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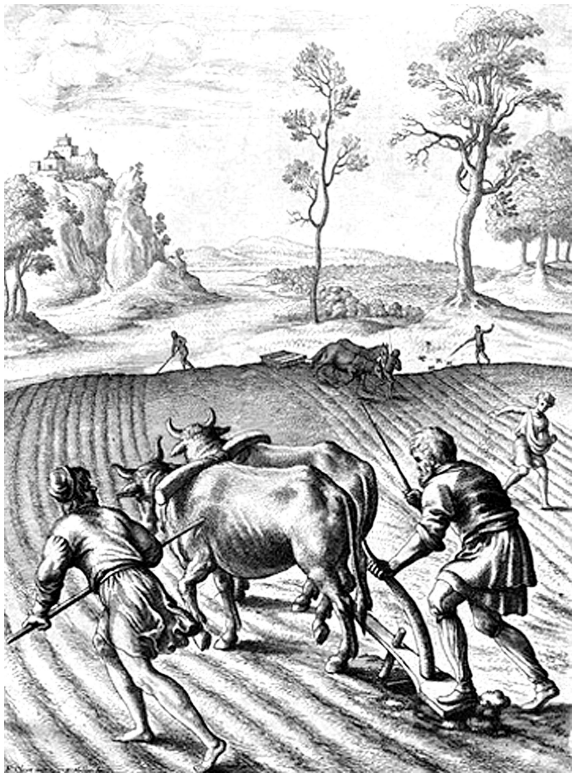

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Effect of Weed Management Practices on Transplanted Aman Rice

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Abstract: An experiment was conducted at the Bangabandhu Sheikh Mujibur Rahman Agricultural University, Bangladesh during June to December 2002 to find out the effective weed control practices in terms of weed dynamics, weed control efficiency and the performance of transplanted aman rice. *Fimbristylis miliacea*, *Scirpus murconatus* and *Monochoria vaginalis* were found as dominant weed species in transplanted aman rice. Two times weeding was found as the best practice to keep weed infestation at minimum level and to ensure higher yield of transplanted aman rice. Other than weed free condition, the highest grain yield (5.07 t ha^{-1}) was produced in two hand weeding and the lowest (2.46 t ha^{-1}) was in unweeded condition. One hand weeding at 25 DAT along with one mechanical weeding at around 40 DAT was also found to be effective next to two hand weeding in these regards. Pre emergence herbicide Refit 500 EC was not effective to keep weed infestation at minimum level and to ensure higher yield of transplanted aman rice.

Key words: Weed, management, transplanted aman rice, *Fimbristylis miliacea*, *Scirpus murconatus*, *Monochoria vaginalis*

INTRODUCTION

In Bangladesh rice occupies around 10.66 million hectares (about two thirds) of the cultivated land[1]. The majority of rice area is covered by transplanted aman rice comprising about 46.10% of the of the total rice area[1]. But the yield of transplanted aman rice in Bangladesh is much lower than that of transplanted aman rice in other rice growing countries of the world. Severe weed infestation is one of the important factors for such low yield[2]. The prevailing climatic and edaphic factors of Bangladesh are highly favourable for luxuriant growth of numerous species of weed, which offer a keen competition with rice crop[2]. When weed control is neglected, there is a decrease in yield because of weeds; even if other means of increasing production, including application of fertilizers, are practiced due to weeds compete with crop plants for light, nutrients, water and space. Without weed control yield loss have been estimated 16 to 48% for transplanted aman rice[3].

Weeds can be controlled by mechanical means or chemical means. Mechanical weed control is an expensive method. On the other hand chemical methods lead to environmental pollution and in many weed species developed resistance against the herbicide. Subsistence farmers of the tropics spend more time and energy on weed control than any other aspects of rice cultivation. Increasing the frequency of hand weeding one or twice times at 21 and 40 Days After Transplanting (DAT) was found to reduce the weed density and weed dry matter resulting in two fold increase in grain yield[4]. Thus the best weeding regimes need to be found with a view to reduce losses due to weed infestation and getting maximum yield of transplanted aman rice. Therefore, this study was conducted to find out the effective weed control practices in terms of weed dynamics, weed control efficiency and performance of transplanted aman rice.

