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VARIETAL PERFORMANCES OF BJRI DEVELOPED TOSSA PAT ON SPECIFIC SOWING DATES

Mubasshir Ahmed[1,*], S.M. Shahriar Parvej[1], Sadia Afrin Jui[1], Kamiliya Kader[1], Ronzon Chandra Das[1], Shaikat Mitra[1], Md. Wahidul Islam[2], Md. Mostansir Billah[3], Md. Abdur Razzak Taohidi[2], Md. Humayun Kabir[4], Md. Shamim-Al-Mamun[1], Atik Hasan[5] and Umme Hafsa Timmi[6]

[1]Agronomy Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh
[2]Genetics Resources and Seed Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh
[3]Jute Seed Production and Research Centre, Nashipur, Dinajpur, Bangladesh
[4]Farm Management Unit, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh
[5]Breeding Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh
[6]Fiber Quality Improvement Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh

**Corresponding author*: hadi.sau@gmail.com

ABSTRACT

This study evaluated the performance of five Tossa jute (*Corchorus olitorius* L.) varieties across three agro-ecological zones in Bangladesh. The experiment was conducted in 2024 at Chandina, Faridpur, and Manikganj under four sowing dates to determine the optimal genotype and planting time for maximum fiber productivity. Significant variations were observed among genotypes and sowing times in terms of fiber yield and related agronomic traits. Among the varieties, BJRI Tossa Pat 9 (V_5) consistently outperformed others across all locations, recording the highest fiber yield (3.08tha^{-1}), stick yield (6.48tha^{-1}), plant height (3.04m), and basal diameter (16.25mm). The effect of sowing time was also significant, with intermediate sowing dates (30 March and 10 April) producing superior results in all locations. The highest yields were recorded for the 30 March sowing at Faridpur (fiber yield: 3.56tha^{-1}; stick yield: 7.25tha^{-1}). Correlation analyses revealed strong positive associations among plant population, basal diameter, plant height, fiber yield, and stick yield, highlighting these traits as key contributors to overall productivity. These findings recommend BJRI Tossa Pat 9 and optimal sowing between late March and early April to maximize Tossa jute yield across diverse agro-climatic conditions in Bangladesh.

Keywords: Tossa jute; Sowing dates; Fiber yield; Varietal performance; Agro-ecological zones

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1. INTRODUCTION

Jute (Corchorus spp.) is one of the most significant bast fiber crops globally and is considered the second-most important natural fiber after cotton in terms of area and production (Lavanya et al. 2020). Bangladesh, the traditional home of jute, enjoys an ideal agro-climatic environment for high-quality fiber production, particularly for *Corchorus olitorius* L. (Tossa jute) and Corchorus capsularis L. (white jute) (Islam and Ali 2017; Ahmed et al. 2023). Jute holds significant socio-economic importance as it supports rural livelihoods, supplies essential raw materials to various industries, and contributes to national foreign exchange earnings. Often referred to as the "Golden Fiber" of Bangladesh, this crop remains a vital eco-friendly resource due to its biodegradable and renewable nature. Its versatile applications extend across the textile and paper industries, as well as emerging sectors such as biocomposites, biodegradable materials, and biofuel production. (Lavanya et al. 2022; Sadhineni et al. 2023).

Jute is a fast-growing, photo-reactive, and renewable biomass crop that completes its life cycle within a short span of 120–130 days (Mamun et al. 2017; Ghorai et al. 2021). Its cultivation integrates well with the tropical monsoon climate, where warm temperatures, high humidity, and abundant rainfall promote vigorous growth (Islam 2019; Begum et al. 2024). Bangladesh's agro-ecological conditions—characterized by fertile alluvial soil and a subtropical monsoon climate—offer ideal circumstances for fiber production (Haque et al. 2015; Al-Mamun et al. 2017). The national average fiber yield of jute has improved significantly from 1.59 to 2.04tha^{-1} during the last decade, mainly due to technological innovations, improved agronomic practices, and the introduction of high-yielding BJRI varieties (Islam 2019; BBS 2023). The crop covers approximately 10% of the country's total

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agricultural land area and contributes nearly 26% of total crop production (BBS 2023), underscoring its continued economic importance.

