Bangladesh Agron. J. 2022, 25(2): 1-9

GROWTH AND YIELD RESPONSE OF SELECTED *AMAN* VARIETIES AS INFLUENCED BY LEAF CUTTING

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(**Received**: 11 June 2022, **Accepted**: 05 December 2022)

Keywords: Leaf removal, photo assimilation, modern rice, harvest index, flag leaf, penultimate leaf

Abstract

Sustainable crop production in the era of increasing input price is adding extra burden while the cultivable land is reducing at an alarming pace. This research article aims to test the hypothesis that the leaf cutting as an agronomic practice could be a better prospective in increasing rice grain production. An experiment was carried out in the experimental field of Sher-e-Bangla Agricultural University, to assess the effect of leaf cutting on plant growth and yield of selected BRRI released Aman varieties. The experiment consisted of five rice varieties namely BRRI dhan32, BRRI dhan33, BRRI dhan39, BRRI dhan62, and BRRI dhan56 treated either as control or leaf cutting (except flag and penultimate leaf). The experiment was laid out in randomized complete block design (RCBD) with three replicates. Leaf cutting was observed with detrimental effect on the usual plant growth and yield performances. Irrespective of all studied varieties, the highest value was obtained while no leaf cutting was performed. BRRI dhan39 was found to be the highest yield producing variety in terms of greater flag leaf length, leaf breadth, flag leaf area, required less time to grain filling, filled grain panicle^{-1}, filled grain%, 1000-grain weight, grain yield and harvest index in leaf cutting condition followed by BRRI dhan32 in terms of plant height, chlorophyll content, tiller hill^{-1} and straw yield. No significant differences in yield contributing parameters except the panicle hill^{-1} were observed in leaf cutting condition compared to control. Leaf cutting at heading (except flag leaf and penultimate leaves) reduced average 10-20% loss of grain yield. BRRI dhan62 shown highly affected by leaf cutting compared to the rest other varieties. Therefore, it can be concluded by suggesting that leaf cutting reduces plant functional efficiency which can be improved by enhancing photosynthetic capacity through proper management of leaf architecture.

Introduction

Rice (*Oryza sativa* L.) is the staple food for over half of the world population and is the second most common cereal crop in the world (Shang *et al.,* 2020). Around 75% of agricultural land in Bangladesh is occupied by rice cultivation that contributes nearly 28% of the GDP (Mazumder *et al.,* 2020). Ever increasing population is putting an extra pressure on cultivable land and is reducing cultivable land at 0.4% rate due to urbanization and industrialization (Karmakar and Karmakar, 2019). Thus, rice output must be increased urgently through yield maximization to ensure long-term food security. Proper agronomic management is necessary to maximize rice crop growth and grain yield. In Bangladesh rice cultivation varies due to seasonal change in water supply. During the growing season, the mean temperature, and the total temperature variation, range, distribution pattern, and diurnal changes, or a combination of these may be highly correlated with the grain yields of rice (Islam *et al.,* 2019). Potential for increased rice production strongly depends on the ability to integrate a better crop management for the different varieties into the existing cultivation. Variety itself is a genetic factor which contributes a lot in producing yield and yield components of a particular crop (Mahmud *et al.,* 2013). To increase cropping intensity and production, there is no alternative for cultivation of short duration variety and adoption of modern agricultural practices. There are several important factors those have tremendous influence on the growth and development, tiller production, grain formation and other yield contributing characters. Flag leaf is metabolically active and has proved that the flag leaf, stem and head are the closest source food to the grain (Rahman *et al.,* 2013). Flag leaf contributed to 45% of grain yield and is the single most component for yield loss through synthesis and translocation of photo-assimilates to the rice grain (Das *et al.,* 2017; Karmakar and Karmakar, 2019). The contribution of leaf removal in different rice cultivar was the minimum, suggesting the probability of maximum translocation of photosynthesis from stem to the grain during grain feeling stage of rice after leaf removal (Abou-khalifa *et al.,* 2008). Since the productivity of a plant depends on the efficiency of its photosynthetic processes and therefore on the extent of its photosynthetic surface, the growth and development of leaves have a profound impact on the yield of the plant (Mazur *et al.,* 2019). The top three leaves have the greatest impact on grain yield. As a result, a thorough investigation of rice yield after chopping flag leaf and surrounding leaves was conducted (Abou-khalifa *et al.,* 2008). In order to improve rice grain yield, it is necessary to examine the morphological and physiological properties of functional leaves. Another significant chemical involved in photosynthesis in plant leaves is chlorophyll, which has a direct impact on crop biomass and production. Photosynthetic rate and chlorophyll content are linked. (Mahmud *et al.,* 2013). If leaf removal has no influence on grain production, it might become one of the most cost-effective ways to boost yield, with the added benefit of providing green fodder for farm animals. Rice cultivation's effectiveness as a dual-purpose crop is largely determined by improved agronomic techniques and cutting time. For collecting enough fodder without reducing grain productivity, the timing of cutting rice leaves and the selection of an appropriate variety appear to be crucial. Considering the above facts, the present study was carried out to evaluate yield, yield related parameters and quality of selected rice cultivars as influenced by leaf cutting.

