Plant Archives Vol. 25, Supplement 1, 2025 pp. 1228-1233 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.167

EVALUATION OF DUAL PURPOSE *BAO* RICE (*ORYZA SATIVA* L.) VARIETIES OF ASSAM FOR FODDER AND GRAIN YIELD UNDER DIFFERENT CUTTING INTERVALS

Himashree Devi*, Seuji Bora Neog, Kishore K. Sharma and Nagendra Sarma Barua
Department of Plant Breeding and Genetics, Assam Agricultural University, Jorhat-785013, Assam, India
*Corresponding author e-mail: himashreedevi24@gmail.com
(Date of Receiving : 03-08-2024; Date of Acceptance : 25-10-2024)

ABSTRACT

Bao rice varieties have unique ability to grow under flooded condition and give better yield. Contemplating the significance, a total of 15 genotypes of *bao* rice were evaluated in a randomized block design at ICR Farm, Assam Agricultural University, Jorhat-13 during *kharif* season, 2022 to study the fodder and yield attributing traits of *bao* rice. In the present study three cuttings were provided. Analysis of variance revealed significance variation among all the genotypes for the characters under study. It was observed that the yield and yield contributing characters were decreased by de-topping when compared with non-cutting genotypes. Maximum crude protein % and ash % was exhibited by the genotypes at 1st cut (65 DAS) and were tend to decrease with increase in cutting interval. However maximum crude fibre % was exhibited by the genotype at 3rd cut (125 days) and it tends to increase with cutting interval. Thus, it reveals that cutting has a significant influence on the genotypes for the characters under study. Genetic variability analysis showed that PCV is slightly higher than the GCV. High heritability along with high genetic advance was recorded for tillers per plant, panicle length, flag leaf length, flag leaf area and grain yield, green forage yield, crude protein%, plant height at 65 DAS and 96 DAS cutting and dry matter yield at 95 and 125 DAS cutting indicating presence of additive gene action. Thus, simple progeny selection will be beneficial for improvement of these traits.
Keywords **:** Bao rice, Cutting, Green Forage Yield, Grain Yield, PCV, GCV, Heritability, genetic advance as a percentage of mean.

Introduction

Rice (*Oryza sativa*) is an important crop for global food security and staple food for over half of the world's population, mainly of Asia (Blümmel et.al. 2020). Rice belongs to the poaceae family. There are mainly two cultivated species of rice *Oryza sativa* L. and *Oryza glaberrima*. Rice provides 21% of the world's dietary energy, 15% of its protein and 15% of its carbohydrates. The estimated production of rice for 2022 -23 is 1308.37 lakh tonnes. Rice occupies over 46 million hectare cultivated area in India (Anonymous 2022). The country holds the second position all over the world in terms of rice production. Rice accounts for 2.45 million ha of Assam's gross cultivated area of 4.16 million ha, and contributes 96% of the state's total production of food grains (Rice Knowledge Bank, Assam).

Bao (deep water rice) is planted in flooded areas where the water depth is maintained at or above 50 cm. There are two types based on stature and depth: Traditional tall and floating types. Traditional tall cultivars are grown at depth of 50 to 100 cm while floating types are grown at 100 cm or deeper depths. It is believed that Asian deep-water rice evolved in Bangladesh (Banglapedia). *Bao* (deep water rice) cultivars are almost universally extremely photoperiod sensitive. Rice grown in deep water has unique adaptive mechanisms. They can grow longer with rise of water level, they can grow nodal tillers and roots from upper nodes in the water, and keep their reproductive organs above the water until the flood subsides *via* "kneeing," or bending the terminal section of the plant upward.

Following the first monsoon shower, bao (deep water rice) is often sown dry in the field in the months of March and April. It has the potential to be a crop for both grain and animal feed. The leaves can be clipped during the vegetative stage, and the cuttings can thereafter be utilized as livestock feed. The leftover straw and ratoon from the harvest can also be used as animal feed. World Population is sharply increasing and creating more pressure on agriculture to produce more food, animal protein and livestock feed. Food-cum forage crop like rice, seems to be one of the most feasible and economically viable practices to serve the needs of human food, cash income and animal feed, particularly for those with limited resources (Usman, 2007).