MATERIALS AND METHODS

An experiment was conducted at the Agronomy Field Laboratory, Bangabandhu Sheikh Mujibur Rahman Agricultural University, under the Madhupur tract Agro-ecological Zone (AEZ-28) of Bangladesh during the period from June to December 2002. The experiment was laid out in a split-plot design with three replications. Three rice varieties were imposed as main plot treatment at random. The varieties were BR11 (V_1), BRRIdhan31 (V_2) and Pajam (V_3). Seven weed management treatments such as no weeding (W_1), Weed free (W_2), Two hand weeding at 25 and 40 DAT (W_2), One hand weeding at 25 DAT (W_3), One hand weeding and one mechanical weeding with locally modified weeder at 25 and 40 DAT, respectively (W_5), Refit 500 EC at the rate of 1 L ha^{-1} at 7 DAT (W_6) and Continuous flooding and one mechanical weeding by BRRI rice weeder at 40 DAT (W_7) were

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imposed as sub plot treatment randomly. In the chemical treatment Refit 500 EC at the rate of 1 L ha^{-1} was applied as pre-emergence at 7 days after transplanting on 5 cm standing water.

Thirty days old seedlings were transplanted with one seedling $hill^{-1}$ at a spacing of 20 × 15 cm. Fertilizers were applied as per recommendation of Bangladesh Rice Research Institute as N-P-K-S-Zn at the rate of 70-50-40-10-2 kg ha^{-1}[5]. Intercultural operations were done as and when required. As weed parameter weeds identification, measurement of weed intensity, weed biomass and weed control efficiency were performed at 30, 60 and 90 DAT. Different crop growth parameters were observed. Finally yield components, grain and straw yield were observed.

Analysis of variance was done following the experimental design with the help of the computer package MSTAT. Later the means were separated through LSD test.

RESULTS AND DISCUSSION

Weed parameters: Eleven different weed species belonging to four families were found to infest the experimental crop. The most important weed species in the experimental plots throughout the growing period were *Fimbristylis miliaea*, *Monochoria vaginalis* and *Scirpus mucronatus*, respectively. At 30 DAT six weed species were found in the experimental field, where *Fimbristylis miliaea* was the top ranking weed with the highest degree of weed infestation (Table 1). Next to it was *Eriocaulon cinereum* and *Monochoria vaginalis*. But at 60 DAT three new weed species emerged and *Eriocaulon cinereum* was found to supersede *Fimbristylis miliacea* in terms of degree of infestation (Table 1). However, after 60 DAT *Eriocaulon cinereum* disappeared from the rice fields leaving *Fimbristylis miliaea* with the highest degree of infestation as observed at 90 DAT (Table 1).

The highest weed density (107 m^{-2}) and weed biomass (34.38 g m^{-2}) were found in the unweeded treatment (W_1) at 60 DAT, which was significantly higher than that in other treatments (Table 2). Similar results were also reported by Ahmed *et al.*[6], Dahama *et al.*[7] and Bajpai and Singh[8]. Two hand weeding at 25 and 40 DAT (W_3) resulted the second lowest weed density and weed biomass at 60 DAT, which were significantly lower than that in one hand weeding (W_4). Pre emergence herbicide Refit 500 EC (W_6) resulted significantly lower weed density (6.44 m^{-2}) at 30 DAT than that in other treatments except weed free condition, thereafter weed infestation increased sharply in this treatment. It might be due to that the toxic effect of the pre emergence herbicide was reduced to non-lethal level quickly resulting mid and late season weed growth. At 60 DAT the highest weed control efficiency was observed in W_2 treatment (weed free) followed by W_3 (Two hand weeding at 25 and 40 DAT), which was significantly higher than the other treatments (Table 2). Alam *et al.*[9] and Singh *et al.*[10] also reported the similar results.

Crop growth parameters: In general, plants with better growth were found in the plants having weed control treatments than in unweeded (W_1) treatment (Table 3). It might be due to that severe rice weed competition occurred in unweeded treatment compared to weed control treatments throughout the growing period.

Tiller is one of the most important developmental stages of rice, having a decisive influence of on grain yield. In all treatment the maximum tillering stage was observed at 60 DAT. At 60 DAT the highest number of tillers $hill^{-1}$ was found in W_2 (weed free) treatment and the lowest in unweeded treatment. Other than weed free treatment, the highest number of tillers per hill was found in W_3 (two hand weeding) treatment. However, one hand weeding along with one mechanical weeding (W_5) also contributed to higher number of tillers per hill next to two hand weeding treatment. This result supports the study by Bajpai and Singh[8]. Refit application (W_6) contributed to the lowest number of tillers per hill other than unweeded treatment. It might be due to possible adverse effects of pre emergence herbicide on rice plants.

The rice crop under the experiment reached maximum LAI at 60 to 75 DAT. Weed free treatment (W_2) maintained the highest LAI throughout the growing period, which was significantly higher than other treatments. At 60 DAT Two-hand weeding (W_3) contributed to the second highest LAI, which was statistically different from that in Refit 500 EC (W_6) and one hand weeding (W_4).

