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# Journal of Contemporary Agriculture and Bioscience

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Research Article

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## Effect of Different Dates of Sowing on Major Insect Pest Infestation on Tossa Jute (*Corchorus olitorius* L.) Varieties During Fiber Growing Season

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| Article info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Abstract                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <p><b>Received:</b> 26 August, 2023<br/> <b>Accepted:</b> 28 September, 2023<br/> <b>Published:</b> 05 October, 2023<br/> <b>Available in online:</b><br/> 08 October, 2023</p> <p><b>*Corresponding author:</b><br/>  <a href="mailto:Shibly.ent@gmail.com">Shibly.ent@gmail.com</a></p> <p></p> <p><b>Link to this article:</b><br/> <a href="http://www.hnpublication.com/article/14/details">http://www.hnpublication.com/article/14/details</a></p> | <p>This study assessed the effects of different sowing dates on the incidence and severity of major insect pests of tossa jute (<i>Corchorus olitorius</i> L.) during the 2023 fiber-growing season. The experiment was carried out at the Jute Research Substation, Manirampur, Jashore, using three tossa jute varieties (O-9897, JRO-524, and BJRI Tossa Pat-8) under four sowing dates (15 March, 30 March, 15 April, and 30 April). Results showed that early sowing (15 March) substantially reduced pest infestations, whereas late sowing (30 April) significantly increased the population densities of semilooper (<i>Anomis sabulifera</i>), hairy caterpillar (<i>Spilosoma obliqua</i>), and yellow mite (<i>Polyphagotarsonemus latus</i>). Among the varieties, O-9897 exhibited moderate resistance across all sowing dates, while JRO-524 was comparatively more susceptible. Fiber yield was highest under early sowing and progressively declined with delayed sowing. Statistical analysis confirmed that the interaction between sowing date and variety had a significant effect on both pest incidence and fiber yield.</p> <p><b>Keywords:</b> Tossa jute, sowing date, insect pests, semilooper, hairy caterpillar, yellow mite and fiber yield.</p> |

### Introduction

Jute (*Corchorus olitorius* L.), known commonly as tossa jute, is one of the principal fiber crops of South Asia, especially Bangladesh and India. Its fibers are biodegradable, renewable, and eco-friendly, making them highly appropriate for textile, packaging, and other industrial uses in an age of increasing environmental concern. However, productivity of tossa jute is constrained by a range of insect and mite pests—most notably yellow mite (*Polyphagotarsonemus latus*), semilooper (*Anomis sabulifera*), and hairy caterpillar (*Spilosoma obliqua*)—which reduce both yield quantity and fiber quality (Chaudhary et al., 2014).

Pest incidence and severity are strongly influenced by climatic and agronomic factors, including temperature, humidity, rainfall, plant age, and crop phenology. One agronomic factor that interacts closely with these is sowing date. Altering sowing time can shift the vulnerable crop growth stages relative to the periods of peak pest activity, potentially reducing exposure to pest pressure. For example, investigations into yellow mite populations in Bangladesh found that plants sown earlier (around mid-March) had higher mite infestation compared to those sown later, with mite density declining with progressively later sowing dates (Islam et al., 2020). Such studies demonstrate that environmental variables (e.g.,

relative humidity, rainfall, temperature) associated with different sowing times can significantly affect pest buildup.

Varietal resistance or tolerance is another key component of pest management. Some tossa jute varieties show differential reaction to yellow mite infestation: in West Bengal, India, for instance, JRO-524 was among varieties included in a study of field reactions to yellow mite, though some varieties (e.g. JRO-7835) showed lower leaf infestation than others (Saha and Roy, 2012). Also, integrated management studies have reported that JRO-524 exhibits moderate resistance to semilooper and hairy caterpillar, and comparatively lower susceptibility to yellow mites, relative to more susceptible varieties (Mukherjee et al., 2014).