Sowing time is a key agronomic determinant that strongly affects the growth dynamics, yield potential, and fibre quality of jute. Properly aligning planting dates with favorable environmental conditions ensures optimal plant establishment, enhances physiological performance, and ultimately maximizes both fibre productivity and quality (Ahmed et al. 2024; Ferdous et al. 2024; Zhumur et al. 2025). Optimum sowing ensures favorable environmental conditions for germination, vegetative growth, and fiber formation, while delayed or early sowing may expose the crop to climatic stress, leading to reduced plant height, base diameter, and biomass (Alam and Haque 2020; Ahmed et al. 2023). Studies have demonstrated that a 10-day variation in sowing date can cause substantial differences in fiber yield and yield attributes (Hossain et al. 2015; Patra et al. 2017). For instance, Ferdous et al. (2022) reported that sowing beyond the optimal window (late March to early April) led to a sharp decline in fiber yield due to excessive rainfall and high temperature during the vegetative stage. Similarly, Alam and Haque (2019) observed that genotype-by-sowing time interactions play a decisive role in determining yield potential in *C. olitorius* under late-season conditions.

Climatic factors, particularly rainfall and temperature distribution, profoundly influence jute growth and fiber development. The ideal climatic regime for Tossa jute includes moderate temperature (below 32°C) and rainfall between 800–1200mm during 10–16 weeks after sowing (WAS) (Rahman et al. 2016; Ahmed et al. 2023). Excessive rainfall exceeding 900 mm or temperatures rising beyond the optimal range during the vegetative stage adversely affect jute performance. Such unfavorable conditions often lead to suppressed plant growth and a noticeable decline in fibre quality (Debnath et al. 2018). The irregular onset and retreat of the monsoon in recent years have disrupted this balance, posing a major challenge for jute farmers in Bangladesh (Haque et al. 2015; Islam 2019). The timing of the monsoon has become uncertain; early droughts followed by intense rainfall events often coincide with the sowing or early vegetative stages, causing poor seed germination, waterlogging, and plant mortality (Ahmed et al. 2023; Ferdous et al. 2024). Consequently, many farmers are compelled to reschedule their sowing time or, in extreme cases, abandon jute cultivation altogether (Alam and Haque 2020).

Jute cultivation is also affected by soil moisture fluctuations, especially in sandy clay loam or light-textured soils common in central and northern Bangladesh (Al-Mamun et al. 2017). Inadequate moisture during sowing delays germination and reduces plant establishment, while excess rainfall in the early stages hampers root development and aeration. Properly identifying the specific sowing time zone that minimizes climatic risk and maximizes fiber yield is thus essential for sustainable jute production (Ahmed et al. 2024; Ferdous et al. 2024).

Several earlier investigations have examined ways to refine agronomic practices with the aim of enhancing jute productivity. These studies collectively highlight the importance of management interventions in maximizing growth, fibre yield, and overall crop performance. For instance, Mollah et al. (2017) emphasized the role of plant growth regulators and their interaction with sowing dates in enhancing seed yield and quality in late-season C. olitorius. Sadhineni et al. (2022) demonstrated that integrated weed management practices combined with timely sowing significantly improved fiber yield in rainfed mesta systems. Moreover, Babalad et al. (2021) reported that genotype and harvesting stages also interact significantly with sowing time, affecting fiber yield and retting quality under rainfed conditions. These findings underscore the complexity of jute production under changing climatic conditions and highlight the necessity of location-specific agronomic recommendations.

The climate change phenomenon, manifested through irregular rainfall, rising temperature, and unpredictable weather patterns, poses additional threats to jute cultivation in Bangladesh (Lavanya et al. 2022). Farmers have reported increasing uncertainty regarding the ideal sowing window due to shifts in monsoon onset and frequent flash floods or droughts (Islam and Ali 2017). These environmental challenges not only reduce fiber yield but also affect retting efficiency, fiber quality, and ultimately, economic returns (Islam 2019; Ghorai et al. 2021). The need for adaptive strategies, including identifying optimal sowing dates, utilising tolerant genotypes, and adopting improved agronomic practices, has therefore become urgent (Ferdous et al. 2022; Ahmed et al. 2024).

Given this context, the present study was undertaken to evaluate the effect of different sowing dates on the fiber yield and yield attributes of Tossa jute under diverse agro-ecological conditions of Bangladesh. The goal is to determine the most suitable sowing period that ensures optimal growth, yield, and fiber quality while minimizing climatic risks. Such knowledge will help develop sustainable management practices that support farmers' resilience and promote the long-term stability of jute cultivation in the face of climatic uncertainty (Rahman et al. 2016; Ahmed et al. 2023).

