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Effect of Herbicides on Different Crop Characters used in Controlling Weeds of Aman Rice Grown under Wet Seeded Culture

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Abstract: Yield and yield contributing attributes of BR11 rice were influenced by different doses of the herbicides used. The highest grain yield (5.14 t ha^{-1}), thousand grain weight, straw yield were obtained by the treatment Golteer 5G at 24.70 kg ha^{-1}. The tallest plant and second highest grains/panicle were produced in Settoff 20WG at 50 g ha^{-1}. Number of grains/panicle was found to be maximum in plots treated with Ronstar 25EC at 1.0 l ha^{-1}. The smallest plant, lowest number of effective tillers $plant^{-1}$, non effective tillers $plant^{-1}$, grains $panicle^{-1}$, thousand grains weight, grain yield and straw yield were found in control. Golteer 5G at 12.35 kg ha^{-1} produced the highest number of non effective tillers $plant^{-1}$. The results also demonstrated significant difference among the treatments.

Key words: Herbicides, crop characters, controlling weeds, Aman rice

Introduction

In Bangladesh traditional methods of weed control practices include preparatory land tillage, hand weeding by Niri (hoe) and hand pulling. Usually, two or three hand weedings are normally done for growing a rice crop depending upon the nature of weeds, their intensity of infestation and the nature of crop grown. Two to three hand weedings are normally done for growing a rice crop. This method involves a large amount of labourers and at the same time it is tidious, time consuming and expensive. Japanese rice weeder used in many parts of the country in small scale more effective than hand weeding. Therefore, a cheaper, speedier less time consuming and quick method of weed control is utmost required for rice cultivation in the country.

Now-a-days use of herbicide is gaining popularity in rice culture due to their rapid effects and less cost involvement compared to traditional methods of weeding (Mian and Mamun, 1969). However, removal of weeds at their critical period by traditional means may not be possible at peck period of labour demand. In such a situation herbicides are promising alternatives in controlling weed (Rao and Pilla, 1974; De Datta, 1980). Some herbicides were reported to have not only controlled weeds, but also increased the rice yield. Chowdhury ***et al.*** (1995) carried out

an experiment on the effect of Ronstar 25EC on weed management, growth and yield of rice. They found Ronstar 25EC significantly reduced weed infestation and increased the yield of rice irrespective of the doses used. Raju and Reddy (1992) studied a field experiment on the effect of 4 herbicide carriers, applied 6 days after transplanting for controlling weeds in rice. They found that rice yield was increased by these herbicides from 3140 to 3784 kg ha^{-1}. So if chemical weed control technology is found suitable under Bangladesh condition, it could be bring a technological advancement in the field of crop production.

Recently a few herbicide are available such as Ronster 25EC, Setoff 20WG, Golteer 5G, 2,4-D Amine and U-46$^{(R)}$D etc. in the market. Among them Ronster 25EC, Setoff 20WG and Golteer 5G are very effective against sedges, grasses, narrow and broad leaved weeds which usually found to grow in the aman rice fields of Bangladesh.

Materials and Methods

The study was conducted at the Agronomy Field Laboratory, Department of Agronomy, Bangladesh Agricultural University, Mymensingh during July to December, 1998.

The single factor experiment was laid out in a randomized complete block design (RCBD) having three replications. Thus, the treatment combinations was thirty and unit plot size was 4.0×2.5 m^2. The spacing between plot to plot was 1.0 m and block to block were 1.5 m. The treatments was randomly assigned in the unit plots of each block.

The popular transplanted aman rice variety BR11 (Mukta) was selected for wet-seeded culture experimentation. It is non-lodging taking 140-145 days to complete its life cycle and can be successfully grown in aman season. The yield ranges between 5.5 to 6.5 t ha^{-1} (Anonymous, 1991).

Following ten treatments were used during the study:

T_0= Control
T_1= Ronstar 25 EC @ 1.0 l ha^{-1}
T_2= Ronstar 25 EC @ 2.0 l ha^{-1}
T_3= Ronstar 25 EC @ 3.0 l ha^{-1}
T_4= Set off 20 WG @ 50 g ha^{-1}
T_5= Set off 20 WG @ 100 g ha^{-1}
T_6= Set off 20 WG @ 200 g ha^{-1}
T_7= Golter 5G @ 12.35 kg ha^{-1}
T_8= Golter 5G @ 24.7 kg ha^{-1}
T_9 = Golter 5G @ 49.4 kg ha^{-1}.

