | Tillers/plant (Nos.) | | | | Grain Yield (q/ha) | | | |
|--|----------------------|---------|---------|------|--------------------|---------|---------|-------|
| | 2015-16 | 2016-17 | 2017-18 | Pool | 2015-16 | 2016-17 | 2017-18 | Pool |
| Farmers' Practice (Hand weeding at 25 and 55 DAS) | 2.30 | 2.60 | 2.50 | 2.47 | 37.70 | 37.00 | 36.80 | 37.17 |
| Sulfosulfuron 75% + metsulfuron methyl 5% @ 32 g a.i./ha at 25 DAS | 4.00 | 4.80 | 4.80 | 4.53 | 43.50 | 45.30 | 47.20 | 45.33 |
| Clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha at 25 DAS | 4.20 | 5.00 | 5.20 | 4.80 | 44.80 | 48.00 | 49.80 | 47.53 |
| SE _m (±) | 0.13 | 0.30 | 0.22 | 0.12 | 0.68 | 0.66 | 0.77 | 0.38 |
| CD 5% | 0.38 | 0.90 | 0.65 | 0.34 | 2.02 | 1.95 | 2.28 | 1.06 |

Table 3. Effect of weed management treatments on economics of wheat crop.

| Treatment | Net returns (Rs/ha) | | | | B:C | | | |
|--|---------------------|---------|---------|-------|---------|---------|---------|-------|
| | 2015-16 | 2016-17 | 2017-18 | Pool | 2015-16 | 2016-17 | 2017-18 | Pool |
| Farmers' Practice (Hand weeding at 25 and 55 DAS) | 35050 | 32700 | 39740 | 35830 | 2.63 | 2.23 | 2.49 | 2.45 |
| Sulfosulfuron 75% + metsulfuron methyl 5% @ 32 g a.i./ha at 25 DAS | 42750 | 44980 | 57460 | 48397 | 2.90 | 2.63 | 3.08 | 2.87 |
| Clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha at 25 DAS | 44700 | 49300 | 62140 | 52047 | 2.99 | 2.79 | 3.25 | 3.01 |
| SE _m (±) | 1022 | 1049 | 1343 | 622 | 0.046 | 0.039 | 0.050 | 0.024 |
| CD 5% | 3036 | 3117 | 4109 | 1757 | 0.14 | 0.12 | 0.15 | 0.07 |

al (2017), Patel *et al* (2017) and Chaudhari *et al* (2017).

Economics of wheat crop

Economic analysis of data revealed that post emergence application of clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha recorded significantly higher net return (Rs. 52,047/ha) which was found to be 7.54 and 45.26 per cent higher than clodinafop 15% + metsulfuron methyl 5% WP @ 32 g a.i./ha and farmers' practice, respectively. Similar results were recorded in terms of B:C where application of clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha registered significantly highest B:C (3.01) as compared to rest of the treatments. Results were in line with Kumar *et al* (2011), Singh *et al* (2012), Malik *et al* (2013), Singh *et al* (2017), Patel *et al* (2017) and Chaudhari *et al* (2017).

CONCLUSION

In spite of increase in grain yield of wheat through improved technology of weed management *i.e.* clodinafop 15% + metsulfuron methyl 1% WP @ 64 g a.i./ha applied as post emergence influenced the technological gap, extension gap and technology index which were 7.47 q/ha, 10.36 q/ha and 13.58 per cent, respectively.

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