Materials and Methods

The experiment was conducted at the research field of Sher-e-Bangla Agricultural University, Dhaka from July to December, 2016. Five rice varieties released from Bangladesh Rice Research Institute (BRRI) were used as plant materials. The rice varieties used in the experiments were V_1=BRRI dhan32, V_2=BRRI dhan33, V_3=BRRI dhan39, V_4=BRRI dhan62, V_5=BRRI dhan56. The seeds were collected from the BRRI, Joydebpur. The experiment consists of two factors, factor A: Five varieties, and factor B- Control (c), and leaf cutting (Lc; except flag and penultimate leaves). The experiment was laid out in randomized complete block design with three replications.

Rice seedlings were sown in the seedbed under the supervision of farm management division of Sher-e-Bangla Agricultural University, Dhaka. As per BRRI recommendation seedbed was prepared with 1 m wide and added nutrients as per requirements of soil. Seed were sown in the seedbed @ 70 gm^{-2}. The plot selected for the experiment was exposed to the sun for a week after initial soil opening. Later on, the land was harrowed, ploughed and cross-ploughed several times followed by laddering to obtain a good tilth condition. Weeds and stubble were removed and 10 tha^{-1} amounts of cowdung, TSP, MP, Gypsum and Zinc and 1/3 of urea were applied at the time of final land preparation at broadcasting method. Half of the rest 2/3 of urea was applied at 25 days after transplanting (DAT) and the rest amount of urea was applied at 45

DAT. The nursery bed was made wet by application of water one day before uprooting the seedlings. At 23 days after sowing, seedlings were uprooted and transplanted to the previously prepared main field, maintaining a distance of 25 cm × 20 cm. Two seedlings hill^{-1} were used during transplanting. Gap filling was done for all of the missing hills at 10 DAT by planting same aged seedlings. First weeding was done from each plot at 15 DAT and second weeding was done from each plot at 40 DAT. The rice plant was harvested depending upon the maturity of grains and harvesting was done manually from each plot. Maturity of crop was determined when 80-90% of the grains become golden yellow in color. Ten randomly selected hills per plot from which different data were collected and 3 m^2 areas from middle portion of each plot was separately harvested and bundled, properly tagged and then brought to the threshing floor. Harvesting, threshing and cleaning of rice seed were done carefully. Fresh weight of grain and straw were recorded plot wise. Finally, the weight was adjusted to a moisture content of 13%.

