

Studies on bioefficacy of low doses high efficiency herbicides in transplanted rice (*Oryza sativa* L.)

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ABSTRACT

To evaluate the efficacy of low dose herbicide either alone or in combination on weeds and yield of transplanted rice, a field experiment was conducted during *kharif* season of 2001 and 2002 at Agricultural Research Farm of Banaras Hindu University, Varanasi. The weed flora of the experimental site were dominated by *Echinochloa colona*, *Echinochloa crus-galli*, *Cyperus rotundus*, *Cyperus iria*, *Fimbristylis miliacea*, *Ammannia baccifera* and *Ludwigia parviflora*. Amongst different herbicide pre-emergence application of almix + 2,4-DEE 15+500 g ha⁻¹ provided excellent control of weeds and their biomass production and significantly superior to all other treatments and was at par with almix 25 g ha⁻¹. These treatments caused significant lower depletion on nutrients (N, P, K) by weeds. Application of almix + 2,4-DEE 15+500 g ha⁻¹ results in significant improvement in all yield attributing characters and maximize grain yield (5930 kg ha⁻¹) and was at par with hand weeding (5930 kg ha⁻¹). Per cent increase in grain yield with almix + 2,4-DEE 15+500 g ha⁻¹ was 85.5 % over weedy checks.

Key words : Rice, Weed, Herbicide, Yield

INTRODUCTION

Rice is a major food crop in the tropics in general and India in particular. It suffers from various constraints in production and one of them is the competition through weeds. Weeds caused on reduction of 45-55% of grain yield (Banerjee and Bhattacharya, 2003; Mukherjee *et al.*, 2003). Transplanted rice infested by heterogeneous type of weed flora, which is one of the serious limitations of their control. Weeds compete to rice crop for nutrient mainly as it is very limited resource. Weeds grow faster than crop plant and thus absorb the available nutrient earlier resulting in lack of nutrient for growth of crop plants (Singh *et al.*, 2004). The use of herbicide offer selective and economic control of weeds right from the beginning giving crop an advantage of good head start and competitive superiority.

Most of weed flora belonging to grasses, sedges and broad-leaved weeds provide tough competition to rice crop. As a result with the continuous use of grassy herbicide like anilofos, butachlor and pretilachlor, the broad-leaved weeds and sedges coming up at faster rate in transplanted rice. So, their application window is very narrow and unable to control only few group of weeds. One of the major drawback of these herbicide are they are not eco-friendly because their application rate is quite high and persist in environment for very long time (Mukherjee *et al.*, 2003). This will distort our ecosystem and ultimately deleterious environment and crop quality. Thus a field experiment was planned to evaluate the effectiveness of herbicide as alone and tank mixture to control weeds in transplanted rice.

MATERIALS AND METHODS

A field experiment was conducted during the rainy seasons of 2001 and 2002 at the Research farm of Institute of Agricultural Sciences, Banaras Hindu University, Varanasi to studies on bioefficacy of low doses high efficiency herbicides in transplanted rice (*Oryza sativa* L.). The soil was sandy clay loam (typical ustochrepts) having pH 7.3, organic carbon 0.44% and available N, P₂O₅ and K₂O 205, 14.9 and 232.8 kg ha⁻¹, respectively. The experiment comprising various dose of metsulfuron methyl (MSM), chlorimuron ethyl (CME), almix, MSM + 2, 4-DEE, CME + 2, 4-DEE, almix + 2, 4-DEE, anilofos and anilofos + 2, 4-DEE along with hand weeding and weedy check (Table 1). The experiment was laid out in randomized block design with three replication. Twenty five days old seedlings

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of rice variety Sarju 52 were transplanted on July 22 and 24, 2001 and 2002, respectively. One third of the recommended dose of N (40 kg ha⁻¹) and full dose P₂O₅ and K₂O (60 kg ha⁻¹ each) were applied before transplanting and remaining amount of N was top dressed in two equal splits, half at active tillering and half at panicle initiation stages. Herbicides were sprayed 8 days after transplanting (DAT) using 600 litre water ha⁻¹ with the help of knapsack sprayer, fitted with flat fan nozzle. The data on weed population and weed biomass were taken at 60 DAT with the help of random quadrat (0.5 m × 0.5 m) at two places and then converted into per square meter and collected weed were dried at 60 ± 5°C to get the dry weight and further used for chemical analysis. These were subjected to square root transformation $\sqrt{x+0.5}$ to normalize their distribution. Nitrogen, phosphorus and potassium contents in weeds were determined by modified kjeldal method, vanadomolybdate phosphoric acid yellow colour method and flame photometer, respectively (Jackson, 1977).

RESULTS AND DISCUSSION

Effect on weeds

The experiment site were dominated by *Echinochloa colona* (L.) Link (16.7%), *Echinochloa crus-galli* (L.) Gaevu (6.5%), *Cyperus rotundus* (L.) (24.9%), *Cyperus iria* (8.2%), *Fimbristylis miliacea* Vahl (4.3%), *Ammannia baccifera* (L.) (14.6%) and *Ludwigia parviflora* (L.) (9.8%).

Of the herbicides, almix + 2,4-DEE 15+500 g ha⁻¹ was the most potential killer of weeds and significantly superior to all herbicidal treatments to check weed population. It gave excellent control of *Echinochloa colona*, *Echinochloa crus-galli*, *Cyperus rotundus* and *Cyperus iria* (Table 1). The next best treatment was almix 25 g ha⁻¹, which gave an excellent control of sedges viz., *Cyperus rotundus*, *Cyperus iria* but failed to bring about noticeable change in *Echinochloa* populations. Chlorimuron ethyl 20 g ha⁻¹ effectively suppresses density of *Echinochloa crus-galli* and *Echinochloa colona* and satisfactory control over *Cyperus difformis*. The different behavior of sulfonylurea herbicides may be attributed to their differential reaction to weed species (Bhattacharya *et al.*, 2002).

All the weed controlled treatments reduced total weeds density significantly over weedy check (Table 2). Almix + 2, 4-DEE 15 +500 g ha⁻¹ was found to be significantly superior to other herbicidal measures and remained at par with almix 25 g ha⁻¹ in reducing the total weed density. This treatment reduced weed population by 80.60 and 78.05 % as compared to weedy checks in 2001 and 2002,