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# Efficacy of Herbicides on Weeds and Yield of Transplanted Rice (*Oryza sativa* L.)

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Rice (*Oryza sativa* L.) is staple food crop of India growing over an area of 44 million hectares with production about 93 million tonnes. The productivity of rice is (2.8 t/ha) lower as against world average 3.9 t/ha. Severe competition from weeds is one of the important factors deterring productivity and sustainability. Transplanted rice is infested with wide variety of weeds viz., grasses, sedges and broad-leaved weeds. The average loss in grain yield by unchecked weeds is reported to be 32.0% (Singh *et al.*, 2007). The use of herbicides offers selective and economical control of weeds right from the beginning till harvest. Butachlor and pretilachlor are effective against weed species, but these are very specific and narrow spectrum of activity. Continuous use of these herbicides leads to weed flora shift and development of herbicide resistance. Therefore, new and alternate herbicides need evaluation to widen application window and weed control spectrum. Keeping these facts in view, the present investigation was undertaken to study the efficacy of herbicides on weeds and yield of transplanted rice.

A field experiment was conducted during rainy season of 2006-07 at Department of Agronomy, Institute of Agricultural Sciences, BHU, Varanasi, to assess the efficacy of herbicides on weeds and yield of rice under transplanted system. The experimental site situated at $23.2^0$ N latitude, 83.03° E longitude and at an altitude of 129 msl in the North-Eastern Gangetic Plain has a typical sub-tropical climate characterized by hot, dry summer and cool winter. The soil of experimental site was sandy clay loam in texture with soil pH 7.3. It was low in organic C (0.43%) and available N (208 kg/ha), medium in available P (15.2 kg/ha) and K (231 kg/ha). The total rainfall received during growing season of 2006-07 was 704.1 mm, of which 38.4, 413.4, 150.2, 55.6 and 46.6 mm, respectively, was received during June, July, August, September and October. The field was under rice-wheat rotation for the last many years. The experiment comprising 10 weed control treatments viz., $T_1$–Anilofos 300 g/ha 30 GR with emulsifier, $T_2$–Anilofos 450 g/ha 30 GR with emulsifier, $T_3$–Anilofos 600 g/ha 30 GR with emulsifier, $T_4$–Anilofos 300 g/ha 30 GR without emulsifier, $T_5$–Anilofos 450 g/ha 30 GR without emulsifier, $T_6$–Anilofos 600 g/ha 30 GR without emulsifier, $T_7$–Anilofos 30 EC (standard check, 300 g/ha), $T_8$–Anilofos 30 EC (standard check, 450 g/ha), $T_9$–Weedy check and $T_{10}$–Weed free check was laid out in randomized block design with three replications (Table 1). Rice variety 'Swarna' seedlings were uprooted carefully from nursery bed and were transplanted in 5 x 5 m gross plot size at the 20 x 10 cm row spacing. The required quantity of herbicides as per treatment was mixed with 25 kg/ha sand and broadcasted, except anilofos 30% EC which was applied with the help of flat fan nozzle attached to the foot sprayer using volume of spray 500 l/ha, at five days after sowing. A uniform dose of 60+60+60+25 kg/ha of N, P, K and Zn was applied through urea, diammonium phosphate, muriate of potash and zinc sulphate, respectively, at the time of transplanting and remaining 60 kg N was top dressed in two equal splits, each at 30 days after transplanting and at panicle initiation. All the other recommended agronomic and plant protection measures were adopted to raise the crop. The data on weed density were recorded at different growth stages of crop with the help of quadrate (0.5 x 0.5 m) at three randomly selected places in each plot and then converted into per square metre. These were subjected to square root transformation ($\sqrt{x+0.5}$) to normalize their distribution before statistical analysis. Data on grain yield of rice were recorded at harvest.

Weed flora of the experimental field comprised *Cynodon dactylon, Echinochloa crusgalli*, *Echinochloa colona*, *Eleusine indica, Digitaria sanguinalis, Dactyloctenium aegyptium* and *Panicum repens* among the grassy weeds; *Cyperus rotundus*, *Cyperus iria*, *Cyperus difformis* and *Fimbristylis miliacea* among the sedges, and *Amaranthus viridis*, *Amaranthus baccifera*, *Caesulia axillaries*, *Corchorus acutangulis*, *Eclipta alba*, *Euphorbia hirta*, *Phyllanthus niruri* and *Ludwigia*