Assam is highly flood prone and due to heavy rainfall during monsoon, there is huge amount of food and fodder loss, which affects the livestock as well as income of the farmers. *Bao* rice (deep water rice) varieties have the ability to survive under heavy flooded condition and give better yield. Thus, utilization of *bao* rice as a fodder crop encourages small farmers for increasing their livestock farm. Hence, Dual-purpose varieties could be beneficial to the resource-poor farmers by providing grain for human consumption and forage as a livestock feed.

Materials and Methods

Location and design of Experiment: The experiment was conducted at the Instructional-Cum-Research (ICR) Farm of Assam Agricultural University, Jorhat, during *kharif* season, 2022. It is located in Upper Brahmaputra Valley Zone of Assam. The farm is situated at 26°46´N latitude and 94°16´E longitude with altitude of 86.6 m above mean sea level. The experiment was conducted on randomized block design (RBD) with two replications and a plot size of 3m x 3m. Three cutting were provided in this experiment at 65, 95 and 125 days after sowing (DAS). Thirteen genotypes along with two check varieties were utilized with spacing of 20 x 20 cm. The list of genotypes used in this study was given in Table-1. Fertilizers were applied at the rate of N 60: P_2O_5 20: K_2O 20 Kg/ha. Half dose of nitrogenous fertilizer along with full dose of phosphatic and potassic fertilizer were applied as a basal dose during final land preparation and remaining half of nitrogenous fertilizer were applied 30 days after sowing.

Observations recorded: Days to 50 per cent flowering (DFF) were recorded by observing total number of days taken from the date of sowing to the day on which 50 per cent of the plants flowered in each plot. The height of the plant (PH) was measured in centimeters from base of the soil level to the shoot tip with a meter scale. Flag leaf length (FLL) was taken in centimeter by measuring from tip to the base of the flag leaf where it touches the stem during panicle initiation. Flag leaf breadth (FLB) was taken in centimeters by measuring the width at mid portion of the flag leaf in the tagged plant at the time of panicle initiation. Flag leaf area (FLA) is calculated by multiplying length and breadth of the flag leaf with a constant K (k=0.75). Green forage yield per plant (GFY) was recorded by cutting ten randomly selected plants from each plot and taking their average weight. Dry matter yield per plant (DMY) was taken by oven drying the plants that are used to measure GFY at 70°C and taking their average weight. Five randomly selected plants from each plot were counted for tillers and their average gave the number of tillers per plant (T/P). At the time of harvesting, five mature random plants from each plot were counted for number of panicles per plant (P/P). Panicle length (PL) was taken in centimeter by measuring the length from tip to the base of the panicle. For number of Grains per panicle (G/P) five random mature plants were harvested from each plot and counted for number of grains per panicle. Test weight (TW) was recorded in gram by taking weighed of 1000 seed using an electronic balance. Grain yield (GY) was recorded by harvesting plants from one-meter square area of each plot and then harvested seeds were dried, threshed and cleaned and weight was recorded in kg/ha.

Biochemical analysis: The samples were finely ground and were used for the analysis of crude protein% using Micro- kjeldahl method, crude fibre% using AOAC procedure, 2000 and ash% by using AOAC method, 1990. The biochemical analysis was done for all the fodder cuttings i.e., cuttings at 65, 95 and 125 DAS.

Statistical analysis: Statistical analysis was carried out using Windostat Version 9.2 software. Analysis of variance was done to check the significance difference among the genotypes. Genetic variability analysis such as PCV and GCV, heritability and genetic advance as a percentage of mean was carried out for each character under study.

Result and Discussion

Yield and fodder attributing traits*:* All the fodder and yield attributing traits were statistically significant for all the genotypes which indicate presence of genetic variation among them for the traits under study in both cutting and non-cutting. (Prasad *et al.* 2011; Ajmera *et al.* 2017) in rice also reported presence of genetic variability among the yield attributing traits. While Kumar (2022) recorded significant differences among all the genotypes for plant height, green forage yield per plant and dry yield per plant in oats.