The data on plant height, leaf parameters, tiller hill^{-1}, chlorophyll (chl) of flag leaf, panicle hill^{-1}, grain panicle^{-1}, grain filling time, filled and unfilled grain panicle^{-1} were collected before harvesting. After harvesting, the straw was sun dried and the yield parameter viz., grain yield, filled grain%, 1000-grain weight, straw yield, biological yield and harvest index were recorded accordingly. Chlorophyll content was measured on fresh weight basis extracting with 80% acetone and used doubled beam spectrophotometer (Model: U-2001, Hitachi, Japan) according to Witham *et al.* (1986). The total chlorophyll content was estimated by adding chl *a* and chl *b*. Harvest index was calculated dividing the grain yield by the total biological yield (grain and straw) of the same area and multiplying by 100.

$$\text{Harvest index (\%)} = \frac{Grain\ yield}{Biological\ yield} \times 100$$

The data obtained for different characters were statistically analyzed to observe the significant difference among the treatment (Statistix 10). The significance of the difference among the treatment means were estimated by the Least Significant Difference (LSD) test at 5% level of probability.

Results and Discussion

Effect of leaf cutting on growth parameters of rice

Plant growth parameters were significantly influenced due to leaf cutting. Leaf cutting negatively impacted on different plant parameters. However, in all the tested parameters, the controls resulted with the highest performances compared to the respective other treatment. Therefore, here we will consider the highest and lowest values of the varieties while leaf cutting was performed.

Plant height, leaf no. at heading

The plant height of different varieties exhibited wide variation in length due to leaf cutting. The plant height was maximum (127.61 cm) in BRRI dhan33. The shortest plant height (97.26 cm) was found from BRRI dhan56. The remaining varieties were intermediate in this regard (Fig. 1A). The number of leaves produced at heading of different rice cultivars showed no significant variation due to leaf cutting. Therefore, less detrimental effect of leaf cutting was observed in varieties due to leaf cutting. However, the maximum numbers of leaves at heading (64.67) were produced by BRRI dhan62 which were statistically superior to the rest of the varieties. BRRI dhan32 and BRRI dhan39 produced second highest number of leaves which was also statistically different from the rest of the lines. The least number of leaves (53.67) produced by BRRI dhan56 while the other varieties took intermediate positions and they were statistically different among themselves (Fig. 1B). Confalonieri *et al.* (2011) detected plant height as a key factor to predict rice yield potential and established a model to estimate the plant height increase. Similarly, Karmakar and Karmakar (2019) reported that plant height was significantly affected by nitrogen rates and different leaf clipping times in BRRI dhan41. Suprio *et al.* (2010) also found effective grains per panicle revealed significant positive relationship with plant height. It indicated that increasing plant height increases effective panicles per plant.

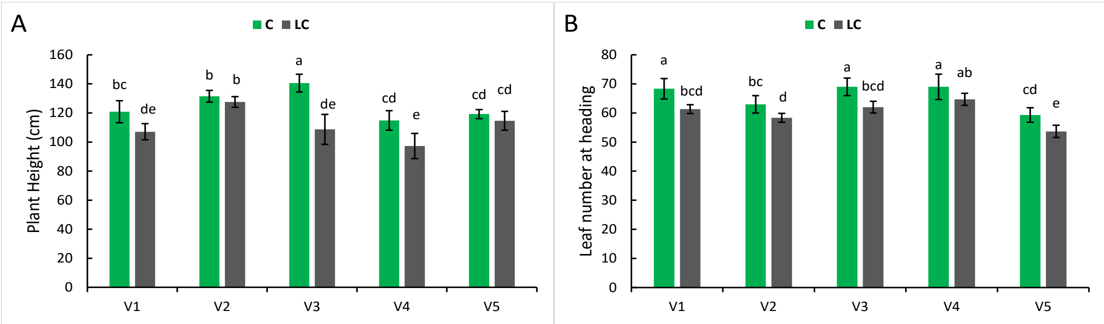

Fig. 1. Combined effect of varieties and leaf cutting on plant height (A) and leaf number at heading (B) of rice. Means with different letters are significantly different at $P \leq 0.05$ by LSD test. Here C, LC denotes control and leaf cutting, V_1- V_5; BRRI dhan32, BRRI dhan33, BRRI dhan39, BRRI dhan62, BRRI dhan56, respectively.