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Table 1. Effect of different weed control treatments of weed density, crop growth and yield of rice

| Treatments | Weed density/m$^2$ | | | | | | | | Plant height (cm) | Tillers/ hill | Crop dry weight (g/hill) | Grain yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Echinochloa colona* | | *Cyperus rotundus* | | *Eclipta alba* | | Other weeds | | | | | |
| | 20 DAT | 40 DAT | 20 DAT | 40 DAT | 20 DAT | 40 DAT | 20 DAT | 40 DAT | 100 DAT | 100 DAT | 100 DAT | |
| $T_1$ | 3.53 (12.0) | 4.69 (21.5) | 3.31 (10.5) | 3.80 (14.0) | 2.43 (5.4) | 3.67 (13.0) | 5.23 (27.2) | 5.47 (29.8) | 95.23 | 17.80 | 20.24 | 4650 |
| $T_2$ | 2.40 (5.25) | 4.03 (15.8) | 2.08 (3.85) | 2.96 (8.25) | 1.87 (3.0) | 2.83 (7.5) | 3.61 (13.0) | 4.63 (21.5) | 98.11 | 20.18 | 22.23 | 5561 |
| $T_3$ | 1.73 (2.50) | 3.24 (10.0) | 1.80 (2.7) | 2.55 (6.0) | 1.22 (1.0) | 1.73 (2.5) | 3.27 (10.7) | 4.57 (20.8) | 100.58 | 21.10 | 23.72 | 5761 |
| $T_4$ | 4.38 (18.8) | 5.29 (27.5) | 3.93 (14.9) | 4.35 (18.5) | 3.39 (11.0) | 4.33 (18.3) | 5.67 (32.1) | 6.49 (42.1) | 93.60 | 16.86 | 20.02 | 4190 |
| $T_5$ | 3.44 (11.3) | 4.52 (20.0) | 2.91 (8.0) | 3.57 (12.3) | 2.74 (7.0) | 3.95 (15.1) | 4.63 (21.5) | 5.91 (25.1) | 97.23 | 18.66 | 20.93 | 5111 |
| $T_6$ | 3.05 (8.79) | 4.41 (19.0) | 2.46 (5.6) | 3.28 (10.2) | 2.12 (4.0) | 3.39 (11.0) | 4.23 (17.9) | 4.91 (24.1) | 98.78 | 20.30 | 22.42 | 5432 |
| $T_7$ | 3.81 (14.0) | 4.84 (23.0) | 3.72 (13.3) | 4.24 (17.5) | 3.24 (10.0) | 4.07 (16.1) | 5.33 (28.4) | 6.48 (41.9) | 94.37 | 17.44 | 20.10 | 4340 |
| $T_8$ | 3.19 (9.7) | 4.30 (17.9) | 2.64 (6.5) | 3.39 (11.0) | 2.20 (4.33) | 3.53 (12.0) | 4.91 (24.2) | 4.75 (22.3) | 98.50 | 19.06 | 21.94 | 5148 |
| $T_9$ | 5.56 (30.5) | 6.51 (42.0) | 4.38 (18.8) | 3.91 (14.9) | 4.28 (17.8) | 4.63 (21.0) | 6.21 (38.6) | 11.7 (136.5) | 90.27 | 16.0 | 18.49 | 3262 |
| $T_{10}$ | 0.71 (0.00) | 0.71 (0.00) | 0.71 (0.00) | 0.71 (0.00) | 0.71 (0.00) | 0.71 (0.00) | 0.71 (0.00) | 0.71 (0.00) | 102.32 | 23.66 | 24.70 | 5955 |
| LSD (P=0.05) | 0.25 | 0.44 | 0.21 | 0.33 | 0.19 | 0.34 | 0.35 | 0.18 | 3.31 | 1.80 | 1.67 | 227 |

$T_1$–anilofos 300 g/ha 30 Gr with emulsifier, $T_2$–Anilofos 450 g/ha 30 GR with emulsifier, $T_3$–Anilofos 600 g/ha 30 GR with emulsifier, $T_4$–Anilofos 300 g/ha 30 GR without emulsifier, $T_5$–Anilofos 450 g/ha 30 GR without emulsifier, $T_6$–Anilofos 600 g/ha 30 GR without emulsifier, $T_7$–Anilofos 30 EC (standard check, 300 g/ha), $T_8$–Anilofos 30 EC (standard check, 450 g/ha), $T_9$–Weedy check and $T_{10}$–Weed free check.

*parviflora* among the broad-leaved weeds. *E. colona*, *C. rotundus* and *E. alba* were the most dominating weed species at all the stages of crop growth as compared to other weeds. Significantly minimum weed density of *E. colona*, *C. rotundus* and *E. alba* were recorded with ($T_3$) anilofos 600 g/ha 30 GR with emulsifier compared to all other herbicidal treatments at all the stages of observation, which was followed by ($T_2$) anilofos 450 g/ha 30 GR with emulsifier. Among the herbicidal treatments, the maximum weed density was recorded with ($T_4$) anilofos 300 g/ha 30 GR without emulsifier at all the stages of crop growth. The results are in close conformity with those of Singh *et al.* (2005). Application of anilofos 600 g/ha 30 GR with emulsifier recorded significantly maximum plant height, crop dry weight and tillers/hill consequently resulting in higher grain yield (5761 kg/ha) as compared to other herbicidal treatments and it was at par with ($T_2$) anilofos 450 g/ha 30 GR with emulsifier and ($T_6$) anilofos 600 g/ha 30 GR without emulsifier. None of the herbicidal treatments reached to the level of weed free check.

## REFERENCES


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