2. MATERIALS AND METHODS

2.1. Experimental Sites and Duration

The field experiment was carried out during the Kharif season of 2023 across three agro-ecologically distinct locations in Bangladesh, Chandina (Cumilla district), Faridpur, and Manikganj, representing diverse soil textures, rainfall patterns, and climatic conditions typical of the country's major jute-growing zones (Islam and Ali 2017; Ferdous et al. 2022). The experiments were conducted under rainfed conditions, with supplementary irrigation applied only when necessary to ensure uniform crop establishment.

2.2. Experimental Design and Treatments

The study was designed as a two-factor factorial experiment arranged in a Randomized Complete Block Design (RCBD) with three replications at each location (Gomez and Gomez 1984). Each plot measured 4m × 2.5m, with a row spacing of 30 cm and plant spacing of 10cm, maintained through thinning 15 days after emergence.

- **Factor A: Sowing Dates**
  - S_1: 20 March
  - S_2: 30 March
  - S_3: 10 April
  - S_4: 20 April
- **Factor B: Varieties**
  - V_1: BJRI Tossa Pat 4
  - V_2: BJRI Tossa Pat 5
  - V_3: BJRI Tossa Pat 6
  - V_4: BJRI Tossa Pat 8
  - V_5: BJRI Tossa Pat 9

This combination allowed assessment of genotype-by-environment interaction effects under varying sowing windows (Alam and Haque 2020; Ahmed et al. 2023).

2.3. Cultural Practices

All standard agronomic practices, including land preparation, fertilization, weeding, thinning, and pest control, were uniformly followed across sites based on the Bangladesh Jute Research Institute (BJRI) recommended package (Islam 2019). Fertilizers were applied at the rate of 60–30–20–10 kgha^{-1} of N–P–K–S, respectively. Half of the nitrogen and full doses of phosphorus, potassium, and sulfur were applied during final land preparation, while the remaining nitrogen was top-dressed 30 days after sowing. Weeding and pest management were done manually or chemically when required, ensuring a weed-free environment during the critical early growth phase (Sadhineni et al. 2022).

2.4. Data Collection

At physiological maturity, ten representative plants were randomly selected and tagged from each plot to record key growth and yield parameters as follows:

- **Plant Population (PP, m^{-2}):** Number of plants per square meter after thinning.
- **Plant Height (PH, m):** Measured from ground level to the apical tip.
- **Basal Diameter (BD, mm):** Measured 5 cm above the ground using a digital caliper.
- **Fiber Yield (FY, tha^{-1}):** Plants were harvested, retted traditionally, and extracted fibers were sun-dried and weighed.
- **Stick Yield (SY, tha^{-1}):** Weight of dried sticks obtained after fiber extraction.

2.5. Statistical Analysis

Data collected from all sites were subjected to Analysis of Variance (ANOVA) following RCBD principles using the R software (version 4.2.2) to assess the significance of treatment effects and interactions (Gomez and Gomez, 1984). Mean comparisons were conducted using Least Significant Difference (LSD) at a 5% probability level. Pearson correlation coefficients were computed to examine interrelationships among agronomic and yield traits, and the correlations were visualized using the "corrplot" package in R (Ahmed et al. 2024).

3. RESULTS AND DISCUSSION

The influence of variety on fibre yield and related traits of Tossa jute was assessed at multiple locations, revealing significant differences among the tested genotypes (Table 1). At Chandina, BJRI Tossa Pat 9 (V_5) exhibited the highest fiber yield (2.99tha^{-1}) and stick yield (6.48tha^{-1}), accompanied by the greatest basal diameter (16.25mm) and plant height (2.97m), whereas BJRI Tossa Pat 4 (V_1) had the lowest fiber and stick yields. Similarly, at Faridpur, V_5 again recorded superior fiber yield (3.08tha^{-1}) and stick yield (6.48 tha^{-1}), while V_1 showed comparatively lower fiber yield (2.99tha^{-1}) but moderate stick yield. At Manikganj, although overall yields were lower, V_5 maintained relatively higher plant height (3.04m) and basal diameter (15.70mm), with fiber yield reaching 2.66tha⁻¹ and stick yield 5.34tha⁻¹, outperforming other varieties except V_4 which had slightly higher stick yield. These results highlight BJRI Tossa Pat 9 (V_5) as the most promising variety across varied agro-ecologies, demonstrating superior adaptability and fiber productivity.