Interestingly the cutting had a significant impact on important yield and fodder attributing characters showed in Table-2(a) and Table-2(b) respectively. The average plant height of genotypes was lower in cutting as compared to non-cutting genotypes. *Panikekua bao* has the maximum plant height in both cutting (125.59cm) and non-cutting (145.66cm). Thus, detopping reduces the height of the plant. Similarly, flag leaf length and flag leaf breadth were also influence by detopping. The average flag leaf length of the genotypes was 29.43 cm in cutting and 30.25 cm in non-cutting. The highest flag leaf length was observed in variety *Panikekua bao* in both non-cutting and cutting (36.16 cm and 35.05 cm respectively). Cutting also had a significant effect on green forage yield and dry matter yield per plant. The average green forage yield per plant is 184.77 (g/plant), 100.49 (g/plant) and 116.27 (g/plant) at 65, 95 and 125 DAS irrespectively and the average dry matter yield at 65, 95 and 125 DAS are 55.07 g/plant, 32.10 g/ plant and 33.98 g / plant respectively. The green forage yield and dry matter yield per plant was maximum at 65 DAS as compared to 95 and 125 DAS which is may be due to more biomass accumulation at 1st cut (65 DAS) than 2nd and 3rd cut which are taken at 30 days interval. Consequently, the cutting also reduces the number of tillers per plant. Notably, detopping delayed flowering by 7 days. Minimum days to attain 50% flowering was observed for *Panikekua bao* and *Buruli bao* in cutting (166.5 days) and *Panikekua bao* (160.5 days) in non-cutting. Interestingly, the grains per panicle was also reduces due to detopping. Distinctly, the cutting also showed significant impact on grain yield. The average grain yield was 1727.63 kg/ha in non-cutting and 1713.41kg/ ha in cutting. The variety having maximum grain yield was *Kola bao* (2803.33 kg/ha) in non-cutting and *Panikekua bao* (2802.22 kg/ ha) in cutting. It was because in non-cutting due to increase in plant height Panikekua bao become highly prone to lodging which ultimately reduced the crop grain yield, but in cutting proper plant stand was maintained so it produces higher yield than non-cutting genotype. From the study it was concluded that the genotypes *Panikekua bao*, *Buruli bao*, *Kola bao*, *Tulsi bao* and *Kekua bao* are found to be promising for dual purpose thus they can be utilizing in further breeding program for developing high yielding dual purpose *bao* rice varieties.

Biochemical analysis results: The analysis of variance revealed that crude protein%, crude fibre% and ash% are statistically at par for all the genotypes. Maximum crude protein% and ash% was exhibited by the genotypes at 65 DAS while for crude fibre% at 125 DAS (Table-2(b)). The genotype *Kola bao* had shown maximum crude protein% (4.71%, 3.32% and 2.84% respectively) and crude fibre% (32.63%, 32.83% and 32.99% respectively) in all the three cuttings. It was also observed that both ash and crude protein% were highest at 1st cut i.e., at 65 DAS and were tend to decrease with increase in cut. Similar findings were reported by Jamarun *et al*. (1999) in rice, Lounglawan *et al.* (2014) in King Napier grass and Malik *et al*. (2015) in oats. However, crude fibre% tends to increase with cuttings which are also reported by Kumar and Chaplot (2015) in sorghum. Thus, it reveals that cutting has a significant influence on the genotypes for the characters under study.

Genetic variability: It was observed that the phenotypic coefficient of variation (PCV) is higher than the genotypic coefficient of variation (GCV) for all the characters in both cutting and non-cutting genotypes which indicates there is an influence of environment for the expressed characters. Karim *et al.* (2016) and Kumar *et al.* (2018) also found higher PCV than GCV for all the characters. For yield and yield attributing traits higher GCV and PCV was observed for the character grain yield in both cutting and non-cutting (Table-3(a)). In both cutting and non-cutting moderate GCV and PCV were observed for the traits tillers per plant, panicle length, flag leaf length and flag leaf area. Kumar *et al.* (2018) and Anyaoha *et al.* (2018) reported for highest GCV and PCV for grain yield per plant in rice. Moderate GCV and PCV for panicle length was reported by Kumar *et al.* (2018). Bisne *et al.* (2009) also reported low GCV and PCV for days to 50% flowering in rice. It was found that for the majority of the characters, cutting resulted in higher GCV and PCV than non-cutting. For fodder attributing traits moderate GCV and PCV was observed for green forage yield and crude protein % in all the three cutting intervals while for plant height at 65 and 95 DAS cutting and Dry matter yield at 95 and 125 DAS cutting (Table-3(b)). Nagabhushan *et al.* (2011) and Chakrovorty and Neog (2015) reported moderate GCV and PCV for green forage yield in forage maize. The traits with high and moderate GCV and PCV indicate presence of significant amount of variation across the genotypes and selection for these traits would be effective.

