

EFFECTS OF HERBICIDES VICHETE 5G AND RIFIT 500 EC ON WEED CONTROL AND GROWTH, YIELD AND YIELD ATTRIBUTES OF BRRI DHAN 28

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Key words: Effect of herbicides, BRRI Dhan28, Vichete 5G, Rifit 500 EC, Weeds

Abstract

Two herbicides Vichete 5G and Rifit 500EC were applied to control weeds in BRRI Dhan 28 with six different treatments *viz.*, T₀ (control, no herbicide was used), T₁ (Vichete 5G half dose), T₂ (Vichete5G normal dose), T₃ (Double the dose of T₂), T₄ (Rifit 500EC half dose) and T₅ (Rifit 500EC normal dose) and studied their effects on the growth, yield and yield attributes of BRRI Dhan 28. Among the six treatments Vichete 5G (T₂) showed most effective to increase the length of tiller, flag leaf area, length of panicle, number of filled grains, total number of grains per panicle, ratio of filled and unfilled grains, 1000- grain weight, fresh weight of straw and grain and dry weight of straw and grain. The N,P,K concentrations of both straw and grain were also found maximum from T₂ where normal dose of Vichete5G was applied.

More than 90% of the population of Bangladesh depend on rice for their major food intake. Despite the efforts for population control over the last few decades, still it is increasing at an alarming rate throughout the developing Asia and that in Bangladesh is about 1.50% (Anon. 2000). Rice accounts to 27% of the world's total food grain production (Paroda 1998, Azhakanandam 1999). Thus rice is the foremost contributor to the daily calories intake and clearly a major source of protein for more than two billion people of the world (Potrykus *et al.* 1995).

Losses due to weeds in Aus rice, range from 58% to complete failure of the crops (BRRI 1981). Mamun (1990) concluded that weed growth reduced the grain yield by 68 - 100% for direct seeded Aus rice, 16 - 48% for transplanted Aman rice and 22 - 36% for modern Boro rice. Amarjit *et al.* (1994) observed that poor weed control is one of the major factors for yield reduction of rice depending on the type of weed flora and their intensity. Rice yield generally continued to increase, however, as the length of the weed free period increased (Mamun *et al.* 1986). Competition of weeds is a major constraint to the productivity of wet-seeded rice because rice has no growth advantage over weeds as in transplanted rice. Grass weeds are also more difficult to hand weeding at the transplanting stage because of their similar morphology to that of rice (Budhar *et al.* 2002). The traditional methods of weed control in rice field in Bangladesh are land tillage and hand weeding which are time consuming and expensive as well. These involve a large number of manpower which during the pick period is very difficult to hire (Chowdhury *et al.* 1995). Therefore, there is a great urge for the use of herbicides to control weeds in paddy field and comparatively involve less cost. The effect of herbicides was found to be positive in controlling the weed species and in increasing the yield components and yield of BR 11 paddy grown in Aman season (Hossain and Rahman 2013). Hence in the present experimentation two herbicides Vichete 5G and Rifit 500EC were applied in different doses and studied their effects on weed control and growth, yield and yield attributes in BRRI Dhan28 grown in Boro season.

BRRI Dhan28 was collected from BADC seed distribution center, Hathazari, Chittagong. BRRI Dhan28 is a recommended variety of BRRI released in 1994 to grow in Boro season. The study was conducted in the experimental field of the Botanical Garden, University of Chittagong.

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Sprouted seeds were sown in the prepared seed bed. Forty days old two healthy seedlings per hill were transplanted from seedbed to the prepared field. The prepared field was divided into 18 plots each measured 4 m × 4 m. Row to row and hill to hill distance were 20 cm × 20 cm and a total no of 400 hills were present in each plot. Irrigation, weeding and other cultural practices were done as an when required.

Table 1. The fertilizers were used in the experimental field as per following schedule (BRR1 1991).

