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# Weed control in wheat (*Triticum aestivum*) under rice (*Oryza sativa*)—wheat system of north Bihar

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ABSTRACT

Two isoproturon group herbicides (Arelon and Tolkan) were evaluated at 0.5 and 1.0 kg ai/ha as post-emergence for weed control in wheat (*Triticum aestivum* L. emend. Fiori & Paol.) under timely and late-sown condition during 1987–88 and 1988–89. There was no effect of sowing time. Arelon or Tolken applied @ 0.5 kg ai/ha resulted better response than 1.0 kg ai/ha in term of yield and additional net return.

In north Bihar wheat (*Triticum aestivum* L. emend. Fiori & Paol.) sowing after rice (*Oryza sativa* L.) harvest is done up to first week of January according to field situation. Majority of the farmers prefer post-emergence weed control in wheat due to mostly unavailability of herbicides in market or to avoid financial load at the time of sowing. Isoproturon is a good post-emergence herbicide for wheat (Balyan *et al.*, 1988; Dinkar and Ahuja, 1987; Panwar *et al.*, 1992; Malik *et al.*, 1992). Effect of sowing time and doses of isoproturon group herbicides on weed and wheat crop is yet to be investigated for this area, hence the present experiment was conducted in aforesaid direction.

## MATERIALS AND METHODS

A field experiment was conducted at Regional Research Station, Madhopur (West Champaran) during winter season of 1987–88 and 1988–89 to find out effect of sowing time and doses of isoproturon group herbicides on weed and wheat. The soil was calcareous sandy loam with pH 8.2, organic carbon 0.40%, low in available $P_2O_5$ (9 kg/ha) and medium (105 kg/ha) in potassium content. The experiment was laid out in split-plot design, replicated thrice.

There were 12 treatment combinations consisting 2 times of sowing (timely and late) in main plot and 6 weed-control treatment (Table 1) in subplots. The farmyard manure (FYM) was incorporated into soil @ 10 tonnes/ha 15 days before sowing. A uniform dose of 100, 50 and 25 kg/ha of N, P and K was applied giving total P and K and half N as basal and the remaining N in 2 splits, at 25 and 55 days after sowing (DAS). Three irrigations each 6 cm depth were applied at 22, 50 and 80 DAS during both the seasons. Under timely condition variety 'UP 262' was sown on 30 November at 22 cm spacing @100 kg/ha seed rate, while late variety 'HP 1209' was sown on 25 December at 18 cm spacing @ 125 kg/ha seed rate during both seasons after harvesting of rice crop. Herbicides were applied at 33 DAS. Data on weed population

and their dry weight was recorded at 70 DAS.

## RESULTS AND DISCUSSION

The major weed flora observed in the experimental plots were *Chenpodium album* L., *Anagallis arvensis* L., *Melilotus alba* Desr., *M. indica* All. *Fumaria parviflora* L., *Vicia sativa* L., *Launea pinnatifide* L. and *Convolvulus arvensis* L. among the dicots; and *Cyprus rotundus* L. and *Cynodon dactylon* (L.) Pers. among the monocot. Among all these of *Chenopodium album* and *Anagallis* spp. were dominant spp. On an average distribution of *Chenopodium* spp., *Vicia* spp. and *Convolvulus* spp. were more in timely sown, while *Anagallis* spp. and *Melilotus* spp. out-numbered in late-sown condition.

There was no difference in weed number/$m^2$ in between timely and late-sown sowings but higher dry weight of weeds was recorded in former condition. Among the herbicides, Arelon at 1.0 kg ai/ha was more effective than lower dose as well rates but these were found to be at par among themselves. Higher weed-control efficacy was also recorded with Arelon at 1.0 kg ai/ha.

During 1987–88, effective tillers were influenced significantly where timely sown gave significantly higher number/$m^2$ than late-sown wheat, but the treatments was found at par during 1988–89. The differences amongst weed-control treatments were significant during both the years. Effective tillers produced under the treatment of Arelon 0.5 kg ai/ha and hand-weeding were significantly more than rest of the treatments, though the differences in other treatments were at par during both the

**Table 1.** Effect of weed-control methods on weed count, dry weight and weed-control efficacy in wheat under rice–wheat rotation in calcarious soil of north Bihar

