# Effect of weed management on yield and economics of transplanted *kharif* rice (*Oryza sativa* L.)

NIRMALA PATEL[1], PRITAM GHOSH[2], DEBASMITA DAS[3]
PalliSiksha Bhavana, Visva-Bharati, Sriniketan, West Bengal, 731236, INDIA

*Abstract:* A field experiment was conducted during *kharif* '2017 at the Agricultural Farm of Palli Siksha Bhavana, Visva-Bharati, Sriniketan, Birbhum, West Bengal, to study the effect of weed managementon yieldand economics of transplanted*kharif* rice.The experiment was laid out in randomized block design with nine treatments which were replicated thrice. The treatments comprised pretilachlor 500g/ha, oxadiargyl 90g/ha, pyrazosulfuron ethyl 25g/ha, pretilachlor 500g/ha fb handweeding at 40 DAT, oxadiargyl 90g/ha fbhand weeding at 40 DAT, pyrazosulfuron ethyl 25g/ha fbhand weeding at 40 DAT, hand weeding at 20&40DAT, weed freeand unweeded control. All the herbicides were applied preemergence at 3 DAT. Among the herbicide applied treatments, pyrazosulfuron ethyl 25g/ha fbone hand weeding at 40DATresulted lowest weed density,higher yield components and yield of rice. Hand weeding twice at 20 and 40 DAT although provided good weed control, thenet return and return per rupee invested were less than pyrazosulfuron ethyl 25g/ha followed byone hand weeding at 40DAT.

*Key words:* Economics, Hand weeding, Pyrazosulfuron ethyl,Rice,Weed management, Yield
Received: June 15, 2022. Revised: January 17, 2023. Accepted: February 21, 2023. Published: March 27, 2023.

## 1. Introduction

Rice (*Oryza sativa* L.) is the most important food grain crop that supports more than half of the human race since they depend on rice for their daily sustenance (Chauhan and Johnson, 2011). Rice has unique position in Indian economy. It plays a vital role in our national food security. In the World, India ranks first in rice area but comes next to China regarding rice production. One of the serious constraints inrice production is weed infestation. Competition of these weeds brought about 32 -50% reduction in yield of rice(Maheshwari *et al*.,2015).Hand weeding is the most popular method of weed control in many parts of the state butthis practice is tedious, time-consuming, labour intensive, expensive and not feasible under all situations. Use of chemicals, on the other hand, for weed control is becoming popular among farmers because it is most practical, effective and economic weed management tool in rice (Barman and Varshney, 2008).Herbicides are effective against weed species, but most of them are specific and are effective against narrow range of weed species (Mukherjee and Singh, 2005). Hence, the combination of herbicides with subsequent hand weeding would be a more environment-friendly and labour-efficient strategy. Therefore, the following investigation was conducted to study the effect of different weed management practices on yield and economics of transplanted *kharif* rice.

The field experimentwas conducted in Block-A, Plot no- 2 of the Agricultural Farm of Palli Siksha Bhavana, Visva-Bharati, Sriniketan during *kharif*' 2017. The soil of the experimental field was sandy loam with pH 5.36, EC 0.61 $dSm^{-1}$, organic carbon 0.57 %, available nitrogen 385 kg $ha^{-1}$, $P_2O_5$23.4 kg $ha^{-1}$ and $K_2O$ 191 kg $ha^{-1}$. Rice seedlings varMTU 1010 were transplantedat 20 cm x 15 cm spacing on 16th July 2017. The recommended dose of N: $P_2O_5$: $K_2O$ was 80:40:40 kg $ha^{-1}$, respectivelyand were applied through urea, single super phosphate and muriate of potash, respectively.The

experiment was laid out in RBD with nine treatments and three replications.The treatments comprised pretilachlor 500g/ha, oxadiargyl 90g/ha, pyrazosulfuron ethyl 25g/ha, pretilachlor 500 g/ha fb hand weeding at 40 DAT, oxadiargyl 90g/ha fbhand weeding at 40 DAT, pyrazosulfuron ethyl 25g/ha fbhand weeding at 40 DAT, hand weeding at 20 & 40 DAT, weed freeand unweeded control. All the herbicides were applied pre emergence at 3 DAT through knap sack sprayer fitted with flat fan nozzle using a spray volume of 500 l $ha^{-1}$.