Yield components and yield: The yield components transplanted aman also varied due to weed control

Table 1: Degree of weed infestation in experimental field at different Days After Transplanting (DAT) in transplanted aman rice

	Degree of weed infestation (%)		
Weed species	30 DAT	60 DAT	90 DAT
Fimbristylis miliacea	34.21	21.32	35.66
Monochoria vaginalis	20.65	20.96	22.60
Scirpus mucronatus	19.69	20.36	24.13
Eriocaulon cinereum	22.48	24.66	00.00
Echinochloa cruss-galli	01.23	03.65	05.00
Cyperus flavidus	00.00	02.48	02.89
Cyperus difformis	00.00	02.13	02.54
Leersia hexandra	00.00	02.13	01.95
Cynodon dactylon	01.74	02.31	00.00
Cyperus iria	00.00	00.00	03.23
Ludwiga octovalvis	00.00	00.00	02.00

Table 2: Weed density, weed biomass and weed control efficiency as affected by weed control treatment in transplanted aman rice

	Weed intensity (No. m^{-2})			Weed biomass (g m^{-2})			WEC (%)		
Weed control treatments	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
W_1	46.44	107.33	77.33	13.53	34.38	44.86	-	-	-
W_2	00.44	00.44	06.00	00.00	00.07	01.54	100.00	99.79	96.58
W_3	12.22	25.56	19.56	01.44	09.821	02.39	89.33	71.27	72.30
W_4	15.56	38.22	32.89	01.52	15.98	21.00	88.73	53.15	53.02
W_5	14.56	29.33	22.00	01.72	10.78	14.14	87.23	68.41	68.37
W_6	06.44	49.11	46.22	01.41	20.38	25.66	89.54	00.44	42.74
W_7	19.11	31.11	22.67	08.26	11.5	15.56	38.57	66.31	65.22
$LSD_{(0.05)}$	04.35	06.58	04.01	00.51	01.45	01.40	03.25	03.17	03.13
CV %	09.86	11.23	10.56	12.30	07.36	08.45	06.55	08.90	07.33

Table 3: Different crop growth parameters as affected by weed control treatment in transplanted aman rice

Weed control methods	Plant height at harvest (cm)	Tiller No. $hill^{-1}$ at 60 DAT	LTR at 60 DAT(%)	LAI at 60 DAT
W_1	131.23	14.98	17.20	23.09
W_2	142.53	21.09	26.33	05.81
W_3	140.16	20.13	25.56	04.96
W_4	135.43	17.96	24.00	03.76
W_5	137.5	19.70	25.22	04.76
W_6	137.65	17.87	25.11	03.61
W_7	139.35	18.93	20.90	04.20
$LSD_{(0.05)}$	001.02	00.36	00.83	00.37
CV %	006.32	10.66	11.32	11.29

Table 4: Yield components and yield as affected by weed control treatment in transplanted aman rice

Weed control methods	Effective tillers $hill^{-1}$	No. of filled grain $panicle^{-1}$	1000-grain weight (g)	Grain yield (t ha^{-1})	Harvestindex
W_1	06.77	086.56	22.44	2.46	0.47
W_2	11.73	130.89	23.26	5.37	0.46
W_3	11.07	120.44	23.1	5.07	0.47
W_4	08.33	103.78	22.65	4.73	0.46
W_5	10.82	112.11	22.73	4.66	0.46
W_6	07.75	101.67	22.93	4.33	0.46
W_7	09.31	111.56	23.09	4.44	0.46
$LSD_{(0.05)}$	00.36	004.18	NS	0.27	NS
CV %	07.45	006.24	05.32	8.05	6.48

treatment. The highest number of effective tillers $hill^{-1}$ and filled grain $panicle^{-1}$ was obtained in weed free treatment (W_2), followed by two hand weeding (W_3) (Table 4). It might be due to least crop weed competition that ensured sufficient nutrients and other growth resources, which enhanced higher filled grain production. 1000-grain weight was also influenced by weed control treatments, but the variation was not significant. It might be due to that grain size is a genetically controlled character and influenced little by management practices.

Among the crop management practices proper weed management in transplanted aman rice field ensures higher yield. Grain yield was significantly affected by weed control treatments but effect on harvest index found to be non significant (Table 4). The highest grain yield (5.37 t ha^{-1}) was obtained from weed free condition, which was significantly higher than other treatments. Bari *et al.*[11] also reported the similar result. The second highest grain yield (5.07 t ha^{-1}) was found in two hand weeding treatment (W_3), while the lowest (2.46 t ha^{-1}) was recorded in unweeded treatment (W_1). Keeping rice fields weed free throughout the season ensures higher grain yield[12-15]. However, from practical point of view it is not feasible since it involves labour, time and money. Therefore, two hand weeding might be considered as the best option in the farmer's condition.

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