Table 1: Effect of variety on fiber yield and yield attributes of Tossa jute at three different locations

Location	Treatment	PP (m^{-1})	PH (m)	BD (mm)	FY (tha^{-1})	SY (tha^{-1})
Chandina	V_1	27.13a	2.75c	14.87b	2.20b	4.80d
	V_2	27.45a	2.92b	15.25b	2.85a	5.82bc
	V_3	28.25a	3.09a	15.40b	2.86a	5.73c
	V_4	29.08a	2.87bc	15.17b	2.88a	6.39ab
	V_5	29.38a	2.97ab	16.25a	2.99a	6.48a
	$LSD_{(0.05)}$	3.71	0.16	0.83	0.20	0.62
	% CV	15.90	6.71	6.56	8.95	12.97
Faridpur	V_1	31.40a	2.88b	14.51b	2.99ab	6.39ab
	V_2	31.40a	3.17a	15.07b	3.01ab	6.15ab
	V_3	30.22a	3.09ab	15.40ab	2.81b	5.73b
	V_4	28.25a	2.88b	15.17b	2.88ab	6.39ab
	V_5	29.08a	2.96ab	16.25a	3.08a	6.48a
	$LSD_{(0.05)}$	4.5	0.23	0.96	0.21	0.86
	% CV	18.63	9.64	7.66	8.76	12.80
Manikganj	V_1	23.29ab	2.40d	14.12c	2.24b	4.33b
	V_2	24.02ab	2.51cd	14.83bc	2.64a	5.08ab
	V_3	22.59b	2.73bc	15.73a	2.39b	5.08ab
	V_4	25.83ab	2.78b	15.58ab	2.82a	5.68a
	V_5	26.47a	3.04a	15.70a	2.66a	5.34a
	$LSD_{(0.05)}$	3.75	0.25	0.83	0.18	0.79
	% CV	18.58	11.25	6.58	8.76	18.80

Values with dissimilar letters are significantly different at $P<0.05$. Legend: V1 = BJRI Tossa Pat 4, V2 = BJRI Tossa Pat 5, V3 = BJRI Tossa Pat 6, V4 = BJRI Tossa Pat 8, V5 = BJRI Tossa Pat 9, S1 = 20 March, S2 = 30 March, S3 = 10 April, S4 = 20 April.

The superior performance of BJRI Tossa Pat 9 across diverse sites indicates its broad adaptability and high genetic potential for fiber production. The improved growth and yield traits observed in this variety may be attributed to its robust stem development and efficient photosynthetic capacity, which promote higher biomass accumulation and fiber formation. Similar findings were reported by Ferdous et al. (2022) and Ahmed et al. (2024), who noted that newer jute genotypes with improved morpho-physiological characteristics performed better under varied agro-ecological conditions. Al-Mamun et al. (2017) also highlighted that genotype selection plays a decisive role in maximizing yield stability across non-traditional jute-growing regions, emphasizing the importance of evaluating varietal adaptability.

The observed variations in plant height and basal diameter among varieties align with previous results by Hossain et al. (2015), who reported that BJRI Tossa Pat 5 and BJRI Tossa Pat 8 demonstrated favorable plant growth attributes under late-sown conditions, which translated into improved fiber yield. Moreover, Islam (2019) explained that differences in genetic composition and response to environmental factors such as temperature and soil fertility largely determine fiber yield potential among jute cultivars.

Overall, the present study reinforces the importance of selecting high-performing and location-responsive varieties for optimizing fiber productivity. Among the tested genotypes, BJRI Tossa Pat 9 consistently outperformed others in most traits across all three locations, demonstrating strong adaptability and potential as a promising commercial variety for enhanced jute production in Bangladesh.