Weed density was recorded at 20, 40, 60 DAT by placing a quadrate of 0.5 m × 0.5 m randomly at one spot in each plot. Weeds were uprooted, washed thoroughly with tap water, and counted. The square-root transformation of original data of weeds was done for statistical analysis as described by Cochran and Cox (1957). The yield components were recorded at the time of harvesting and grain yield and straw yield were recorded after threshing and expressed in kg $ha^{-1}$. Economics of different treatments was calculated taking into account of the prevailing market price of inputs and outputs and were analysed statistically.

The predominant weed flora present in the experimental field were *Echinochloa glabrescens* among grasses, *Cyperus difformis* and *Cyperus iria* among sedges, *Ludwigia parviflora* among broadleaved weeds.

All the treatments recorded significantly lower weed density than unweeded control. Among the weed management treatments, the lowest density of weeds(Table 2) at 20 and 60 DAT were registered under pyrazosulfuron ethyl 25g/ha with onehand weeding at 40 DAT. It recorded significantly lower weed densitythan pretilachlor 500g/ha and oxadiargyl 90 g/ha with or without hand weeding at 40 DAT and was closely followed by hand weeding twice. This might be due to higher efficacy of pyrazosulfuron ethyl to control wide range of weeds.Mandal *et al*. (2005) were of similar observation.

**Table 1. Effect of weed management on weed density, yield components and yield of rice.**

| Treatments | Density of weeds (No./$m^2$) | | | No. of effective tillers/$m^2$ | No. of grains/ Panicle | 1000 grain weight (g) | Grain yield (t/ha) | Straw yield (t/ha) |
|---|---|---|---|---|---|---|---|---|
| | 20DAT | 40DAT | 60 DAT | | | | | |
| $T_1$ Pretilachlor 500g/ha | 3.19 (9.71) | 4.30 (17.96) | 4.77 (22.25) | 420.34 | 73.33 | 21.13 | 3.93 | 5.64 |
| $T_2$Oxadiargyl 90g/ha | 3.13 (9.33) | 4.18 (16.96) | 4.58 (20.49) | 426.45 | 73.47 | 21.51 | 4.01 | 5.64 |
| $T_3$ Pyrazosulfuron ethyl 25g/ha | 3.09 (9.06) | 3.99 (15.42) | 4.34 (18.32) | 432.18 | 74.20 | 21.91 | 4.12 | 5.67 |
| $T_4$ Pretilachlor 500g/ha *fb* hand weeding at 40DAT | 3.18 (9.67) | 3.74 (13.49) | 3.88 (14.57) | 433.12 | 75.47 | 22.39 | 4.56 | 6.13 |
| $T_5$Oxadiargyl 90g/ha *fb* handweeding at 40DAT | 2.95 (8.26) | 3.46 (11.46) | 3.68 (13.07) | 451.31 | 75.87 | 22.45 | 4.90 | 6.41 |
| $T_6$Pyrazosulfuron ethyl 25g/ha *fb* hand weeding at 40 | 2.67 (6.64) | 3.29 (10.30) | 3.50 (11.75) | 453.18 | 76.27 | 22.46 | 5.22 | 6.61 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DAT | | | | | | | | |
| $T_7$ Hand weeding at 20 &40 DAT | 2.92 (8.03) | 3.25 (10.05) | 3.60 (12.48) | 453.46 | 76.00 | 22.54 | 5.12 | 6.43 |
| $T_8$ Weed free | 0.71 (0.00) | 0.71 (0.00) | 0.71 (0.00) | 462.33 | 80.93 | 22.71 | 5.41 | 6.44 |
| $T_9$Unweeded control | 4.58 (20.44) | 6.26 (38.74) | 7.99 (63.32) | 376.25 | 65.73 | 21.03 | 3.33 | 5.11 |
| S.Em( ±) | 0.10 | 0.03 | 0.03 | 6.78 | 0.93 | 0.24 | 0.13 | 0.20 |
| CD at 5 % | 0.29 | 0.09 | 0.08 | 20.31 | 2.77 | 0.71 | 0.39 | 0.60 |

The data on weed density were transformed to √ x + 0.5 and the figures in the parenthesis are original values.