All the characters except flag leaf breadth in cutting showed high heritability which indicate that these characters were less influence by environment and they exhibit simple inheritance pattern irrespective of number of genes governing those traits. Thus, selection for these traits will be successful in succeeding generations since the phenotype seemed to accurately reflect the genotype. Karim *et al.* (2016) reported high heritability for plant height, leaf area, days to 50% flowering, number of effective tillers per plant, panicle length, number of filled grains per panicle,1000 grain weight and grain yield per plot in aman rice. While high heritability of green forage and grain yield/plant were reported by Nagabhusan *et al.* (2011) in dual purpose forage maize. Borkakati *et al.* (2013) in semi-glutinous rice and Thomas *et al.* (2018) in pearl millet reported high heritability for fodder quality traits.

Genetic advance as a percentage of mean in plant breeding programmes gives information about the anticipated advantage that comes from selecting superior genotypes. In yield attributing traits, high heritability coupled with high genetic advance as a percentage of mean was observed for tillers per plant, panicle length, flag leaf length, flag leaf area and grain yield. While in case of fodder attributing traits *i.e.,* green forage yield, crude protein% in all the three cutting intervals, plant height at 65 and 96 DAS cutting and dry matter yield at 95 and 125 DAS cutting showed high heritability coupled with high genetic advance as a percentage of mean. This indicates that the genetic variance in these characters is due to the presence of additive gene action. Thus, simple progeny selection methods would be beneficial for improvement of these traits. These findings were in accordance with earlier findings by Kumar *et al.* (2018) and Thomas *et al.* (2018). Borkakati *et al.* (2013) also reported high heritability with high genetic advance as a percentage of mean for crude protein content in semi-glutinous rice. High heritability coupled with moderate genetic advance as a percentage of mean was recorded for the trait's tillers per plant and flag leaf breadth in both cutting and non-cutting, plant height at 125 DAS cutting interval and dry matter at 65 DAS cutting interval. This indicates that the genetic variation in these characters is due to the preponderance of both additive and non-additive gene action. Thomas *et al.* (2018) reported high heritability with moderate genetic advance as a percentage of mean for the trait leaf breadth in pearl millet. Thus, these traits can be utilized in future breeding programme of *bao* rice for which selection would be effective.

Conclusion

Based on the result, it was found that de-topping had a significant impact on yield and yield contributing characters. The yield and yield contributing characters were found to be decrease by de-topping when compared with control. It was seen also that with increase in number of cuttings, the ash% and protein% were found to be decreasing, while it increases for crude fibre%, indicating significant effect of cutting on nutritional characters. It was observed that for most of the characters *Panikekua bao, buruli bao kola bao, Tulsi bao and kekua bao* performed better in dual purpose condition. Thus, they can be selected in further breeding programmes for developing dual purpose *bao* rice varieties. Genetic variability analysis reported high GCV and PCV for grain yield which indicates that direct selection of the trait will help in improvement of the character. It was also observed that for most of the characters cutting resulted in higher GCV and PCV than non-cutting. Tillers per plant, panicle length, flag leaf length, flag leaf area and grain yield, green forage yield, crude protein% in all the three cutting intervals and plant height at 65 and 96 DAS and dry matter yield at 95 and 125 DAS showed high heritability coupled with high genetic advance as a percentage of mean indicating preponderance of additive gene action. However, characters with high heritability coupled with moderate genetic advance indicate that there is presence of both additive and non-additive gene action. Thus, there is a scope for the improvement of these traits through selection.

Table 1 : List of genotypes

Sl No.	Experimental materials	Source
1	*Amona bao*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
2	*Dalmora bao*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
3	*Buruli bao*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
4	*Nagheri bao (check)*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
5	*Panikekua bao*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
6	*Jagilee bao*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
7	*Baola bao*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
8	*Tulsi bao*	AICRP on Forage Crops & Utilization, Assam Agricultural University(AAU), Jorhat
9	*Pagrow bao*	Majorbari Gaon, Disangmukh, Sivasagar
10	*Duwari bao*	Majorbari Gaon, Disangmukh, Sivasagar
11	*Bedal bao*	Majorbari Gaon, Disangmukh, Sivasagar
12	*Lahi bao*	MajorbariGaon ,Disangmukh, Sivasagar
13	*Kola bao*	Majorbari Gaon, Disangmukh, Sivasagar
14	*Ranga bao*	Majorbari Gaon, Disangmukh, Sivasagar
15	*kekua bao (check)*	Majorbari Gaon, Disangmukh, Sivasagar