The effect of sowing dates on fiber yield and yield attributes of Tossa jute was significant across three locations, with intermediate sowing dates (30 March and 10 April) consistently producing superior results compared to early (20 March) and late (20 April) sowing (Table 2). At Chandina, sowing on 30 March (S2) and 10 April (S3) resulted in the highest plant population (35.77 and 36.88m⁻²), plant height (3.35 and 3.50m), basal diameter (17.30 and 17.75mm), fiber yield (3.39tha⁻¹ and 3.38tha⁻¹), and stick yield (6.91tha⁻¹ and 6.89tha⁻¹), significantly outperforming other sowing dates. Similar trends were observed at Faridpur, where S2 and S3 treatments yielded the greatest fiber production (3.56 and 3.32tha⁻¹) and stick yield (7.25 and 6.81tha⁻¹), with corresponding improvements in growth parameters. Manikganj exhibited comparable results, with the highest yields and growth characteristics recorded under the 10 April sowing (S3), reaching fiber yield of 3.20tha⁻¹ and stick yield of 6.63tha⁻¹. These findings clearly indicate that sowing Tossa jute during late March to early April optimizes growth and yield, providing critical guidance for agronomic management to maximize fiber production.

Citation: Ahmed M, Parvej SMS, Jui SA, Kader K, Das RC, Mitra S, Islam MW, Billah MM, Taohidi MAR, Kabir MH, Shamim-Al-Mamun M, Hasan A and Timmi UH, 2025. Varietal performances of BJRI developed Tossa pat on specific sowing dates. Agrobiological Records 22: 52-60. https://doi.org/10.47278/journal.abr/2025.048

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Table 2: Effect of sowing dates on fiber yield and yield attributes of Tossa jute at three different locations

Location	Treatment	PP (m^{-2})	PH (m)	BD (mm)	FY (tha^{-1})	SY (tha^{-1})
Chandina	S_1	18.87b	2.30c	12.98b	1.91c	4.28c
	S_2	35.77	3.35a	17.30a	3.39a	6.91a
	S_3	36.88a	3.50a	17.75a	3.38a	6.89a
	S_4	21.53b	2.53b	13.51b	2.35b	5.30b
	$LSD_{(0.05)}$	3.32	0.14	0.74	0.18	0.56
	% CV	15.90	6.71	6.56	8.95	12.97
Faridpur	S_1	24.08b	2.86b	12.98b	2.59c	5.47b
	S_2	36.40a	3.36a	17.67a	3.56a	7.25a
	S_3	36.45a	3.49a	17.38a	3.32b	6.81a
	S_4	21.74b	2.27c	13.087b	2.35d	5.38b
	$LSD_{(0.05)}$	4.08	0.21	0.86	0.21	0.59
	% CV	18.63	9.64	7.66	8.76	12.80
Manikganj	S1	13.18d	2.48b	14.25b	1.65d	3.36d
	S_2	27.87b	2.79a	15.84a	2.95b	5.75b
	S_3	35.04a	3.01a	16.49a	3.20a	6.63a
	S_4	21.67c	2.50b	14.21b	2.40c	4.67c
	$LSD_{(0.05)}$	3.35	0.22	0.73	0.16	0.73
	% CV	18.58	11.25	6.58	8.76	18.80

Values with dissimilar letters are significantly different at P<0.05. Legends: V_1 = BJRI Tossa Pat 4, V_2 = BJRI Tossa Pat 5, V_3 = BJRI Tossa Pat 6, V_4 = BJRI Tossa Pat 8, V_5 = BJRI Tossa Pat 9; S_1 = 20 March, S_2 = 30 March, S_3 = 10 April, S_4 = 20 April.

The superior performance under S_2 and S_3 sowing dates may be attributed to favorable temperature, day length, and soil moisture conditions prevailing during the early vegetative and reproductive stages, which promote better crop establishment and biomass accumulation. Early sowing (S_1) possibly exposed the crop to low soil temperature and uneven germination, while late sowing (S_4) might have subjected plants to excessive heat and moisture stress during fiber formation, adversely affecting yield (Alam and Haque 2020; Ferdous et al. 2022; Hossain et al. 2025).

The results of the present investigation corroborate earlier studies demonstrating that jute sown during the late March to early April window exhibits enhanced vegetative growth and higher fibre yield compared with crops established either earlier or at later sowing dates. Rahman et al. (2016) and Mollah et al. (2017) observed that delayed sowing reduces plant height and fiber yield due to shortened vegetative growth periods, while appropriate timing supports optimal stem elongation and fiber development. Similarly, Patra et al. (2017) found that variation in sowing time significantly affects jute growth attributes and seed quality in the red and lateritic zones of West Bengal. Ahmed et al. (2024) and Tasnime et al. (2025) also reported that fiber yield and yield components of mesta and jute are strongly influenced by sowing date, confirming the importance of proper planting windows for maximizing yield potential.