In control, no weeding as well as no weedicide were used. Pre-emergence application of all the weedicide was done. All the three weedicide were used as pre-emergence application. Certified seeds of BR11 was treated with vitavex-200 @ 2.5 g kg^{-1} of seeds (Anonymous, 1979). Seeds were sown @ 80 kg ha^{-1}.

For land preparation the land was irrigated and puddled thoroughly by ploughing three times with the country plough. The weeds and stubbles were thoroughly cleaned from the prepared field. Fertilizers were applied to the plots @ 60, 8, 30 and 4 kg ha^{-1} as N, P, K and S on the basis of Fertilizer Recommendation Guide (Anonymous, 1997) through urea, TSP, MP and gypsum, respectively.

Seeds were evenly broadcasted on unit plot when about 80% of the seeds were sprouted, using conventional method. Irrigation was done as and when necessary.

A quadrate of 1×1 m^2 was randomly placed on each plot and all the weeds (species -wise) in the quadrate was counted on 21st October, 1998. Then the average number of weeds (species-wise) per plot was computed from the results obtained in sampling. Data regarding the yield and yield contributing characters were collected and analysed statistically.

For convenience of observation on the crop characters except the grain and straw yield were collected from 10 randomly selected plants from each of the plots. The sample plants were up rooted prior to harvest and sun-dried. The plant height was measured with the help of meter scale from the base of the plant to tip of the panicle. Panicle length was measured from the neck node to tip of the panicle. Number of grain and unfilled spikelets $panicle^{-1}$ were recorded separately. Data on crop characters as affected by different weed control treatments have been presented in Table 1. It was observed that crop characters were significantly or numerically affected by treatments. The data recorded were compiled and tabulated in proper form and subjected to statistical analysis. The mean differences among the treatments were adjusted by Duncan's new multiple range test (Gomez and Gomez, 1984).

Results and Discussion

Different weed control treatments manifested significant effect on plant height at 1% level of significance. The tallest plant (107.50 cm) was noticed in Setoff 20WG @ 50 g ha^{-1}, it could be due to the presence of suitable growing conditions of crop. On the other hand, the shortest plant (102.8 cm) were found in control, which indicated that the plant height severely affected by heavy weed infestation in this treatment (Table 1). Similar results were also reported by Patil ***et al.*** (1986). The highest dose of Ronstar 25EC found better results in plant height than other two doses of this herbicides. But in case of Setoff 20WG and Golteer 5G showed the reverse results that the highest dose of these herbicides reduced the plant height than the lowest dose. The adverse effect of the highest dose of Setoff 20WG and Golteer 5G than Ronstar 25EC was occurred on plant height might be due to some physiological disorder caused by these herbicide.

Golteer 5G @ 24.7 kg ha^{-1} produced the highest (4.00) number of effective tillers plant^{-1}; while the lowest (3.05) number of effective tillers plant^{-1} was found in control. Results of this study showed that control failed to produce more tillers due to severe weed infestation in the experimental plots. Results also indicated that the number of effective tillers plant^{-1} increased with the increment of doses of Ronstar 25EC (Table 1). But the highest dose of Setoff 20WG (200 g ha^{-1}) decreased the number of effective tillers plant^{-1} than the highest doses of Setoff 20WG and Golteer 5G. This might also due to fact that the unidentified physiological disorder in plant by Setoff 20WG and Golteer 5G that reduced the effective tillers plant^{-1}.

The highest (0.57) number of non effective tiller plant^{-1} was produced in Golteer 5G @ 12.35 kg ha^{-1}. On the contrary, the lowest (0.27) non effective tillers plant^{-1} was noticed in control (Table 1).