Beyond pest incidence, sowing date also impacts fiber yield and other yield attributes. Recent work with BJRI Tossa Pat-8 has shown that sowing in mid-April yields significantly higher fiber and stick yields than earlier or much later dates across multiple locations in Bangladesh (Rahman et al., 2023). Likewise, experiments with variety O-795 demonstrated significant differences in fiber yield depending on sowing date: sowing on 14 March gave higher yield than earlier dates in trials in Bangladesh (Hasan et al., 2019).

Given that both sowing date and variety are manageable by farmers, optimizing these can serve as an effective, low-cost, environmentally safer strategy for pest management in tossa jute.

This study aims to investigate how different sowing dates affect infestation by major pests (semilooper, hairy caterpillar, yellow mite) across several tossa jute varieties, and how these infestations translate into differences in fiber yield. Understanding the interaction between sowing time, pest dynamics, and varietal susceptibility will help refine management recommendations to reduce insect-mediated losses and improve yield stability.

## Materials and Methods

### Experimental Site

The field experiment was conducted during the 2023 jute fiber-growing season at the Jute Research Substation, Monirampur, Jashore, Bangladesh and is characterized by a subtropical climate with hot, humid summers. Soils of the experimental field are silty loam with a neutral pH and moderate organic matter content.

### Experimental Design and Treatments

The trial was laid out in a randomized complete block design (RCBD) with three replications. Treatments consisted of four sowing dates—15 March (D<sub>1</sub>), 30 March (D<sub>2</sub>), 15 April (D<sub>3</sub>), and 30 April (D<sub>4</sub>)—combined with three tossa jute varieties: O-9897 (V<sub>1</sub>), JRO-524 (V<sub>2</sub>), and BJRI Tossa Pat-8 (V<sub>3</sub>). Each plot measured 3 m × 2 m, with rows spaced 30 cm apart and plants thinned to 10 cm within rows to maintain the recommended plant density.

### Crop Management

Land preparation, sowing methods, and thinning were carried out following standard agronomic practices for tossa jute as recommended by the Bangladesh Jute Research Institute. Fertilizers were applied at recommended rates and incorporated before sowing. Intercultural operations such as weeding and gap filling were performed uniformly across all treatments to ensure proper crop establishment. No insecticides or acaricides were applied; pest infestation was allowed to develop naturally in order to assess inherent pest pressure.

### Data Collection

Observations on pest infestation were recorded at 30, 45, and 60 days after sowing (DAS). For each plot, the population densities of semilooper larvae, hairy caterpillar larvae, and yellow mite colonies were counted on 10 randomly selected plants. Leaf damage was visually estimated as percentage of foliage affected on the same plants. At maturity, fiber yield was recorded from the entire net plot area, weighed, and converted to tonnes per hectare (t ha<sup>-1</sup>).

### Statistical Analysis

The data were subjected to two-way analysis of variance (ANOVA) to evaluate the effects of sowing date, variety, and their interaction. Treatment means were separated using Fisher's least significant difference (LSD) test at the 5% probability level. All analyses were performed using standard statistical software.

## Results

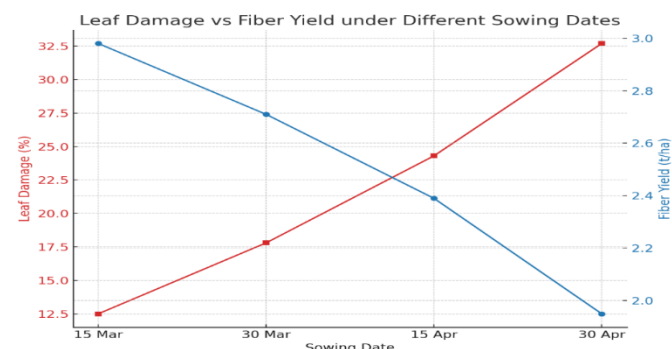
### Effect of Sowing Date on Pest Infestation and Fiber Yield