Leaf parameters (Leaf length, breadth and area)

Leaf cutting significantly reduced the leaf length, breadth and area of flag leaf, penultimate and 3rd leaf in all five tested varieties compared to the control (Table 1). However, due to leaf cutting the highest reduction of leaf length in flag leaf, penultimate and 3rd leaf 22.24, 23.37 and 17.29% was observed in V_5, V_4 and V_2 variety, respectively. On the contrary, the highest flag, penultimate and 3rd leaf length was observed in V_3, V_3 and V_5 variety, respectively (Table 1). Leaf length is very important in rice because leaf length is positively correlated with panicle length thereby was correlated with the grain yield of rice. Genetic analysis of the morphological and physiological characteristics of functional leaves, especially flag leaf is found important for rice improvement program. It is noticed that when leaf length is high the panicle length is also high. Rahman *et al.* (2013) observed length of flag leaf and panicle of two rice cultivars, BR11 and BRRI dhan28 where flag leaf length positively correlates with yield and was highly significant. Plants with greater flag leaf length had elongated panicle length, thus producing increased number of primary and secondary rachis resulted in increased number of grains in the panicle that ultimately improved the yield of the variety. Flag leaf contributed to 45% of grain yield and is the single most component for yield loss. These results are in agreement with earlier reports on the contribution of flag leaf and top three leaves to grain yield (Misra and Misra, 1991).

Table 1. Combined effect of varieties and leaf cutting on leaf length, breadth and area of rice

Treatment	Leaf length (cm)			Leaf breadth (cm)			Leaf area (cm^2)		
	F	P	T	F	P	T	F	P	T
V_1	37.22de	49.26cd	20.52cd	1.65bcd	1.56d	1.31fg	59.33cd	63.33c	29.67bc
V_2	38.52de	51.19bcd	18.26de	1.74ab	1.68cd	1.24g	61.67bcd	71.00b	32.33b
V_3	60.89b	66.86a	14.49f	1.77ab	1.84abc	1.83a	62.00bcd	59.00cd	25.67de
V_4	34.23e	28.49f	22.04bc	1.42e	1.38ef	1.44cd	42.67f	53.00ef	19.00f
V_5	38.60de	46.18d	25.82a	1.52de	1.30f	1.31efg	58.33d	51.00f	23.00e
$LSD_{(0.05)}$	5.48	6.59	3.08	0.16	0.17	0.10	3.99	5.07	2.66
CV $_{(\%)}$	7.06	7.47	8.59	5.88	6.32	4.13	3.96	4.71	5.59

Combined effect of varieties and leaf cutting on leaf length, breadth and area of rice. Means with different letters are significantly different at $P \leq 0.05$ by LSD test. Here, V_1- V_5; BRRI dhan32, BRRI dhan33, BRRI dhan39, BRRI dhan62, BRRI dhan56, respectively and F, P, T denotes flag leaf, penultimate leaf and 3rd leaf, accordingly.

Thereby indicating, it is possible to improve grain yield by genetic improvement of length of flag leaf. Furthermore, the highest leaf breadth reduction in flag, penultimate and 3rd leaf were 8.33, 24.75 and 12.83% in V_1, V_5 and V_5, respectively compared to control. Interestingly, variety V_3 was reported with highest leaf breadth in all three mentioned leaves. Blake *et al.* (200) found that potential yield and Grain number were positively correlated with length, breadth and area of flag leaf. In terms of leaf area, the variety with highest value under leaf cutting condition is V_3, V_2 and V_2 (62, 71 and 32 cm^2 in flag, penultimate and 3rd leaf) respectively. However, less leaf area reduction in flag, penultimate and 3rd leaf was observed in V_2, V_2 and V_1 variety, respectively compared to control (Table 1). The Grains yield and yield related traits were positively related to flag leaf area (Bassuony and Zsembeli, 2021). Prakash *et al.* (2011) found that the Grains yield was positively related with flag leaf area in rice varieties.