Overall, the present findings clearly demonstrate that late March to early April sowing (S_2–S_3) provides the most favorable environment for Tossa jute growth, ensuring balanced vegetative and reproductive development. Hence, this sowing window may be recommended for farmers across different jute-growing regions of Bangladesh to achieve sustained high fiber yield and quality.

Fig. 1 presents a Pearson correlation matrix illustrating the linear relationships among six variables: PP (Plant Population), Ph (Plant Height), bd (Base Diameter), SY (Stick Yield), and fy. The color gradient represents correlation strength, with deeper blue indicating stronger positive correlations. All displayed correlations are statistically significant (P< 0.001), as indicated by triple asterisks (***). Strong positive correlations were observed between SY and PP (r = 0.87), Ph and PP (r = 0.86), and SY and fy (r = 0.87), suggesting substantial linear associations among these traits. These results highlight important interrelationships that may inform selection criteria and further statistical analyses.

The significant association between base diameter (bd) and both SY and FY also highlights the role of stem thickness as a reliable indicator of overall plant vigour and productivity. Similar findings were reported by Daba and Mekonnen (2022), who demonstrated that jute yield components such as plant height and basal diameter are major contributors to fiber yield potential. The close linkage among these traits suggests that improvement in one variable may positively influence others, thereby enhancing total yield performance.

The high positive correlations among the growth and yield parameters imply that agronomic management practices—such as optimized seed rate, appropriate sowing dates, and effective weed control—can simultaneously influence multiple yield-contributing traits. These findings align with those of Degla et al. (2022) and Qasem (2019), who reported that favourable environmental and cultural management practices enhance morphological growth, leading to improved fiber accumulation (Ahmed et al. 2025). Overall, the correlation analysis provides a foundation for identifying key selection traits and refining management strategies to improve the yield potential of Tossa jute under variable agro-climatic conditions.

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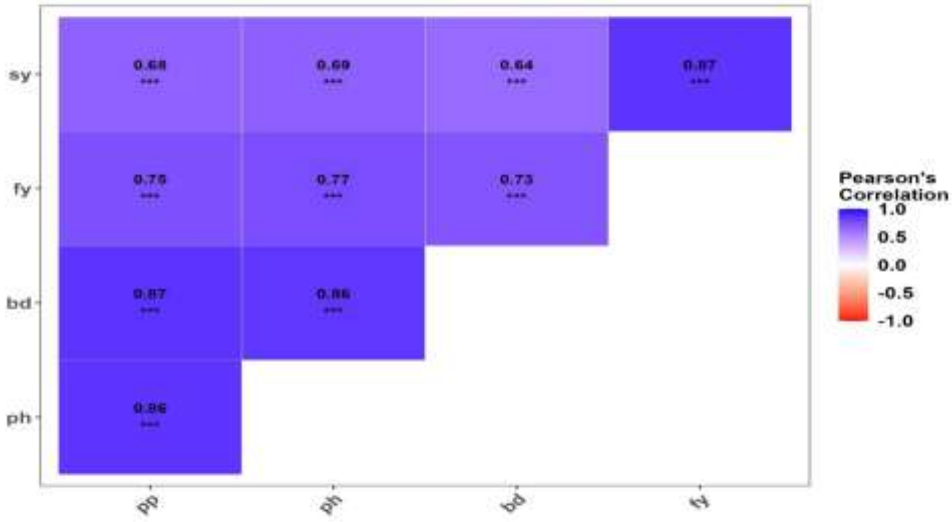

Fig. 1: Pearson correlation among the parameters at Chandina. Legends: PP= Plant population, Ph= Plant Height, bd= base diameter, SY = Stick Yield; ns=P>0.05; *=P<0.05; **=P<0.01; ***=P<0.001.