Name of fertilizers	Kg/ha	Time of application
N	180	(i) As basal dose during land preparation
	180	(ii) As top dressing after 21 DAT
	180	(iii) At booting stage
P ₂ O ₅	100	As basal dose during land preparation
K ₂ O	50	As basal dose during land preparation
ZnSO ₄	10	As basal dose during land preparation

Table 2. Two herbicides were applied as per following schedule:

Treatments	Herbicides	Doses of herbicides	Time of application
T ₀ (control)	No herbicide was used	-	-
T ₁	Vichete5G	Half of the dose of T ₂ (12.5 kg/ha)	After 3 days of transplantation.
T ₂	Vichete5G	Normal of the dose of Vichete5G (25 kg/ha)	"
T ₃	Vichete5G	Double of the dose of T ₂ (50 kg/ha)	"
T ₄	Rifit 500EC	Half of the dose of T ₅ (500 ml/ha)	"
T ₅	Rifit 500EC	Normal of the dose of Rifit 500 EC (1000 ml or 1 l/ha)	"

Complete randomized design (CRD) was maintained in this experiment. There were six treatments each with three replications. BRR1 Dhan28 was harvested after 105 days from the date of transplantation when the grains were matured and became yellow in colour. For collection of data ten hills per plot were selected at random. The following data were recorded: No. of tillers/hill, length of tiller (cm), flag leaf area (cm²), length of panicle (cm), No. of filled and unfilled grains per panicle (30 panicle in each replication), 1000-grain weight (g) and fresh and dry weight of straw and grain (t/ha).

For chemical analysis 100 g of straw and grain were taken from each plot separately and the straw was cut into small pieces. Straw and grain were dried in an oven at 65°C till a constant dry weight was obtained. The dried straw and grain were grinded separately in an electric grinder and made into powder (60 meshed sieves) and stored in airtight containers for digestion. Dried powdered plant samples (straw and grain) were digested by modified micro-Kjeldahl method and nitrogen was analyzed as described by Jackson (1973). Phosphorus was determined in spectrophotometer (Spectronic 21D Milton Roy of 420 nm) and potassium was analyzed in flame photometer (Corning Flame Photometer).

Different doses of Vichete5G and Rifit500EC were used in the present experimentation and studied their effects on weed control and growth, yield and yield attributes of BRR1 Dhan28. It was revealed from Table 3 that the number of tillers per hill increased significantly in all the

treatments from T₀ to onwards. The highest number of tillers per hill (17.85) was found in T₃ followed by T₂, T₁, T₄, T₅ and T₀, respectively. The length of tiller increased significantly in all the treatments from T₀ to T₅. The highest length of tiller (80.39) was found in T₂ followed by T₁, T₄, T₅, T₃ and T₀, respectively. The flag leaf area increased significantly in all the treatments from T₀, to T₅. The highest value (21.16) was obtained from T₂ followed by T₁, T₄, T₅, T₃ and T₀, respectively. The length of panicle increased significantly in all the treatments from T₀. The highest length of panicle (20.53) was found from T₂ followed by T₁, T₄, T₅, T₃ and T₀, respectively.

Table 3. Effect of Vichete5G and Rifit 500EC on number of tillers per hill, length of tiller, flag leaf area and length of panicle of BRRI Dhan28 grown in Boro season.

Treatments	Number of tillers/hill	Length of tiller (cm)	Flag leaf area (cm ²)	Length of panicle (cm)
T ₀	11.60	75.51	19.01	18.73
T ₁	13.60	79.68	20.49	20.26
T ₂	13.90	80.39	21.16	20.53
T ₃	17.85	78.28	20.14	19.45
T ₄	13.55	79.60	20.40	19.93
T ₅	13.48	78.94	20.36	19.73
SE(d) ±	0.063	0.44	0.16	0.34
LSD _{0.05}	0.14	0.98	0.38	0.76
LSD _{0.01}	0.20	1.40	0.52	1.08