Table 2(a) : Mean performances of yield attributing traits under cutting and non-cutting

Genotypes	T/P		P/P		PL(cm)		G/P		TW(g)		FLL (cm)		FLB (cm)		FLA (cm2)		DFF		GY (kg/ha)	
	Cutting	Non cutting	Cutting	Non cutting	Cutting	Non-cutting	Cutting	Non-cutting	Cutting	Non-cutting	Cutting	Non-cutting	Cutting	Non cutting	Cutting	Non cutting	Cutting	Non cutting	Cutting	Non cutting
Amona bao	10.70	12.76	10.00	12.50	28.23	28.60	163.76	181.18	25.00	25.01	25.37	20.71	1.20	1.20	22.84	29.28	172.00	165.00	1148.89	862.22
Dalmora bao	9.90	11.91	8.50	10.00	25.35	25.91	161.92	177.10	25.56	26.20	19.95	25.82	1.10	1.15	16.46	24.24	172.50	165.50	1100.00	1061.11
Buruli bao	15.50	18.40	10.00	12.00	35.64	36.49	182.05	195.75	24.41	24.47	34.77	35.78	1.10	1.10	28.69	21.24	166.50	161.00	2267.78	2516.67
Ranga bao	11.00	13.65	8.50	10.50	31.28	31.88	168.14	182.26	25.80	25.88	27.73	28.31	1.30	1.35	27.04	31.27	171.00	164.50	1550.00	1202.22
Panikekua bao	15.65	19.25	10.50	12.00	36.76	37.01	182.74	197.53	26.15	26.28	35.05	36.15	1.15	1.20	30.21	28.98	166.50	160.50	2802.22	2633.33
Jagilee bao	11.55	14.75	8.00	9.50	33.51	34.03	171.50	187.42	25.16	25.44	29.55	29.75	1.30	1.30	28.81	24.54	169.50	162.50	1577.78	876.67
Baola bao	12.80	15.15	7.50	9.00	33.66	34.16	174.30	183.95	25.85	26.18	30.23	31.20	1.20	1.20	27.20	28.23	169.00	162.50	1728.89	1127.78
Tulsi bao	15.10	17.88	9.50	10.50	32.97	33.45	181.65	193.63	25.16	25.70	33.79	32.55	1.00	0.95	25.36	14.41	167.00	161.00	2061.11	2455.56
Pagrow bao	14.10	15.50	10.00	12.00	35.25	35.48	178.64	192.10	25.24	25.54	31.94	34.45	1.25	1.30	29.94	19.35	168.00	161.50	1784.44	1850.00
Duwari bao	9.10	10.95	9.50	10.50	24.51	25.18	155.92	180.13	25.40	25.96	19.23	20.35	1.15	1.15	16.62	22.20	175.00	167.00	944.44	1003.33
Bedal bao	10.85	13.40	8.50	9.50	28.38	29.00	165.14	181.80	24.36	24.70	26.49	26.95	1.20	1.25	23.78	30.17	172.00	165.00	1393.33	1405.56
Lahi bao	13.20	15.30	8.00	11.00	32.05	32.58	178.48	190.87	24.78	25.03	30.60	32.19	1.05	1.00	24.12	11.83	168.50	162.50	1765.56	2743.33
Black bao	15.15	18.24	10.50	12.00	35.23	35.78	182.03	194.80	25.52	25.98	33.96	34.85	1.05	1.05	26.74	15.94	167.00	161.00	2175.56	2803.33
Nagheri bao (check)	11.80	14.35	9.50	10.50	33.80	33.90	170.10	174.68	24.29	24.94	29.30	30.41	1.05	1.05	23.06	20.02	169.50	163.50	1564.44	1621.11
Kekua bao (check)	14.50	16.10	9.50	11.00	35.57	35.88	180.19	194.34	25.68	26.04	33.55	34.25	1.20	1.20	30.19	27.90	167.50	161.50	1836.67	1752.22
Mean	12.73	15.17	9.20	10.83	32.14	32.62	173.10	187.17	25.22	25.55	29.43	30.25	1.15	1.16	25.40	23.31	169.43	162.97	1713.41	1727.63
CD%	1.37	1.54	1.12	1.03	1.38	1.58	5.10	3.88	0.76	0.62	0.59	0.47	0.15	0.13	3.54	5.17	1.03	1.10	324.14	378.30

