Effect of flag leaf clipping and GA_3 application on hybrid rice seed yield

M. Sirajul Islam, G.J.U. Ahmed, and A.W. Julfiquar, Bangladesh Rice Research Institute (BRRI), Gazipur 1701, Bangladesh

Hybrid rice technology, now a reality in Bangladesh, aims to break the present yield ceiling of inbred rice to meet the future demand for rice in the country. Today, the major constraint to the expansion of this technology is hybrid rice seed production. With a view to increase per unit area production of hybrid seed, a field experiment was conducted at BRRI during the 2001 T. aman (wet season) and 2002 boro (dry season) to find out the effect of flag leaf clipping and gibberellic acid (GA_3) application on hybrid rice seed yield. IR58025A (female parent) and BR827R (male parent) were taken as experimental materials. Four treatments were applied: T_1 = control, T_2 = GA_3 application without flag leaf clipping, T_3 = flag leaf clipping without GA_3 application, and T_4 = GA_3 application with flag leaf clipping. The experiment was laid out in a randomized complete block design with three replications. Unit plot size was 21.5 m^2.

The R line was seeded thrice in both seasons at 5-d intervals. In T. aman, the first set was seeded on 15 July, the second set on 20 July, and the third on 25 July. The A line was seeded on 26 July, synchronizing with the second set of the R line, because the A line was found to flower 6 d earlier than the R line. The R line was transplanted on 10 Aug with 16-, 21-, and 26-d-old seedlings and the A line was transplanted on 16 Aug with 21-d-old seedlings in the main field. A 2:8 ratio of R and A lines was maintained for the experiment. Similarly, in the boro season, three R-line seedings were done on 10, 15, and 20 Dec. A-line seeding was done on 21 Dec. The R line was transplanted on 11 Jan 2002 and the A line was transplanted on 17 Jan 2002. Fertilizer was applied at 180:100:70 kg ha^{-1} as urea, triple superphosphate, and muriate of potash, respectively, during T. aman. It was 270:130:120:70 kg ha^{-1} as urea:TSP:MP:gypsum, respectively, in the boro season. Urea was applied in three equal splits in both seasons.

Half of the flag leaf of the A line was clipped using a sickle when primary tillers were at booting stage in both seasons. GA_3 was applied at 75 g ha^{-1} in two splits. The first spraying of GA_3 was done when 10–15% of the tillers started to flower; the second spraying was done 2 d after the first spray using a knapsack sprayer. Supplementary pollination was provided during flowering to facilitate pollen dispersal using a bamboo stick.

In the 2001 T. aman season, the A-line plants were moderately infested by bacterial leaf blight (BLB) and stem borer. Some missing hills were retransplanted by splitting tillers from the main experimental plots. In the 2002 boro season, the R line flowered 2 d earlier than expected. At heading time of the A line, some R-line plants were brought from an adjacent border to cope with the pollen load of the R line.

Results indicated that, in the T. aman season, plant height of the A line differed significantly among different treatments (see

Effect of flag leaf clipping and GA_3 application on the plant characters and yield of an A line in T. aman (wet season) 2001 and boro (dry season) 2002 at BRRI, Gazipur, Bangladesh.

Treatment[a]	Plant height (cm)	Tillers $hill^{-1}$ (no.)	Panicles $hill^{-1}$ (no.)	Outcrossing rate (%)	Seed yield (kg ha^{-1})
2001 T. aman (wet season)					
T_1	66	10.5	9.1	17	685
T_2	90	8.6	5.9	17	677
T_3	63	9.7	7.6	19	709
T_4	82	9.6	6.9	20	724
LSD(0.5)	5.126	1.808	3.115	6.113	181.91
CV (%)	3.4	9.4	21.0	16.0	13.0
2002 boro (dry season)					
T_1	88	15	15	19	1,229
T_2	86	12	10	23	1,406
T_3	79	16	15	25	1,520
T_4	82	13	12	30	1,676
LSD(0.5)	9.064	8.494	7.673	6.283	292.39
CV (%)	5.4	29.8	29.7	12.9	10.0

[a] T_1 = control, T_2 = GA_3 application without flag leaf clipping, T_3 = flag leaf clipping without GA_3 application, T_4 = GA_3 application with flag leaf clipping.