Chlorophyll Content in flag Leaf

Chlorophyll content of flag leaf at 12 days and at maturity from the study of five BRRI released rice varieties showed significant differences due to leaf cutting. Results indicated that flag leaf contained increased amount of total chlorophyll at 12 days than that of at maturity for all of the studied varieties. However, highest reduction of chl 27.56 and 35.30% in flag leaf at 12 days and maturity was resulted in V_3 variety compared to control (Fig. 2). This might have happened due to the increased demand of photo assimilates for the growing panicle. Any damage done to that flag leaf will have a direct and dramatic impact on crops potential. Chlorophyll is positively correlated with photosynthetic rate. In rice, the leaf is metabolically active and critically important in determining yield. It has been assigned an important role in terms of supply of photosynthates to the grains (Suárez *et al.,* 2021). Increased grain yield was observed by Rahman *et al.* (2013) in BRRI dhan34 when chlorophyll was higher. Abou-khalifa *et al.* (2008) also found the similar yield enhancing role of chl content in flag leaf in two rice cultivars.

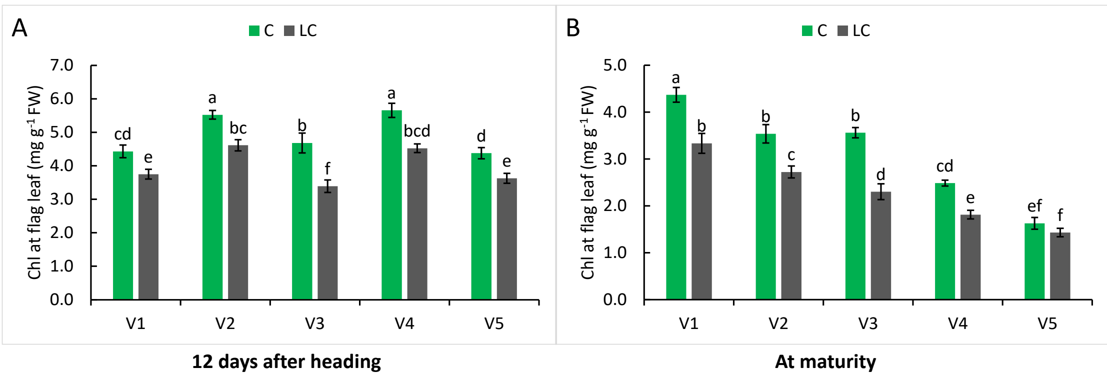

Fig. 2. Combined effect of varieties and leaf cutting on chl of flag leaf at 12 days after heading (A) and chl of flag leaf at maturity (B) of rice. Means with different letters are significantly different at P≤0.05 by LSD test. Here C, LC denotes control and leaf cutting, V_1- V_5; BRRI dhan32, BRRI dhan33, BRRI dhan39, BRRI dhan62, BRRI dhan56, respectively.

Effect of leaf cutting on yield contributing parameters of rice

Different yield contributing characters viz. tillers $hill^{-1}$, panicle $hill^{-1}$, duration of grain filling, grain $panicle^{-1}$, effective grain $panicle^{-1}$ and filled grain% were significantly affected due to leaf cutting (Table 2). No significant variation of tillers $hill^{-1}$ was observed due to leaf cutting whereas, the panicle number $hill^{-1}$ were significantly reduced by leaf cutting. The highest reduction (31.26%) of panicle was observed in V_5 variety and the lowest (10.16%) was in V_3 variety, compared to the control. However, significant variance in grain filling duration was not observed due to leaf cutting although except V_3 in rest other varieties, leaf cutting delayed the grain filling duration. In terms of grains panicle^{-1}, filled grains panicle^{-1} and filled grain% were not significantly reduced due to leaf cutting whereas 24.84, 29.72 and 49.43% highest reduction was resulted in V_2, V_2 and V_5, respectively (Table 2). Due to reduced photo assimilation and reduced tiller number highly impacted on the panicle number of the rice that leads to reduced panicle size and resulted in reduction of other yield contributing characters. This finding corroborates with the earlier findings of Won *et al.* (2022) who reported that the greater sink size the higher is the grains panicle^{-1}.