Table 1: Mean values for yield and yield contributing characters of BR11 as affected by weed control treatments

Treatments	Plant height (cm)	No. of effective tillers	No. of non-effective tillers	No. of grains/panicle	No. of unfilled spikelets/panicle	1000 seed weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})
Control	102e	3.05e	0.27e	82.21i	24.50a	21.20e	3.40g	4.51g
Ronstar 25E @ 1.0 l ha^{-1}	103de	3.24de	0.33cde	97.84a	20.56f	21.81c	4.46c-e	5.70e
Ronstar 25EC @ 2.0 l ha^{-1}	103d	3.46cd	0.47ab	87.39e	21.51e	22.12b	4.15e	5.98de
Ronstar 25EC @ 3.0 l ha^{-1}	105b	3.53b-d	0.29 de	84.69f	22.10d	21.49d	4.29de	6.00d
Setoff 20 WG @ 50 g ha^{-1}	107a	3.70a-c	0.42b-d	93.25b	23.20c	22.10b	4.88ab	6.44b
Setoff 20 WG @ 100 g ha^{-1}	104c	3.83ab	0.45a-c	88.09d	23.40c	21.84c	4.71bc	6.32bc
Setoff 20 WG @ 200 g ha^{-1}	105b	3.51b-d	0.31de	84.36g	22.30d	22.00bc	4.17e	6.05cd
Golteer 5G @ 12.35 kg ha^{-1}	105b	3.23de	0.57a	83.76h	21.57e	22.10b	3.83f	4.85f
Golteer 5G @ 24.7 kg ha^{-1}	104c	4.00a	0.31de	88.67c	22.30d	22.67a	5.14a	7.03a
Golteer 5G @ 49.4 kg ha^{-1}	104c	3.80ab	0.40b-e	84.78f	24.00b	21.89bc	4.51cd	5.82de

The results indicated that the production of highest non effective tillers plant^{-1} might be due to plant physiological disorder caused by Golteer 5G @ 12.35 kg ha^{-1} and the lowest was in control due to naturally grown in association with weeds. Comparing the effects of herbicides, the highest number of non effective tillers hill^{-1} was obtained in Golteer 5G @ 12.35 kg ha^{-} ;^{1} while the lowest number of non effective tillers hill^{-1} (0.29) was produced from Ronstar 25EC @ 3.0 l ha^{-1} which was quite desirable in using herbicides (Table 1).

Different treatments exhibited significant variation at 1% level of significance in terms of number of grains panicle^{-1}. The highest number of (97.4) grains panicle^{-1} was recorded in treatment Ronstar 25EC @ 1.0 l ha^{-1}. On the other hand, the lowest (82.21) number of grains panicle^{-1} was produced in control (Table 1). Results revealed that higher doses of Ronstar 25EC and Setoff 20WG decreased the number of grains panicle^{-1} than lowest doses of those herbicides. On the contrary, higher dose of Golteer 5G produced the relatively higher grains panicle^{-1} than the lowest dose of Golteer 5G.

The highest (24.5) number of unfilled spikelet was found in control. It perhaps, due to heavy weed infestation in the control plot. On the contrary, the lowest (20.56) number of sterile spikelets panicle^{-1} was produced in Ronstar 25EC @ 1.0 l ha^{-1} (T_1) which was quite expected (Table 1). Results also indicated that the highest doses of Ronstar 25EC and Golteer 5G increased the number of sterile spikelets panicle^{-1}; while the highest dose in Setoff 20WG decreased the unfilled spikelets panicle^{-1} (Table 1). Among the treatments Ronstar 25EC @ 1.0 l ha^{-1} led to better performance than rest of the treatments. Similar findings were also reported by Islam (1995).

Thousand grains weight manifested significant variation at 1% level of significance due to different weed control treatments. The highest 1000-grains weight (22.67g) was recorded in Golteer 5G @ 24.70 kg ha^{-1}. On the other hand, the lowest 1000 grain weight (21.21 g) was found in control (Table 1). The control produced the lowest 1000 grains weight might be due to higher weed infestation than other herbicidal treatments and highest 1000-grains yield produced in T_8 might be due to relatively lower weed infestation and effective weed control. The treatments were also showed a reduction pattern in 1000-grains weight with increment in different dose of the used three herbicides. Average of three dose of Golter 5G showed the better results in terms of 1000-grains weight, over the other average of both three doses of Ronstar 25EC and Setoff 20WG. The result further, revealed that the three average dose of Setoff 20WG secured the second position in terms of 1000-grains weight.