The number of filled grains per panicle was found highly significant in all the treatments from T₀. The highest number of filled grains (87.22) was obtained from T₂ followed by T₁, T₄, T₅, T₃ and T₀. The total number of grains per panicle increased significantly in all the treatments from T₀. The highest value (96.33) was obtained from T₂ followed by T₁, T₄, T₅, T₃ and T₀. The ratio of filled and unfilled grains increased significantly in all the treatments from T₀. The highest ratio of filled and unfilled grains (9.57) was found from T₂ followed by T₁, T₄, T₅, T₃ and T₀. The 1000-grain weight increased significantly in all the treatments from T₀. The highest 1000-grain weight (23.13) was found from T₂ followed by T₁, T₄, T₅, T₃ and T₀. The fresh weight of straw per hectare increased significantly in all the treatments from T₀. The highest value (8.63) was from T₂ followed by T₁, T₃, T₅, T₄ and T₀. The fresh weight of grain per hectare was found significantly increased in all the treatments from T₀. The highest fresh weight (5.50) was from T₂ followed by T₁, T₄, T₅, T₃ and T₀. The dry weight of straw per hectare increased significantly in all the treatments from T₀. The highest value (3.90) was obtained from T₂ followed by T₁, T₄, T₅, T₃ and T₀. The dry weight of grain per hectare increased significantly in all the treatments from T₀. The highest dry weight (4.43) was found from T₂ followed by T₁, T₄, T₅, T₃ and T₀ (Table 4).

The N, P and K concentrations of straw increased significantly in all the treatments from T₀. The highest value was obtained from T₂ followed by T₅, T₄, T₁, T₃ and T₀. The total NPK concentration of straw was found maximum at T₂. In N : P : K of straw, N and P concentrations were found maximum from T₄ but K concentration was found highest at T₀ (Table 5).

The effects of different doses of Vichete 5G and Rifit 500EC were not found similar on the growth, yield and yield attributes of BRRI Dhan28. The length of tiller, length of panicle, flag leaf area, number of filled grains, ratio of filled and unfilled grains increased in all the treatments from T₀ (control) where no herbicide was applied. The highly significant increased values of these parameters were found at T₂ where normal dose of Vichete 5G was applied. The increase of length

Table 4. Effect of Vichete 5G and Rifit 500 EC on number of filled grains, total number of grains, ratio of filled and unfilled grains, 1000-grain weight, fresh weight of straw and grain, dry weight of straw and grain of different treatments in BRRi Dhan28 grown in Boro season.

Treatments	Filled grains, no./panicle	Total grains, no./panicle	Ratio of filled and unfilled grains	1000-grain wt. (g)	Fresh wt. of straw (t/ha)	Fresh wt. of grains (t/ha)	Dry wt. of straw (t/ha)	Dry wt. of grains (t/ha)
T ₀	67.24	77.82	6.36	18.47	6.65	3.84	2.92	2.44
T ₁	80.45	89.81	8.60	20.47	8.60	5.45	3.73	4.10
T ₂	87.22	96.33	9.57	23.13	8.63	5.50	3.90	4.43
T ₃	67.93	78.21	6.61	19.43	7.92	5.20	3.31	3.70
T ₄	78.92	89.17	7.70	19.87	7.54	5.34	3.36	3.90
T ₅	74.07	84.33	7.22	19.60	7.83	5.31	3.33	3.84
SE(d) ±	0.58	0.49	0.57	0.69	0.54	0.28	0.17	0.19
LSD _{0.05}	1.70	1.76	1.25	1.57	1.22	1.17	1.08	1.10
LSD _{0.01}	1.84	1.96	1.79	1.83	1.71	1.52	1.34	1.38

The N, P and K concentrations of grain also increased significantly from T₁, T₂, T₃, T₄ and T₅ from T₀. The highest values of N, P, K (1.25, 0.42 and 1.26) were found from T₂ followed by T₅, T₄, T₁, T₃ and T₀. The highest total NPK concentration of grain was also obtained at T₂. In N : P : K of grains, N and K concentrations were found maximum at T₀ but P concentration was found highest at T₂ (Table 5).

