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EFFECT OF SOWING DATE ON DRY MATTER PARTITIONING OF TOSSA JUTE

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ABSTRACT

An experiment was conducted at the research field of Sher-e-Bangla Agricultural University, Dhaka- 1207 to find out the biomass yield of different jute varieties at varying sowing dates. BJRI released two tossa jute variety i.e., BJRI tossapat8, BJRI tossapat9 along with popular Indian tossa jute variety i.e., JRO-524 were tested under three sowing dates i.e. 5th, 25th July and 15th August. The experiment followed RCBD design with three replications. Results revealed that, BJRI tossapat8 produced the highest amount of bark and stick weight both green and dry condition where BJRI tossapat9 produced the highest amount of root and leaf weight both conditions. JRO-524 performed lower at all cases.

Key words: Jute, biomass, variety, sowing date

Introduction

Dry matter accumulation and its subsequent partitioning among different plant organs-leaves, stems, and roots-play a central role in determining growth efficiency, fiber yield, and physiological performance of jute (*Corchorus* spp.) (Rahman *et al*., 2020). Therefore, understanding how environmental and agronomic factors regulate dry matter distribution is essential for optimizing fiber productivity (Sarker and Kashem, 2018). Among agronomic practices, sowing date remains one of the most critical determinants of growth duration, vegetative vigor, and biomass production. Early sowing generally exposes jute plants to favorable temperature, moisture and photoperiod conditions, resulting in better leaf development, enhanced light interception, and prolonged vegetative phase (Chowdhury *et al*., 2017; Islam *et al*., 2019). In contrast, delayed sowing shortens the effective growing season and increases heat stress, thereby limiting photosynthesis, restricting canopy expansion, and reducing assimilate availability for stem development-the primary sink for fiber formation (Ahmed *et al*., 2016; Haque *et al*., 2021). Varietal differences further add complexity to dry matter partitioning. Jute varieties exhibit distinct morpho-physiological traits, photosynthetic efficiencies, stem thickening patterns, and source-sink behaviors that influence dry matter allocation (BISRCI, 2021). High-performing genotypes typically show a strong partitioning bias toward stem tissues without compromising leaf area and root development, thereby supporting sustained fiber differentiation (Rahman *et al*., 2020). However, how different varieties respond to variation in sowing date remains insufficiently explored. The present study evaluates dry matter production and partitioning in multiple tossa jute varieties grown under different sowing dates. Special emphasis is given to quantifying varietal responses in leaf, stem, and root biomass and identifying optimal sowing windows that support maximum productive dry matter allocation. This knowledge is vital for farmers and researchers aiming to enhance fiber yield under changing climatic conditions in Bangladesh and similar agro-ecological regions.

Materials and Methods

The experiment was conducted at the research field of Sher-e-Bangla Agricultural University, Dhaka- 1207 during the period from July to September, 2020. The research was done on land belongs to the Agro-ecological zone of "The Modhupur Tract", AEZ-28 slightly acidic soil following the Randomized

Complete Block Design (RCBD) with three replications. Three tossa jute varieties viz. BJRI tossapat8, BJRI tossapat9 and JRO-524 were used as experimental materials. Seeds of all jute varieties were collected from Bangladesh Jute Research Institute (BJRI). Land was prepared by ploughing and cross ploughing with laddering and was fertilized according to varietal recommendation. The unit plot size was 3m x 4m and seeds were sown in line. The crops were sown on 5 July, 2022. All intercultural operations were done as and when necessary. Data on root, stick, bark and leaves of were collected from randomly selected 20-plants by fresh sample and 30 days sun dried samples. Data were subjected to ANOVA using MSTAT-C (Gomez and Gomez, 1984). Treatment means were separated with LSD (Least significant difference).

Results and Discussion

Effect of tossa jute varieties on biomass production

Bark and stick biomass variation among varieties: Significant varietal differences were observed in both green and dry bark and stick weights (Table 1). BJRI tossapat8 recorded the highest green bark (137.70 g) and green stick weight (161.90 g), followed by BJRI tossapat9, while JRO-524 showed consistently lower values. Similar trends were evident for dry bark and dry stick weights, indicating superior fiber-bearing biomass production in BJRI tossapat8. These results demonstrate strong genetic control over stem biomass allocation, a finding consistent with previous reports showing that improved BJRI varieties typically produce more robust stem tissues than older varieties (Hossain *et al*., 2012; Islam *et al*., 2013).

Root and leaf biomass variation among varieties: Root and leaf biomass also varied significantly among the varieties (Table 2). BJRI tossapat9 produced the highest green root weight (48.43 g) and dry root weight, indicating a more vigorous root system that supports better nutrient uptake and stress tolerance (Haque *et al*., 2015). It also exhibited the highest green leaf biomass (52.367 g), suggesting a larger photosynthetic surface area and enhanced growth capacity. In contrast, JRO-524 recorded the lowest root and leaf values, corroborating earlier findings that older varieties often lag in vegetative vigor and biomass production compared to improved lines (Saha *et al*., 2019). Together, these results highlight distinct biomass allocation patterns: BJRI tossapat8 excels in stem-related biomass, while BJRI tossapat9 is superior in root and leaf production.