Table 2(b) : Mean performances of fodder attributing traits under three different cutting intervals

Genotypes	PH (cm) (cutting)			PH(cm) (non-cutting)			GFY(g/plant)			DMY (g/plant)			Ash (%)			CP (%)			CF (%)		
	65 DAS	95 DAS	65 DAS	95 DAS	125 DAS	125 DAS	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS
Amona bao	91.30	95.50	98.00	91.30	111.70	130.70	148.5	74.50	98.00	50.00	28.50	29.00	15.47	14.71	13.83	4.37	3.73	3.19	31.71	31.91	32.21
Dalmora bao	90.11	89.50	94.05	90.11	111.60	128.55	147.0	72.00	92.00	50.00	27.00	28.50	14.68	14.00	13.00	4.01	3.38	3.07	30.75	30.98	31.1
Buruli bao	118.10	109.25	116.15	118.10	140.35	157.55	227.0	126.5	138.5	62.50	39.50	40.00	15.50	14.90	14.04	4.70	3.81	3.29	32.22	32.44	32.68
Ranga bao	91.55	98.05	100.15	91.55	120.55	131.80	165.5	89.00	105.0	52.00	28.90	30.00	14.19	13.49	12.70	3.82	2.89	2.39	30.98	31.19	31.39
Panikekua bao	129.13	130.75	116.90	129.13	148.65	159.20	240.5	146.0	159.0	63.00	39.50	41.50	14.27	13.60	12.89	3.27	2.57	2.15	30.23	30.39	30.70
Jagilee bao	94.50	91.00	102.50	94.50	122.00	143.10	181.0	93.50	111.0	53.00	29.70	31.50	15.40	15.00	14.65	4.16	3.71	2.23	31.52	31.70	31.86
Baola bao	102.30	99.00	106.80	102.30	127.55	144.45	184.5	105.0	115.5	54.50	32.00	35.00	14.15	13.46	12.69	4.07	3.30	2.89	31.38	31.64	31.82
Tulsi bao	105.03	103.70	112.20	105.03	137.85	156.55	223.5	121.7	132.5	59.00	38.50	39.50	15.56	14.70	13.88	4.51	3.84	3.35	32.24	32.37	32.52
Pagrow bao	103.55	101.50	108.65	103.55	136.90	152.30	210.5	106.3	119.0	57.00	32.35	36.50	14.18	13.80	13.40	3.84	3.04	2.63	31.63	31.85	32.03
Duwari bao	87.30	87.95	93.40	87.30	108.8	126.55	140.0	70.50	90.50	47.50	23.00	26.50	14.87	14.07	13.54	3.37	2.62	2.29	30.38	30.49	30.60
Bedal bao	91.35	97.65	100.00	91.35	113.55	138.30	167.0	90.50	106.0	53.00	29.50	31.25	14.62	13.92	13.21	3.69	2.82	2.44	31.01	31.21	31.29
Lahi bao	102.70	99.45	107.00	102.70	133.20	145.40	124.5	99.00	113.5	54.50	30.50	33.00	14.59	13.56	12.85	3.23	2.8	2.51	32.52	32.71	32.8
Kola bao	109.10	109.80	114.45	109.10	143.30	153.65	218.5	112.0	129.5	59.00	38.50	39.50	15.76	14.82	14.01	4.71	3.93	3.52	32.63	32.83	32.99
Negheri bao (check)	98.17	91.70	102.30	98.17	122.30	138.95	180.5	91.25	110.5	53.00	29.50	31.45	15.24	14.49	13.61	4.20	3.67	3.29	32.12	32.40	32.50
Kekua bao (check)	107.29	100.45	109.15	107.29	136.45	153.65	213.0	109.5	123.5	58.00	34.50	36.50	14.42	13.71	12.89	4.25	3.75	3.38	31.84	32.09	32.30
MEAN	101.43	100.35	105.45	101.43	127.65	144.05	184.7	100.4	116.27	55.07	32.10	33.98	14.86	14.15	13.41	4.01	3.32	2.84	31.54	31.74	31.92
CD 5%	5.00	5.91	5.88	5.00	9.61	10.71	15.48	11.26	12.60	5.75	4.58	4.63	0.417	0.323	0.441	0.16	0.13	0.11	0.09	0.10	0.09

DAS: Days after sowing; PH: Plant height; GFY: Green forage yield; DMY: Dry matter yield; CP: Crude protein; CF: Crude fibre; CD: Critical difference.