Fig. 2 presents the Pearson correlation matrix among agronomic parameters at Faridpur, including PP (Plant Population), Ph (Plant Height), bd (Base Diameter), and SY (Stick Yield). The matrix visualizes the strength and direction of linear relationships using both a color gradient and correlation coefficients, where deeper blue indicates stronger positive associations. All correlations are statistically significant (P < 0.001), denoted by triple asterisks (***). Notably, SY shows strong positive correlations with PP (r = 0.76), fy (r = 0.73), and bd (r = 0.59), suggesting these traits contribute significantly to stick yield. Moderate correlations are observed between Ph and other traits, with the lowest being between SY and Ph (r = 0.46). These results indicate key interrelationships among traits influencing yield performance at the Faridpur site.

The moderate correlations between plant height (Ph) and other variables indicate that while plant height contributes to yield formation, its influence may vary under different environmental and management conditions. This finding aligns with the results of Degla et al. (2022) and Qasem (2019), who noted that jute yield is more strongly determined by basal diameter and population density than by height alone. The relatively lower correlation between SY and Ph (r = 0.46) implies that height alone may not serve as a reliable predictor of yield without considering stem thickness and stand density.

Overall, the correlation pattern observed at Faridpur emphasizes that both morphological and management-related factors contribute collectively to yield optimization. The findings corroborate the earlier observations of Islam and Uddin (2019), who reported that synchronizing plant density with favourable climatic conditions enhances fiber and stick yield in jute. Hence, improving plant population uniformity and stem robustness should be prioritized in agronomic practices aimed at maximizing yield efficiency under similar agro-climatic settings.

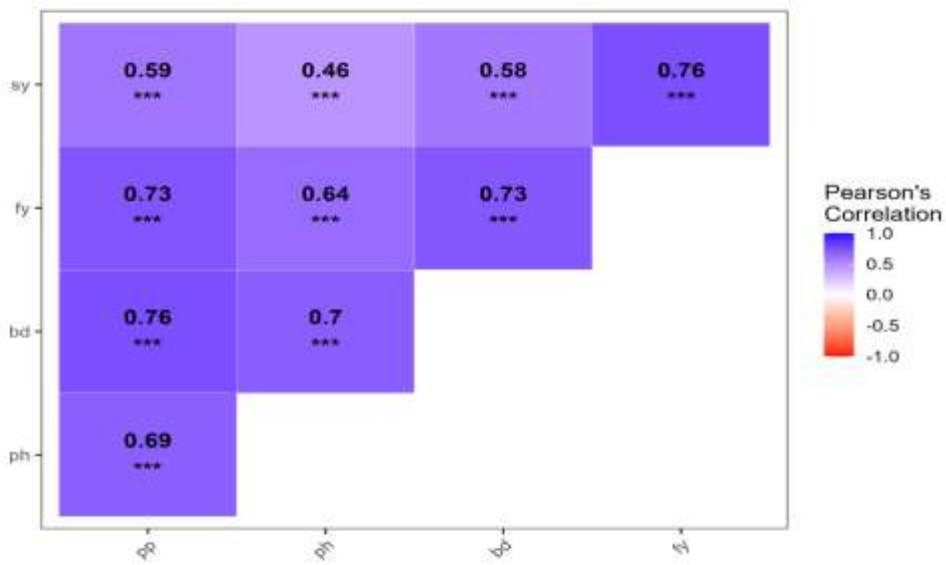

Fig. 2: Pearson correlation among the parameters at Faridpur. Legends: PP= Plant population, Ph= Plant Height, bd= base diameter, SY = Stick Yield; ns=P>0.05; *=P<0.05; **=P<0.01; ***=P<0.001.

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Fig. 3 displays the Pearson correlation matrix among key agronomic traits at a specific site, including PP (Plant Population), Ph (Plant Height), bd (Base Diameter), SY (Stick Yield), and fy. The strength and direction of linear associations are visualized with a blue-to-red color scale and corresponding correlation coefficients. All correlations are statistically significant ($P < 0.001$), indicated by triple asterisks (***). Strong positive correlations are observed between SY and PP ($r = 0.84$), SY and bd ($r = 0.74$), and PP and fy ($r = 0.87$), suggesting that plant population and base diameter are critical contributors to yield. Moderate positive relationships also exist between Ph and other traits, highlighting its supportive role. These findings emphasize the importance of plant population and morphological traits in influencing stick yield performance. Similar relationships have been observed in previous studies, where plant population and basal diameter were key contributors to enhanced fiber and stick yields (Daba and Mekonnen, 2022; Ahmed et al. 2024; Hasan et al. 2025).