Table 2. Combined effect of varieties and leaf cutting on yield contributing characteristics of rice

Treatments	No. of tiller hill^{-1}		No. of panicle hill^{-1}		Duration of grain filling		No. of grains panicle^{-1}		Filled grain panicle^{-1}		Filled grain%	
	C	LC	C	LC	C	LC	C	LC	C	LC	C	LC
V_1	15.67ab	15.00b	17.70a	15.18b	33.00cd	34.67a-c	107.20cd	105.60cd	93.37b	89.38b	87.10ab	84.75ab
V_2	17.00a	15.00b	19.10c	14.39d	30.33de	35.33a-c	150.64a	113.23b	131.44a	92.37b	87.23ab	81.69bc
V_3	13.00c	12.67c	13.81d	12.41de	35.00a-c	29.00e	102.76d	104.35d	93.19b	90.78b	90.64a	86.98ab
V_4	11.33c	9.33d	16.41de	14.35e	36.33ab	37.33a	76.49e	66.32f	60.82c	50.67d	79.64bc	76.37c
V_5	13.00c	12.00c	15.36f	10.56g	31.00de	34.33bc	110.57bc	106.45cd	93.33b	92.97b	84.58ab	87.44ab
LSD $_{(0.05)}$	1.70		1.02		2.83		5.69		8.83		7.97	
CV $_{(\%)}$	7.43		3.99		4.91		3.18		5.60		5.49	

Combined effect of varieties and leaf cutting on yield contributing characteristics of rice. Means with different letters are significantly different at P≤0.05 by LSD test. Here, V_1- V_5; BRRI dhan32, BRRI dhan33, BRRI dhan39, BRRI dhan62, BRRI dhan56, respectively and F, P, T denotes flag leaf, penultimate leaf and 3rd leaf, accordingly.

Effect of leaf cutting on yield parameters of rice

Grain parameters significantly varied due to leaf cutting (Fig. 3). The 1000-grain yield reduced in all tested varieties excepted increased in V_5. The highest reduction of 1000-grain yield (13.43%) was observed in V_2 variety (Fig. 3A). Significant variation in grain yield was observed in all varieties except V_3 was observed under leaf cutting condition. The highest reduction of grain yield was (30.72%) in V_2 variety compared to respective control (Fig, 3B). Straw yield significantly reduced under leaf cutting condition. However highest straw yield under leaf cutting condition was observed in V_2 variety whereas the lowest was in V_5 variety. On the contrary, V_3 and V_3 showed statistically similar yield. The highest reduction compared to control (31.79%) was observed in V_5 followed by 25.05% in V_2 variety (Fig. 3C). The harvest index showed no significant differences between the control and the variety treated with leaf cutting. Except V_1 and V_2, in rest three varieties leaf cutting increased harvest index significantly. In leaf cutting condition, the highest harvest index 56.51% followed by 54.74% was observed in V_5 and V_3, respectively (Fig. 3D). Results indicating yield was always significantly reduced when leaf was removed from the plant at panicle initiation stage. This is might be due to the inappropriate food supply to sink that mostly leaf does and thus the effect was observed as various defects in the floral identity. Therefore, it is worth mentioning that leaf has a great contribution on yield. Tambussi *et al.* (2007) also found the similar result and stated that grains filling is sustained by current photosynthesis of the upper parts of the plant, i.e., the flag leaf and penultimate leaves and the ear.