Table 3(a) : Estimation of genetic parameters for yield attributing traits

Characters	Mean ±SE (m)		PCV (%)		GCV (%)		$h^2_{b,s}$ (%)		GA (%of mean)	
	Cutting	Non-cutting	Cutting	Non-cutting	Cutting	Non-cutting	Cutting	Non-cutting	Cutting	Non-cutting
T/P	12.73± 0.45	15.17±0.508	17.55	16.61	16.82	15.92	91.80	91.90	33.19	31.44
P/P	9.2± 0.37	10.83±0.338	11.18	10.44	9.63	9.47	74.30	82.20	17.11	17.68
PL	32.14± 0.46	32.62±0.520	12.04	11.69	11.87	11.48	97.20	96.30	24.11	23.20
G/P	173.10± 1.68	187.18±1.278	5.08	4.04	4.89	3.92	92.70	94.30	9.71	7.84
TW	25.22± 0.25	25.55±0.204	2.47	2.45	2.03	2.17	67.40	78.70	3.43	3.97
FLL	29.43± 0.57	30.25±0.467	17.02	16.69	16.80	16.54	97.40	98.30	34.16	33.79
FLB	1.15± 0.05	1.16±0.044	9.17	10.64	6.87	9.19	56.20	74.50	10.61	16.34
FLA	25.40± 1.17	23.31±2.41	17.90	27.23	16.68	25.19	86.80	85.60	32.01	47.99
DFF	169.43± 0.34	162.97±0.362	1.53	1.25	1.50	1.21	96.60	93.70	3.04	2.41
GY(kg/ha)	1713.41± 106.87	1727.63±124.72	29.04	42.61	27.67	41.37	90.80	94.30	54.31	82.74

T/P: Tillers per plant; P/P: Panicle per plant; PL: Panicle length; G/P: Grains per panicle; TW: Test weight; FLL: Flag leaf length; FLB: Flag leaf breadth; FLA: Flag leaf area; DFF: Days to 50% flowering; GY: Grain yield; SE(m): Standard error of mean; PCV: Phenotypic coefficient of variance; GCV: Genotypic coefficient of variance; $h^2_{b,s}$: heritability in board sense; GA: Genetic advance.

Table 3(b) : Estimation of genetic parameters for fodder attributing traits under different cutting intervals

Characters	Mean ±SE (m)			PCV (%)			GCV (%)			$h^2_{b,s}$ (%)			GA (% of mean)		
	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS	65 DAS	95 DAS	125 DAS
PH	101.43± 2.84	100.35± 3.89	105.44±3.86	11.66	10.75	7.43	10.96	10.39	6.72	88.40	93.50	87.80	21.25	20.71	13.44
GFY (g/plant)	184.7± 7.22	100.48± 5.25	116.26±5.88	19.55	21.14	15.97	16.78	19.10	14.65	98.00	96.90	95.00	39.46	42.22	31.25
DMY (g/plant)	55.06± 2.68	32.10± 2.13	33.98±2.15	8.65	15.95	14.31	7.939	15.24	13.59	84.10	91.30	90.10	15.00	30.00	26.58
Ash %	14.86± 0.14	14.15± 0.11	13.41±0.15	3.97	4.04	4.52	3.75	3.90	4.25	89.20	93.10	88.40	7.30	7.75	8.23
CP %	4.01± 0.05	3.32± 0.04	2.84± 0.04	11.98	14.75	17.07	11.84	14.63	16.97	97.60	98.40	98.80	24.09	29.90	34.74
CF %	31.54± 0.03	31.74 ± 0.03	31.92± 0.03	2.38	2.41	2.37	2.38	2.40	2.37	99.70	99.60	99.70	4.89	4.94	4.88

DAS: Days after sowing; PH: Plant height; GFY: Green forage yield; DMY: Dry matter yield; CP: Crude protein; CF: Crude fibre; SE (m): Standard error of mean; PCV: Phenotypic coefficient of variance; GCV: Genotypic coefficient of variance; $h^2_{b.s}$: heritability in board sense; GA: Genetic advance.