table). The highest plant height was observed in T_2, where GA_3 was applied without flag leaf clipping. But the differences during the boro season were nonsignificant. The number of tillers and panicles per hill remained statistically identical among all treatments in both seasons. The outcrossing rate in the boro season was highest in T_4, where GA_3 and flag leaf clipping were done simultaneously. The average outcrossing rate was also highest in T_4 in the T. aman season, but the differences were nonsignificant. The highest hybrid rice seed yield was observed in T_4, which was significantly higher than that of the control plots in the boro season. Differences in the T_2, T_3, and T_4 were nonsignificant. No significant differences were observed in terms of seed yield among different treatments during T. aman.

It is concluded that hybrid rice seed yield was increased by the application of GA_3 and flag leaf clipping. Seed yield was lower in the T. aman season because of unfavorable weather conditions and pest infestations during the growth period in Gazipur, Bangladesh.

Rice yield as affected by use of biofortified straw compost combined with NPK fertilizer

Y. Singh, H.C. Sharma, K. Singh, U.N. Singh, A.K. Singh, C.S. Singh, and K.K. Singh, Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University (BHU), Varanasi 221005, India

To fully exploit the yield potential of input-responsive, high-yielding rice cultivars, agronomists generally consider improving the management of essential macro mineral elements only (NPK) while ignoring the rest. Rice straw as farm waste was found useful for sustaining rice productivity and soil health in a pollution-free environment when used either alone or in combination with mineral fertilizers (macro- and micronutrients) or bioactivators or both (Gaur 1999). This study was conducted during the 2002 and 2003 rainy seasons at the BHU Research Farm to find the efficiency of bio-fortified rice straw compost in combination with NPK in transplanted rice.

Soil at the experimental site was sandy clay loam (Ustochrept) with a pH of 7.2 and an ECe of 0.33 dS m^{-1} at 25 °C. It was moderately fertile, being low in organic C (0.46%) and available N (180 kg ha^{-1}) and medium in available P (19 kg ha^{-1}) and K (206 kg ha^{-1}). The experiment was carried out in a randomized block design. Samba Mansuri (BPT5204) was the test crop used. Half the amount of N and full P and K were applied as basal; the remaining N was applied in two equal splits at tillering and panicle initiation. Rice straw compost was applied at 6 t ha^{-1} before transplanting. To prepare this, rice straw was collected from the threshing floor and brought to the composting pit (3 m length × 2 m breadth × 1 m height). Rice straw was spread layer after layer, with each layer having a thickness of 15 cm. On each layer, urea solution (1 kg urea for 1,000 L of water) was spread. These pits (three in number) were irrigated frequently to maintain the moisture level at 80–100%. The rice straw compost was treated with a suitable culture of N_2-fixing bacteria (*Azotobacter chrococcum* to raise their number to 100 × 10^6 100 kg^{-1} of organic material), P-solubilizing fungi (*Trichoderma viridae* at 300 g t^{-1} of raw material), and PSB (*Bacillus polymyxa* at 500 g t^{-1} of raw material) to obtain compost with enriched quality. Low-grade rock phosphate (1%) was added to improve the P content of the compost. Rice straw compost was enriched with spraying of salt solution containing 12 kg $CaSO_4 \cdot 2H_2O$, 6 kg SSP, 4 kg $MgSO_4$, 500 g $FeSO_4$, 200 g $ZnSO_4$, 15 g $MgCl_2$, 7 g $CuSO_4$, 70 g H_3BO_3, 5 g $(NH_4)_6Mo_7O_{24} \cdot 4H_2O$, and 7 g $CoSO_4$. These salts were sufficient for approximately 1 t of composting biomass and were dissolved in 10 L of water and sprayed on the composting mass at the 30th day of the process. The material was thoroughly mixed three times at 15-d intervals during the entire composting period for proper aeration. The total decomposed rice straw compost thus obtained had a concentration of 0.43% N, 0.09% P, 1.16% K, 0.80% CaO, 0.02% Fe, and 3.82% Si.

The pooled grain and straw yield data (Table 1) were significantly influenced by the biofortified rice straw compost superimposed on NPK. Maximum yield was obtained with the application of rice straw compost inoculated