Table 5. Effect of Vichete 5G and Rifit 500EC on N, P and K concentrations (g% of dry weight basis) of straw and grain of BRRi Dhan28 grown in Boro season.

Treatments	Straw			Total* NPK	N:P:K*	Grains			Total* NPK	N:P:K*
	N	P	K			N	P	K		
T ₀	0.60	0.25	0.62	1.47	40.82 : 17.00 : 42.18	1.18	0.33	1.19	2.70	43.70 : 12.22 : 44.07
T ₁	0.66	0.32	0.67	1.65	40.00 : 19.39 : 40.61	1.21	0.37	1.23	2.81	43.06 : 13.17 : 43.77
T ₂	0.78	0.41	0.80	1.99	39.20 : 20.60 : 40.20	1.25	0.42	1.26	2.93	42.66 : 14.33 : 43.00
T ₃	0.62	0.28	0.63	1.53	40.52 : 18.30 : 41.18	1.20	0.36	1.20	2.76	43.48 : 13.04 : 43.48
T ₄	0.76	0.33	0.77	1.86	40.86 : 20.63 : 41.40	1.22	0.39	1.24	2.85	42.80 : 13.68 : 43.51
T ₅	0.77	0.35	0.79	1.91	40.31 : 18.32 : 41.36	1.24	0.41	1.25	2.90	42.76 : 14.14 : 43.19
SE(d) ±	0.003	0.003	0.001	0.007	-	0.002	0.002	0.009	0.01	-
LSD _{0.05}	0.007	0.007	0.002	0.02	-	0.005	0.005	0.02	0.03	-
LSD _{0.01}	0.011	0.010	0.003	0.03	-	0.007	0.007	0.03	0.04	-

*Calculated value.

of tiller due to application of Rifit 500 EC was found consistent with the findings of Awan *et al.* (2001) and Hossain (personal communication). The length of tiller and length of panicle were also higher and highly significant positive correlation ($r = 0.97$) was obtained between these two parameters. The increase in yield of the present investigation corroborates with the findings of Chandler (1969) and Matsunaka (1970) who also reported significant increase in yield of rice with the application of herbicide. Budhar *et al.* (2002) also observed significant higher grain and straw yield over hand weeding by the use of herbicides.

In BRRI Dhan 28, the grain yield per hectare was found to increase in all the treatments where the increase of straw yield per hectare was obtained and significant positive correlation ($r = 0.88$) was found between them. The increase of flag leaf area of this experimentation due to application of Rifit 500EC was found consistent with the findings of Hossain (personal communication). The flag leaf area increased where the length of panicle increased and highly significant positive correlation ($r = 0.96$) was obtained between flag leaf area and length of panicle. The total number of grains per panicle increased mainly due to the increase of filled grains per panicle which corroborates with the findings of Hossain (personal communication). A highly significant positive correlation ($r = 0.99$) was found between these two parameters. The number of filled grains per panicle was found higher where the ratio of filled and unfilled grains was higher and a highly significant positive correlation ($r = 0.98$) was obtained between these two parameters. The increase in yield and yield attributes of paddy in the present investigation due to application of herbicides corroborates with the findings of Hossain and Rahman (2013) who also reported the increase in yield components and yield of paddy through application of Rifit 500 EC.

The N, P and K concentrations of straw and grain were observed maximum at T₂ where the normal dose of Vichete 5G was applied. The normal dose of Vichete 5G may help in better uptake of NPK nutrients from the soil. However, the effect was found most positive in T₂ where maximum growth, yield and yield attributes were found. So, normal dose of Vichete 5G may be recommended for the control of weed population and ultimate increase in growth, yield and yield attributes of BRRI Dhan 28.

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(Manuscript received on 3 January, 2016; revised on 21 July, 2016)