**Table 2 Effect of weed management practices on economics of rice cultivation.**

| Treatments | Cost of cultivation (Rs.) | Gross return (Rs.) | Net return (Rs.) | Return / rupee invested (Rs.) |
|---|---|---|---|---|
| $T_1$ Pretilachlor 500g/ha | 35400 | 72573 | 37173 | 2.05 |
| $T_2$Oxadiargyl 90g/ha | 36565 | 73895 | 37330 | 2.02 |
| $T_3$ Pyrazosulfuron ethyl 25g/ha | 35790 | 75772 | 39982 | 2.12 |
| $T_4$ Pretilachlor 500g/ha *fb* hand weeding at 40DAT | 37400 | 83149 | 45749 | 2.22 |
| $T_5$Oxadiargyl 90g/ha *fb* hand weeding at 40DAT | 38565 | 89473 | 50908 | 2.32 |
| $T_6$Pyrazosulfuron ethyl 25g/ha *fb* hand weeding at 40 DAT | 37790 | 94825 | 57035 | 2.51 |
| $T_7$ Hand weeding at 20 &40 DAT | 42900 | 92908 | 50008 | 2.17 |
| $T_8$ Weed free | 50300 | 97608 | 47309 | 1.94 |
| $T_9$Unweeded control | 34900 | 62210 | 27311 | 1.78 |
| S.Em( ±) | -- | 2198.40 | 2198.40 | 0.06 |
| CD at 5 % | -- | 6590.10 | 6590.10 | 0.18 |

## 2. Problem Formulation

Weed free treatment recorded the highest values of yield components such as no. of effective tillers/$m^2$, no. of grains/panicle and test weight(Table 1) whereas the lowest values were observed under unweeded control. All the treatments recorded significantly higher no. of effective tillers/$m^2$ and no. of grains/panicle than unweeded control due to lower crop-weed competition resulting more availability of growth resources to plants. Among the chemical weed management treatments($T_1$ to $T_6$), pyrazosulfuron ethyl 25g/ha as pre-emergence followed byhand weeding at 40 DAT registeredthehighest no. of effective tillers/$m^2$, grains/panicle and test weight and were statistically at par with other two herbicides, oxadiargyl and pretilachlor when followed by one hand weeding at 40 DAT.

The highest grain yield(5.41t/ha) was recorded in weed free plot (Table 1) which was statistically at par with pyrazosulfuron ethyl 25g/ha as pre-emergence followed byhand weeding at 40 DAT and hand weeding at 20 &40 DAT.The lowest grain yield was recorded under unweeded control. All the treatments applied for weed management recorded significantly higher grain yield than unweeded control. Application of herbicides along with hand weeding recorded higher grain yield than their sole application.

The highest gross return (Rs. 97,608 $ha^{-1}$) was recorded in weed free treatment (Table 2) whereas the lowest was observed under unweeded control plot(Rs. 62,210 $ha^{-1}$). However, the net return and return per rupee invested were found highest in pyrazosulfuron ethyl 25g/ha followed by hand weeding at 40 DAT closely followed by oxadiargyl 90g/hawith one hand weeding at 40 DAT. All the herbicide treatments registered higher return per rupee invested over weedy check (1.78). The lower return per rupee invested in weed free treatment was mainly because of higher labour cost involved in hand weeding. Similar observations were also made by Chakrabort*iet al*. (2017).

## 3. Conclusion

Based on the above results, it could be concluded that application of pyrazosulfuron ethyl 25g/ha as pre-emergence *fb* hand weeding at 40 DATis promishing for effective and economic weed management in transplanted *kharif* rice in red and laterite soil of West Bengal.

*References*

[1]. Barman, K. K. and Varshney, J. G. 2008. Impacts of herbicide on soil environment. *Indian Journal of Weed Science***40**(1&2): 10 - 17.

[2]. Chakraborti, M., Duary, B. and Datta, M. 2017. Effect of weed management practices on nutrient uptake by direct seeded upland rice under Tripura condition. *International Journal of Current Microbiology and Applied Sciences***6**(12): 66 - 72.

[3]. Chauhan, B.S. and Johnson D.E. 2011.Row spacing and weed control timing affect yield of aerobic rice. *Field Crops Research***121**(2):226-231.

[4]. Cochran, W. G. and Cox, G. M. (Eds.). 1957. Experimental design.615pp. 2nd Edition, John Willey and Sons, Inc. New York.

[5]. Maheswari, M. D., Rao, A. S., Prasuna Rani, P. and Venkateswarlu, B. 2015. Effect of Weed Management 5Practices on Growth and Economics of Transplanted Rice. *International Journal of Pure and Applied Bioscience***3**(3): 113-116.

[6]. Mandal, D. C., Hossain, A. and Duary, B.2005. Effect of pyrazosulfuron-ethyl

on weeds and yield of transplanted rice under lateritic belt of West Bengal. *Indian Journal of Weed Science* **37** (3 & 4): 263-264.

[7]. Mukherjee, D. and Singh, R.P. 2005. Effect of micro-herbicides on weed dynamics, yield and economics of transplanted rice. *Indian Journal of Agronomy***50**: 292-295.