Moderate positive correlations between plant height (Ph) and other parameters suggest that while height supports overall plant vigour, it exerts an indirect effect on yield compared with population density and stem thickness. This aligns with findings by Degla et al. (2022), who reported that yield improvements in jute depend more on the synergistic effects of stand establishment and basal growth than on height alone. The strong associations among PP, bd, and yield parameters further support the concept of integrated management practices that optimize plant spacing and density to maximize productivity (Islam and Uddin 2019; Kaur et al. 2025).

Overall, the correlation structure at Manikganj highlights that both morphological and management factors collectively influence yield potential. The strong interdependencies among these parameters suggest that selecting for traits such as higher plant population and greater basal diameter can serve as reliable indicators for improving both stick and fiber yield across varied agro-ecological conditions.

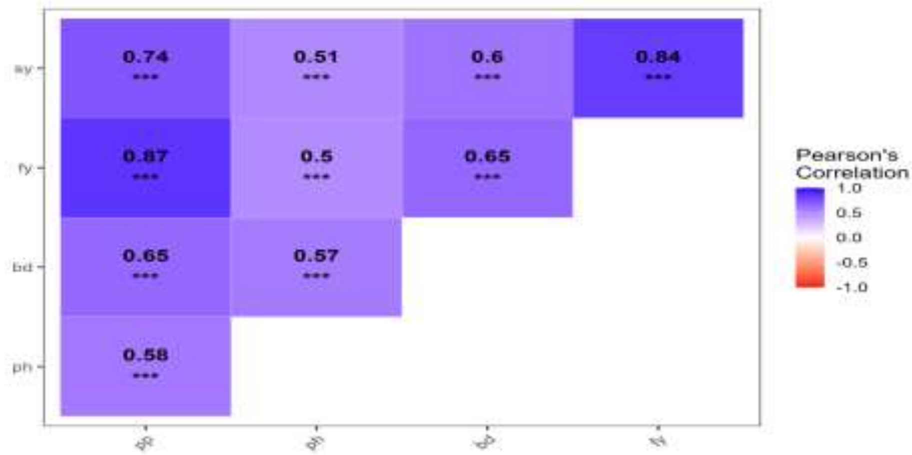

Fig. 3: Pearson correlation among the parameters at Manikganj. Legends: Legends: PP= Plant population, Ph= Plant Height, bd= base diameter, SY = Stick Yield; ns=P>0.05; *=P<0.05; **=P<0.01; ***=P<0.001.

4. CONCLUSION

The results clearly demonstrate that BJRI Tossa Pat 9 (V_5) is the most promising variety for Tossa jute cultivation across varied environments, offering superior performance in terms of fiber yield, morphological traits, and adaptability. Furthermore, sowing during the intermediate window (30 March–10 April) significantly enhances growth and yield attributes compared to early or late planting. The strong correlations among plant population, plant height, basal diameter, and yields further confirm the importance of these traits in varietal selection and crop management. These findings provide valuable recommendations for farmers, researchers, and policymakers to optimize jute production through variety choice and precise sowing time.

Declarations

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Conflict of Interest: The authors declare that they have no conflicts of interest and that the research was conducted independently without any financial or personal influence.

Data Availability: All data generated or analyzed during this study are available from the corresponding author upon reasonable request.

Ethics Statement: This study involved field experimentation only and did not include human or animal subjects; therefore, ethical approval was not required, and all procedures complied with institutional research guidelines.

Author's Contribution: Mubasshir Ahmed conceived and designed the experiment, coordinated the field research, analyzed the data, and prepared the initial draft of the manuscript. S.M. Shahriar Parvej assisted in experimental design, data interpretation, and manuscript editing. Sadia Afrin Jui, Kamiliya Kader, and Ronzon Chandra Das contributed to field management, data collection, and preliminary analysis. Shaikat Mitra and Md. Wahidul Islam supported statistical analysis and improved the methodological framework. Md. Mostansir Billah, Md. Abdur Razzak Taohidi, and Md. Humayun Kabir assisted in field supervision and logistics across locations. Md. Shamim-Al-Mamun and Atik Hasan provided critical review and technical inputs to refine the manuscript. Umme Hafsa Timmi contributed to data verification and assisted in preparing tables and figures. All authors reviewed, revised, and approved the final manuscript.

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