References

Ajmera, S., Kumar, S.S. and Ravindrababu, V. (2017). Evaluation of genetic variability, heritability and genetic advance for yield and yield components in rice genotypes. *International Journal of Current Microbiology and Applied Sciences,* **6**(10): 1657-1664.

Anonymous (2022). Annual Report 2022-2023. Government of India. Ministry of Agricultural and Farmers' welfare Department of Agriculture, Cooperation and Farmers welfare, Director of Economics and Statistics.

Anyaoha, C., Adegbehingbe, F., Uba, U., Popoola, B., Gracen, V., Mande, S. and Fofana, M. (2018). Genetic diversity of selected upland rice genotypes (*Oryza sativa* L.) for grain yield and related traits. *International Journal of Plant and Soil Science,* **22**(5): 1-9.

Banglapedia:http://en.banglapedia.org/index.php?title= Deepwater _Rice

Bisne, R., Sarawgi, A.K. and Verulkar, S.B. (2009). Study of heritability, genetic advance and variability for yield contributing characters in rice. *Bangladesh Journal of Agricultural Research,* **34**(2): 175-179.

Blümmel, M., Duncan, A.J. and Lenné, J.M. (2020). Recent advances in dual purpose rice and wheat research: a synthesis. *Field Crops Research,* **253**: 107823.

Borkakati, R.P., Chowdhury, R.K., Kurmi, K. and Borah, R.C. (2013). Biochemical parameters in indigenous Chokuwa (semi glutinous) rice of Assam and their variability. *New Agriculturist,* **24**(2): 185-188.

Chakrovorty, M. and Neog, S.B. (2015). Studies on genetic variability in forage maize (*Zea mays* L.).*Forage Research,* **41**(2): 126-129.

Jamarun, N. and Marini, N. (1999). Effect of cutting leaves of rice (*Oryza sativa* L.) on quality of its rice straw. *Jurnal Peternakan dan Lingkungan (Indonesia)* **5**(2): 60-63

Karim, M.J., Jesmin, F., Ali, M.H., Islam, M.N. and Mahmud, E. (2016). Variability, heritability and genetic advances for quantitative characters in T. Aman rice. *International Journal of Biological Research,* **1**(2): 1-5.

Kumar, D. and Chaplot, P.C. (2015). Effect of fertility levels on quality of multi-cut forage sorghum genotypes. *Forage Research,* **40**(4): 251-253.

Kumar, R. (2022). Study of genetic variability to emphasize breeding programme for fodder and grain yield in oat genotypes. *The Pharma Innovation Journal,* **11**(5): 2505-2508.

Kumar, S., Chauhan, M.P., Tomar, A. and Kasana, R.K. (2018). Coefficient of variation (GCV and PCV), heritability and genetic advance analysis for yield contributing characters in rice (*Oryza sativa* L.). *Journal of Pharmacognosy and Phytochemistry,* **7**(3): 2161-2164.

Lounglawan, P., Lounglawan, W. and Suksombat, W. (2014). Effect of cutting interval and cutting height on yield and chemical composition of King Napier grass (*Pennisetum purpureum* x *Pennisetum americanum*). *APCBEE procedia,* **8**: 27-31.

Malik, P., Midha, L.K., Arya, S. and Joshi, U.N. (2015). Effect of cutting and fertility levels on quality of oat. *Forage Research,* **40**(4): 257-258.

Nagabhushan, Mallikarjuna, N.M., Haradari, C., Shashibhaskar, M.S. and Prahalada, G.D. (2011). Genetic variability and correlation studies for yield and related characters in single cross hybrids of maize (*Zea mays* L.). *Current Biotica,* **5**(2): 157-163.

Prasad, G.S., Sujatha, M., Chaitanya, U. and Rao, L.S. (2011). Studies on variability, heritability, genetic advance, correlation and path analysis for quantitative characters in rice (Oryza sativa L.). *The Journal of research ANGRAU,* **39**(4):104-109.

RKB, Assam. Rice Knowledge Bank. https://www.rkbassam.in/

Thomas, A.M., Babu, C. and Iyanar, K. (2018). Genetic variability and association studies in pearl millet for green fodder yield and quality traits. *Electronic Journal of Plant Breeding,* **9**(3): 1263-1271.

Usman, K. (2007). Effect of detopping on forage and grain yield of rice under agro-climatic conditions of DI Khan. *Sarhad Journal of Agriculture,* 23(1): 1-4.