Significant variation was observed in grain yield at 1% level due to different weed control treatments. The maximum grain yield (5.14 t ha^{-1}) was obtained in Golteer 5G @ 24.70 kg ha^{-1} (T_8). On the contrary, the lowest grain yield (3.40 t ha^{-1}) as found in control (Table 1). The lowest grain yield in control might be due to resultant effects of the lowest performance of yield contributing characters. This happened due to severe weed infestation of various species of

weeds and greater competition for moisture, space, air, nutrient between weeds and rice plant, which influenced the reduction of all yield components and finally grain yield. Anonymous (1979) reported similar results. There was no significant difference in between Ronstar 25EC @ 2.0 l ha^{-1} and Setoff 20WG @ 200 g ha^{-1}. The highest grain yield increased by 51.18% over the yield in control (Table 2), this might be due to produce the highest number of effective tillers, heaviest grain and finally effective weed control measure. Though the highest grain yield produced in treatments of Golteer 5G but the average of three dose of Setoff 20WG showed its superiority over the other two averages of three doses of Ronstar 25EC and Golteer 5G. The lowest doses of Ronstar 25EG increased the grain yield; while the lowest dose of Golteer 5G and Setoff 20WG showed quite reverse effects on grain yield.

Different weed control treatments in regard to straw yield manifested significant difference at 1% level of significance. The highest straw yield (7.03 t ha^{-1}) was observed in (Golter 5G @ 24.7 kg ha^{-1}; while the lowest straw yield (4.51 t ha^{-1}) was found in control (Table 1). The lowest straw yield was recorded in control might be due to heavy weed infestation and competition with crop plants and finally depressed the effective tillers $plant^{-1}$ and grain $panicle^{-1}$. These results also accord to the findings of Islam (1995), Hauqe (1993) and Mazid (1990). The results further indicated that the highest straw-grain ratio (1.45) was obtained from the treatment T_6. It might be due to some unknown physiological causes which reduced the partitioning of dry matter in the grain. On the other hand, the lowest straw-grain ratio (1.27) was found in Golteer 5G @ 12.35 kg ha^{-1} (Table 2). This might be due to more partitioning of dry matter in grain without any disruption in physiological process by the lowest dose of Golteer 5G. The straw yield increased by 55.87% in Golteer @ 24.70 kg ha^{-1} treatment than that in control (Table 2).

Table 2: Percent increase of production of grain and straw over control in aman rice grown under wet-seeded culture due to weed controlling treatments and straw grain ratio

	Grain yield		Straw yield		
Treatments	t ha^{-1}	%increase	t ha^{-1}	%increase	Straw grain ratio
Control	3.4	-	4.51	-	1.33
Ronstar 25EC @ 1.0 l ha^{-1}	4.46	31.18	5.70	26.38	1.28
Ronstar 25EC @ 2.0 l ha^{-1}	4.15	22.06	5.98	32.59	1.44
Ronstar 25EC @ 3.0 l ha^{-1}	4.29	26.17	6.00	33.03	1.04
Setoff 20WG @ 50 g ha^{-1}	4.88	43.52	6.44	42.79	1.32
Setoff 20WG @ 100 g ha^{-1}	4.71	38.53	6.32	40.13	1.34
Setoff 20WG @ 200 g ha^{-1}	4.17	22.64	6.05	34.21	1.45
Golteer 5G @ 12.35 kg ha^{-1}	3.83	12.65	4.85	7.53	1.27
Golteer 5G @ 12.35 kg ha^{-1}	5.14	51.18	7.03	55.87	1.37
Golteer 5G @ 12.35 kg ha^{-1}	4.51	32.64	5.82	29.05	1.29

Yields (grain and straw) and yield contributing characters such as plant height, production of total, effective and non effective tillers hill^{-1}, number of spickelets panicle^{-1} and weight of thousand grains of BR11 (Mukta) rice were significantly influenced by different weed control treatments. But among three herbicides Golter 5G showed relatively better performance over ronstar 25EC and Set off 20WG. The highest doses of Ronstar 25EC, Setoff 20WG and Golteer 5G reported to show lower performance in BR11 than that of medium doses of this herbicides. Set off 20WG @ 50 g ha^{-1} produced the highest plant height (107.500 cm) and second highest number of grains panicle^{-1}. The smallest plant, lowest number of effective, non effective tillers plant^{-1}, grains panicle^{-1}, grain yield, straw yield were produced in control. The highest number of effective tillers plant^{-1}, 1000 grain weight, grain yield, straw yield were obtained by the Golteer 5G @ 24.70 kg ha^{-1}.

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