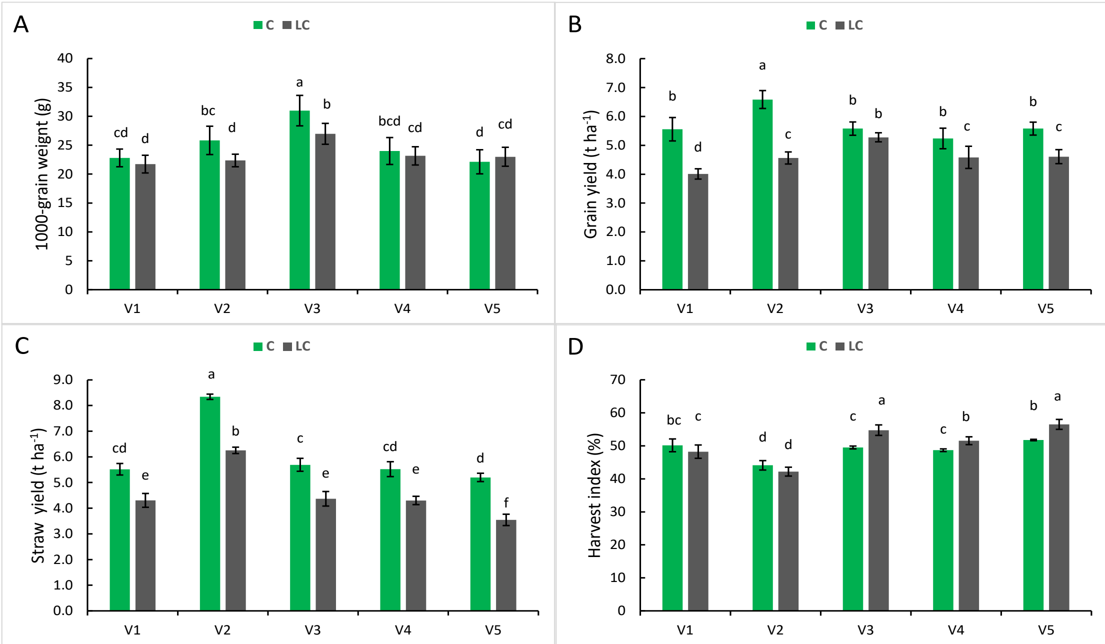

Fig. 3. Combined effect of varieties and leaf cutting on yield parameters: 1000-grain weight (A), grain yield (B), straw yield (C), Harvest index (D) of rice. Means with different letters are significantly different at P≤0.05 by LSD test. Here C, LC denotes control and leaf cutting, V_1- V_5; BRRI dhan32, BRRI dhan33, BRRI dhan39, BRRI dhan62, BRRI dhan56, respectively.

Correlation with other parameters

From correlation analysis, it has been resulted those different parameters showed strong relation between each other. Plant height showed strong correlation with most of the crop parameters. Third leaf length showed negative correlation with leaf breadth and leaf are. In addition, duration of grain filling notably impacted yield and yield contributing characters. Furthermore, harvest index has negatively affected by most of the plant parameters (Table 3). Gholizadeh *et al.* (2017) observed similar positive correlation among different leaf chl and nitrogen dynamics and their relationship to lowland rice yield for site-specific paddy management.