Table 1. Green and dry bark and stick weight of tossa jute varieties

Variety	Green bark wt./ plant (g)	Dry bark wt./ plant (g)	Green stick wt./ plant (g)	Dry stick wt./ plant (g)
BJRI tossapat8	**137.70a**	**23.27a**	**161.90a**	**35.07a**
BJRI tossapat9	114.97b	19.77b	134.67b	30.33b
JRO-524	104.23c	18.70c	122.50c	28.83c
CV (%)	4.49	2.95	6.85	2.56
LSD (0.05)	5.3328	0.6058	9.5656	0.8048

Table 2. Green and dry root and leaf weight of tossa jute varieties

Variety	Green root wt./ plant (g)	Dry root wt./ plant (g)	Green leaf wt. /plant (g)	Dry leaf wt./ plant (g)
BJRI tossapat8	43.600b	**15.50a**	40.433c	9.10c
BJRI tossapat9	**48.433a**	14.00b	**52.367a**	**12.50a**
JRO-524	37.200c	12.83c	45.633b	10.23b
CV (%)	3.97	6.46	4.32	3.02
LSD (0.05)	1.7073	0.9104	1.9904	0.3199

Effect of sowing date on biomass production

Bark and stick biomass response to sowing time: Sowing date significantly influenced green and dry bark and stick weight (Table 3). The 5 July sowing produced the highest values across all stem-related traits, with green bark (166.00 g) and green stick weight (180.67 g) being markedly higher than later sowings. Biomass declined in the 25 July sowing, and the lowest values were recorded for 15 August, which produced only 75.23g green bark and 95.73 g green stick weight. This decline with delayed sowing is consistent with reduced growing degree days, shorter photoperiod, and less favorable monsoon conditions for vigorous stem development (Ahmed *et al*., 2018; Roy *et al*., 2017). Early July sowing ensures optimal rainfall, temperature, and light intensity, which are crucial for stem elongation and bark thickening-two key determinants of fiber yield in jute (Islam *et al*., 2013).

Table 3. Green and dry bark and stick weight during sowing dates

Sowing time	Green bark wt./ plant (g)	Dry bark wt./ plant (g)	Green stick wt./ plant (g)	Dry stick wt./ plant (g)
5-July	**166.00a**	19.43b	**180.67a**	30.67b
25-July	115.67b	**28.83a**	142.67b	**43.30a**
15-August	75.23c	13.47c	95.73c	20.27c
CV (%)	4.49	2.95	6.85	2.56
LSD (0.05)	5.3328	0.6058	9.5656	0.8048

Table 4. Green and dry root and leaf weight during sowing dates

Sowing time	Green root wt./ plant (g)	Dry root wt./ plant (g)	Green leaf wt. /plant (g)	Dry leaf wt./ plant (g)
5-July	**52.300a**	**17.67a**	**68.800a**	**15.10a**
25-July	40.533b	11.30c	41.933b	11.17b
15-August	36.400c	13.37b	27.700c	5.57c
CV (%)	3.97	6.46	4.32	3.02
LSD (0.05)	1.7073	0.9104	1.9904	0.3199

Table 5. Sowing date X Variety interaction effects on dry matter partitioning of jute

Sowing time X Variety	Green root wt./plant (g)	Dry root wt./plant (g)	Green stick wt./plant (g)	Dry stick wt./plant (g)	Green bark wt./plant (g)	Dry bark wt./plant (g)	Green leaf wt./plant (g)	Dry leaf wt./plant (g)
S_1xV_1	46.300b	17.90ab	**201.00a**	17.50g	**179.00a**	11.50f	53.400c	10.60d
S_1xV_2	**67.300a**	**19.00a**	179.00b	21.80f	168.00b	14.20e	**85.600a**	**20.700a**
S_1xV_3	43.300cd	16.10c	162.00c	21.50f	151.00c	14.70e	67.400b	14.00b
S_2xV_1	40.600de	11.80e	185.00ab	**55.70a**	155.00c	**37.70a**	41.300e	10.50d
S_2xV_2	38.500e	9.00f	123.00d	36.20c	95.00d	24.00b	39.500e	11.30c
S_2xV_3	42.500cd	13.10de	120.00d	38.00b	97.00d	24.80b	45.000d	11.70c
S_3xV_1	43.900bc	16.80bc	99.70e	32.00d	79.10e	20.60c	26.600g	6.20e
S_3xV_2	39.500e	14.00d	102.00e	33.00d	81.90e	21.10c	32.000f	5.50f
S_3xV_3	25.800f	9.30f	85.50e	27.00e	64.70f	16.60d	24.500g	5.00f
CV (%)	3.97	6.46	6.85	2.56	4.49	2.95	4.32	3.02
LSD (0.05)	2.9571	1.5769	16.568	1.3940	9.2367	1.0493	3.4475	0.5542

Root and leaf biomass response to sowing time: Similar to stem biomass, root and leaf production were also greatest in the 5 July sowing (Table 4). Green root weight (52.30g) and green leaf weight (68.80g) declined progressively with delayed sowing, with 15 August recording the lowest biomass values. Late sowing likely subjected plants to shortened vegetative periods and cooler late-season temperatures, both of which suppress leaf expansion, root growth, and overall vegetative vigor (Haque *et al*., 2015).

Effect of sowing date and variety interaction on biomass production: Table 5 represents that, sowing dates and varieties have significant effect on biomass production. Green and dry root and leaf weight, respectively found maximum from 5th July with BJRI tossapat9 interaction. On the other hand, green stick and bark found maximum from 5th July with BJRI tossapat8 but dry stick and bark found maximum from 25th July with BJRI tossapat8 interaction.

Conclusion

It might be concluded that, BJRI tossapat8 perform better among three tested tossa jute varieties based on fiber and stick production.

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