SUMMARY AND CONCLUSION
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The field experiment entitled “Integrated weed management in wheat (Triticum aestivum L. emend. fiori and Poal)” was carried out at Brahmanand Mahavidyalaya, Rath (Hamirpur) U.P. during rabi seasons of 2004-2005 and 2005-2006. Thirty six treatments comprised of three methods of sowing (broadcast, line sowing and cross sowing), three levels of seed rate (100, 125 and 150 kg ha\(^{-1}\)) and four weed management practices (weedy check, weed free, isoproturon @ 1.0 kg ha\(^{-1}\) alone and in combination with 2, 4-D Na salt @ 0.50 kg ha\(^{-1}\) post emergence) were laid out in split plot design with 3 replications keeping method of sowing and seed rate combination in main plots. The soil of the experimental field was silty loam in texture, having pH 7.8, EC 0.34 – 0.38 and low in available nitrogen and phosphorus and medium in potassium. A uniform dose of 120 kg N, 60 kg P\(_2\)O\(_5\) and 60 kg K\(_2\)O ha\(^{-1}\) was applied to all plots. Wheat cv. PBW-343 was sown as per treatment on 20\(^{th}\) and 24\(^{th}\) November during 1\(^{st}\) and 2\(^{nd}\) year, respectively. Herbicides were sprayed with the help of manual operated Knapsack sprayer fitted with flat fan nozzle using 600 litres water per hectare. The salient achievements of the experiment are summarized hereafter.
Method of sowing

- The divergent nature of weed flora comprising of *Phalaris minor*, *Cynodon dactylon*, *Cyperus rotundus* and other broad leaf weeds were noted in the experimental field during both the years of study.

- Cross sowing method was found most effective to reduce the weed density, weed fresh and dry weight and nitrogen uptake by weeds at all the stages during both the years.

- Cross sowing method in conjunction application of herbicide mixture (isoproturon @ 1.0 kg + 2,4-D Na salt @ 0.50 kg ha\(^{-1}\)) in cross sown wheat exhibited better control of weeds as compare to same method of weed control in broadcast sown crop.

- Initial plant population, growth characters (plant height, number of tillers plant\(^{-1}\), functional leaves plant\(^{-1}\)) and days taken to 50% heading and maturity were not influenced significantly by varying method of sowing. However, significantly higher leaf area index, plant fresh and dry weight was recorded by cross sowing than broadcast and line sowing methods.

- Different methods of sowing did not cause significant variations in length of spike, weight of grain spike\(^{-1}\), number of spikelets per spike, number of grains spike\(^{-1}\) and 1000-grain weight during both the years. However, cross sowing method recorded significantly higher grain, straw and biological yields than broadcasting. The values of harvest index were also maximum
with cross sowing than line sowing and broadcast sowing methods.

**Seed rate**

- A seed rate of 125 to 150 kg ha\(^{-1}\) resulted in reduced weed density, weed fresh and dry weight and nitrogen uptake by weeds at all the stages.

- Higher seed rate of 125 to 150 kg ha\(^{-1}\) registered higher initial plant population but failed to exhibit significant effect on plant height, number of functional leaf plant\(^{-1}\) and days taken to 50% heading and maturity during both the years. A seed rate of 100 to 125 kg ha\(^{-1}\) was found appropriate. Leaf area index was significantly higher with 150 kg seed ha\(^{-1}\) over 100 kg seed ha\(^{-1}\) during both the years.

- Length of spike, weight of grains spike\(^{-1}\), number of spikelets per spike were not influenced appreciably by the use of varying seed rates, higher number of grains spike\(^{-1}\) was noted with 100 kg ha\(^{-1}\) while higher 1000-grains weight was recorded with 100 - 125 kg seed ha\(^{-1}\).

**Weed management practices**

- Herbicide mixture i.e. isoproturon @ 1.0 kg + 2, 4-D Na salt @ 0.5 kg ha\(^{-1}\) (tank mix) applied as post emergence proved its superiority over the use of isoproturon alone @ 1.0 kg ha\(^{-1}\) and both were better than unweeded check by reducing the weed density, weed fresh and dry weight as well as nitrogen uptake by weeds.
Various weed management practices did not show significant effect on initial plant population, functional leaves plant$^{-1}$ and days taken to 50% heading and maturity. Significant increase in number of tillers plant$^{-1}$ at 90$^{th}$ day and at harvest, plant height, leaf area index, fresh and dry weight of plant at 60$^{th}$, 90$^{th}$ and harvest stages were recorded with weed free and isoproturon @ 1.0 kg ha$^{-1}$ either alone or in combination with 2,4-D Na salt @ 0.50 kg ha$^{-1}$ than weedy check.

Weed free closely followed by isoproturon @ 1.0 kg ha$^{-1}$ + 2, 4-D Na salt @ 0.50 kg ha$^{-1}$ enhanced weight of grains spike$^{-1}$, number of spikelets spike$^{-1}$, number of grains spike$^{-1}$ and 1000 grain weight. Application of isoproturon @ 1.0 kg ha$^{-1}$ + 2, 4-D Na salt @ 0.50 kg ha$^{-1}$ which was at par with weed free provided higher grain, straw and biological yields. The increase in grain yield by weed free, isoproturon + 2, 4-D Na salt (1.0 + 0.50 kg ha$^{-1}$) and isoproturon alone @ 1.0 kg ha$^{-1}$, unweeded check was 48.16, 39.82 and 43.17 per cent in first year and 44.88, 35.47 and 42.92 per cent in second year, respectively.

**Economics**

Cross sowing method using 100 kg seed ha$^{-1}$ and post emergence application of isoproturon + 2, 4-D Na salt (1.0 + 0.50 kg ha$^{-1}$) was found most economical and gave the highest net income of Rs. 19875.88 ha$^{-1}$, net income rupees$^{-1}$ investment of Rs. 1.42.
CONCLUSION

On the basis of above achievements, the following conclusions are drawn-

1. Cross sowing in line was very effective to reduce the weed flora and nitrogen loss by weeds and produced better yields than broadcast method.

2. The seed rate of 100 to 125 kg ha\(^{-1}\) considered suitable for enhancing growth, yield and yield contributing characters while better weed control was noted under 150 kg seed ha\(^{-1}\).

3. Post-emergence application of herbicide mixture, isoproturon + 2, 4-D Na salt (1.0 + 0.50 kg ha\(^{-1}\)) has been found equally to weed free for better weed control and higher yield.

4. The combination of cross sowing method + 100 kg seed rate + herbicide mixture of isoproturon + 2, 4-D Na salt (1.0 + 0.50 kg ha\(^{-1}\)) has been found most economical.

RECOMMENDATION

For better weed management and higher yield, cross sowing method using 100 to 125 kg seed ha\(^{-1}\) coupled with the application of isoproturon + 2, 4-D Na salt (1.0 + 0.50 kg ha\(^{-1}\)) may be adopted for normal sown wheat in Bundelkhand region of Uttar Pradesh.