| Treatment | Weed count ($m^2$) | | Dry weight of weeds ($g/m^2$) | | Weed-control efficacy (%) | |
|---|---|---|---|---|---|---|
| | 1987–88 | 1988–89 | 1987–88 | 1988–89 | 1987–88 | 1988–89 |
| *Sowing time* | | | | | | |
| Timely sown | 4.32 (18.72) | 5.16 (26.63) | 5.02 (25.70) | 5.43 (29.58) | | |
| Late sown | 3.95 (15.62) | 4.29 (18.42) | 2.98 (8.88) | 3.14 (9.85) | | |
| CD (P = 0.05) | NS | NS | 0.95 | 0.87 | | |
| *Weed-control method* | | | | | | |
| Unweed control | 7.96 (63.4) | 8.49 (72.1) | 7.40 (54.7) | 8.10 (65.6) | | |
| Arelon 0.5 kg ai/ha | 2.28 (5.2) | 2.44 (6.0) | 4.10 (16.8) | 4.4 (19.4) | 44.59 | 46.67 |
| Arelon 1.0 kg ai/ha | 2.19 (4.8) | 2.25 (5.1) | 3.90 (15.2) | 4.2 (17.6) | 47.29 | 48.14 |
| Tolken 0.5 kg ai/ha | 2.36 (5.6) | 2.44 (6.0) | 4.50 (20.2) | 4.70 (22.1) | 39.18 | 41.97 |
| Tolken 1.0 kg ai/ha | 2.28 (5.2) | 2.32 (5.4) | 4.00 (16.0) | 4.50 (20.2) | 45.94 | 44.44 |
| 1 hand-weeding at 30 days* | 3.20 (10.3) | 3.53 (12.5) | 2.10 (4.4) | 2.20 (4.8) | 71.62 | 72.83 |
| CD (P = 0.05) | 3.58 | 3.69 | 1.2 | 1.2 | | |

Original data are in the parentheses

*, Days after sowing

**Table 2.** Effect of sowing time and weed control methods on yield attributes, yield and net additional income of wheat under rice–wheat rotation of north Bihar

| Treatment | Effective tillers/m² | | Grains/ ear head | | 1,000-grain weight (g) | | Seed yield (q/ha) | | | Net additional profit due to treatment (Rs/ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B | Pooled | |
| *Sowing time* | | | | | | | | | | |
| Timely sown | 301.6 | 242.3 | 41.8 | 40.3 | 38.3 | 37.3 | 26.07 | 26.65 | 26.36 | |
| Late sown | 264.5 | 228.4 | 39.2 | 38.2 | 38.1 | 36.7 | 24.60 | 24.43 | 24.51 | |
| CD (P = 0.05) | 33.6 | NS | NS | NS | NS | NS | NS | NS | NS | |
| *Weed control methods* | | | | | | | | | | |
| Unweeded control | 185.3 | 176.2 | 34.6 | 32.8 | 33.4 | 33.1 | 22.11 | 21.61 | 21.91 | |
| Arelon 0.5 kg ai/ha | 274.1 | 276.6 | 40.1 | 39.8 | 37.6 | 37.5 | 26.11 | 26.36 | 26.25 | 920 |
| Arelon 1.0 kg ai/ha | 255.6 | 260.4 | 39.4 | 38.6 | 37.3 | 37.4 | 24.01 | 24.57 | 24.29 | 325 |
| Tolken 0.5 kg ai/ha | 261.3 | 268.3 | 39.7 | 39.7 | 37.5 | 37.6 | 25.62 | 26.44 | 26.03 | 865 |
| Tolken 1.0 kg ai/ha | 258.6 | 264.7 | 38.8 | 38.6 | 37.1 | 37.0 | 25.44 | 25.87 | 25.65 | 665 |
| 1 hand-weeding at 30 days* | 281.8 | 278.6 | 41.1 | 40.2 | 37.7 | 37.6 | 26.71 | 26.50 | 26.60 | 72 |
| CD (P = 0.05) | 18.6 | 17.3 | 1.3 | 1.4 | 1.2 | 1.2 | 1.69 | 1.71 | 1.70 | |

A, 1987–88; B, 1988–89

years except Arelon at 1.0 kg ai/ha and control plots.

In both the years differences in number of grains/ear and test weight were found non-significant. The grains/ear and test weight increased significantly in weed-control treatments. All yield attributes were significantly superior in weed-control treatments. All yield attributes had significantly lower value in control plot, whereas the highest in hand-weeding. The values in hand-weeding and herbicidal plots were found statistically at par.

In both the years, weed-control treatments resulted in significant increase in grain yield as compared to control. Arelon at lower rate caused maximum increase (26.36 q/ha) and proved significantly superior to Arelon at 1.0 kg ai/ha, but was statistically at par with rest of the treatments in both the years. However, all the herbi-cidal treatments gave comparable grain yield to hand-weeding treatments. Maxi-mum grain yield was recorded in hand-weeding in both the years. Timely-sown wheat gave higher yield than late-sown wheat in both the years.

During both the years, significantly lowest grain yield was recorded in control (unweeded) plot. Higher yield in herbicidal treated crop was mainly because of the control of both grassy and broad-leaf weeds of wheat. Arelon is more effective in controlling both type of weeds, but it may injure the physiological process at early stage of the crop plants. On the average the highest additional income was found under 0.5 kg ai/ha isoproturon-treated plots than their respective 1.0 kg ai/ha and lowest in hand-weeding treatment.

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