Table 3. Correlation matrix of different plant parameters of rice

			Leaf length			Leaf breadth				Leaf area			Chlorophyll (Flag leaf)											
		PH	Flag	Penul.	3rd	Flag	Penul.	3rd	LN	Flag	Penul.	3rd	12-d-Head	Maturity	T. hill-1	P. hill-1	DGF	GP	FGP	F. grain %	TSW	GY	SY	HI
	PH	1.00																						
Leaf length	Flag	0.49	1.00																					
	Penul.	0.57	0.79	1.00																				
	3rd	-0.24	-0.55	-0.52	1.00																			
Leaf breadth	Flag	0.54	0.55	0.77	-0.61	1.00																		
	Penul.	0.63	0.69	0.74	-0.53	0.65	1.00																	
	3rd	0.15	0.83	0.49	-0.52	0.33	0.48	1.00																
	LN	0.17	0.21	0.09	-0.30	0.36	0.32	0.45	1.00															
Leaf area	Flag	0.65	0.56	0.86	-0.27	0.71	0.61	0.14	-0.09	1.00														
	Penul.	0.60	0.17	0.51	-0.29	0.59	0.62	-0.07	0.33	0.61	1.00													
	3rd	0.66	0.17	0.58	-0.21	0.62	0.64	-0.19	0.13	0.71	0.90	1.00												
Chlorophyll (Flag leaf)	12-d-Head	0.40	-0.08	-0.19	0.14	0.00	0.21	-0.02	0.53	-0.15	0.41	0.27	1.00											
	Maturity	0.45	0.15	0.44	-0.30	0.64	0.52	0.04	0.55	0.44	0.80	0.72	0.28	1.00										
	T. hill-1	0.52	0.07	0.49	-0.09	0.47	0.54	-0.28	-0.07	0.66	0.76	0.85	0.12	0.67	1.00									
	P. hill-1	0.19	-0.13	0.00	0.15	0.16	0.37	-0.11	0.46	0.10	0.64	0.53	0.69	0.58	0.50	1.00								
	DGF	-0.13	-0.38	-0.44	0.06	-0.15	-0.45	-0.10	0.28	-0.50	-0.13	-0.23	0.26	-0.05	-0.38	-0.01	1.00							
	GP	0.55	0.23	0.57	-0.01	0.41	0.50	-0.21	-0.25	0.78	0.66	0.79	0.09	0.38	0.80	0.35	-0.49	1.00						
	FGP	0.58	0.32	0.64	-0.03	0.45	0.54	-0.13	-0.21	0.82	0.65	0.78	0.04	0.40	0.78	0.29	-0.52	0.97	1.00					
	F. grain %	0.44	0.47	0.63	-0.10	0.43	0.40	0.21	0.00	0.63	0.32	0.38	-0.20	0.29	0.39	-0.12	-0.38	0.42	0.63	1.00				
	TSW	0.45	0.73	0.56	-0.49	0.45	0.47	0.65	0.36	0.33	0.25	0.16	0.12	0.23	-0.06	-0.12	-0.20	0.08	0.22	0.52	1.00			
	GY	0.48	0.43	0.42	0.01	0.25	0.59	0.25	0.28	0.38	0.44	0.44	0.48	0.33	0.34	0.47	-0.52	0.49	0.51	0.27	0.43	1.00		
	SY	0.60	0.15	0.27	-0.06	0.34	0.58	-0.11	0.25	0.37	0.77	0.72	0.73	0.52	0.61	0.71	-0.22	0.63	0.58	0.07	0.20	0.71	1.00	
	HI	-0.43	0.14	-0.03	0.15	-0.29	-0.33	0.30	-0.19	-0.18	-0.71	-0.63	-0.62	-0.50	-0.54	-0.63	-0.16	-0.39	-0.29	0.18	0.09	-0.11	-0.77	1.00

Here, PH, LN, DGF, GP, FGP, TSW, GY, SY and HI denotes plant height, leaf number, duration of grain filling, grain panicle^{-1}, filled grain panicle^{-1}, 1000-seeds weight, grain yield, straw yield and harvest index

Conclusion

Leaf cutting has a detrimental effect on the normal growth and physiology of the rice crops. In all tested varieties in the present study, control treatments were reported with highest plant growth, leaf, yield contributing and grain yield parameters compared to the varieties treated with leaf cutting. Based on the comparison of five rice varieties, BRRI dhan39 (V_3) was found to be the highest yield producing variety in terms of greater flag leaf length, leaf breadth, flag leaf area, required less time to grain filling, filled grain panicle^{-1}, filled grain%, 1000-grain weight, grain yield and harvest index in leaf cutting condition. BRRI dhan32 (V_2) is the second highest performing variety considering plant height, chlorophyll content, tiller hill^{-1} and straw yield. Leaf cutting at heading (except flag leaf and penultimate leaves) reduced avarage10-20% loss of grain yield. It has been seen from this experiment that BRRI dhan39 show less effected by leaf cutting on the other hand BRRI dhan62 shown highly affected by leaf cutting. Hence it can be concluded that leaf cutting at heading stage is not a better practice and by developing the photosynthetic capacity of leaf is the key to overcome the photosynthate-source restriction on grain yield and to make a new breakthrough of yield potential in future development of rice.

Acknowledgement

The authors acknowledged the Farm division of Sher-e-Bangla Agricultural University to provide the input materials and Bangladesh Rice Research Institute (BRRI) to supply the quality seeds that supported us a lot to conduct the study.

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