Sowing date had a marked influence on the population densities of all three major insect pests of tossa jute. Mean semilooper, hairy caterpillar, and yellow mite populations increased progressively with delayed sowing from 15 March (D<sub>1</sub>) to 30 April (D<sub>4</sub>) (Table 1). The lowest infestations were recorded in 15 March sowing, with mean populations of 5.3, 3.7 and 4.2 larvae/colonies per 10 plants for semilooper, hairy caterpillar, and yellow mite, respectively. In contrast, the highest infestations occurred in the 30 April sowing (14.6, 10.3 and 13.2 larvae/colonies per 10 plants, respectively). Mean leaf damage percentage also rose sharply from 12.5% at 15 March sowing to 32.7% at 30 April sowing. Correspondingly, fiber yield declined steadily from 2.98 t ha<sup>-1</sup> in the earliest sowing to 1.95 t ha<sup>-1</sup> in the latest sowing. These trends are depicted in Figure 1, which shows the progressive increase of pest populations with delayed sowing.

**Table 1.** Mean pest population density (per 10 plants), leaf damage (%) and fiber yield (t ha<sup>-1</sup>) across sowing dates.

| Sowing Date | Semilooper (larvae) | Hairy Caterpillar (larvae) | Yellow Mite (colonies) | Mean Leaf Damage (%) | Fiber Yield (t/ha) |
|-------------|---------------------|----------------------------|------------------------|----------------------|--------------------|
| D1 (15 Mar) | 5.3                 | 3.7                        | 4.2                    | 12.5                 | 2.98               |
| D2 (30 Mar) | 7.8                 | 5.1                        | 6.4                    | 17.8                 | 2.71               |
| D3 (15 Apr) | 11.2                | 7.9                        | 9.6                    | 24.3                 | 2.39               |
| D4 (30 Apr) | 14.6                | 10.3                       | 13.2                   | 32.7                 | 1.95               |

**N.B.:** Pest population and leaf damage increased with delayed sowing, while fiber yield declined.



**Figure 1.** illustrates the negative association between leaf damage and fiber yield under different sowing dates: as leaf damage increased, fiber yield decreased proportionally.

### Varietal Performance under Different Sowing Dates

Varietal differences in susceptibility to semilooper were evident (Table 2). O-9897 consistently recorded lower larval populations across all sowing dates (ranging from 4.2 to 12.8 larvae/10 plants), whereas JRO-524 was the most susceptible (5.8 to 16.1 larvae/10 plants). BJRI Tossa Pat-8 showed intermediate susceptibility. The trend of increasing pest population with delayed sowing was consistent across all varieties, although the magnitude of infestation varied.

**Table 2.** Interaction effect of sowing date × variety on semilooper population (larvae/10 plants).

| Sowing Date | O-9897 | JRO-524 | BJRI Tossa Pat-8 | Mean |
|-------------|--------|---------|------------------|------|
| D1          | 4.2    | 5.8     | 6.0              | 5.3  |
| D2          | 6.5    | 8.9     | 8.0              | 7.8  |
| D3          | 9.6    | 12.3    | 11.7             | 11.2 |
| D4          | 12.8   | 16.1    | 15.0             | 14.6 |
| Mean        | 8.3    | 10.8    | 10.2             |      |

**N.B.:** O-9897 consistently showed lower infestation compared to other varieties. JRO-524 was most susceptible.

### Analysis of Variance

The two-way ANOVA confirmed that sowing date had a highly significant effect ( $p < 0.01$ ) on semilooper, hairy caterpillar, yellow mite populations, and fiber yield (Table 3). Varietal differences were also significant ( $p < 0.05$ ) for all pests and yield, although the F values were lower than those for sowing date. The interaction

between sowing date and variety was significant ( $p < 0.05$ ) for semilooper population and fiber yield but non-significant for hairy caterpillar (Table 3), indicating that sowing date effects on these parameters were largely consistent across varieties.

**Table 3.** Summary of ANOVA (two-way) for pest populations and fiber yield.

| Source of Variation | df | Semilooper (F value) | Hairy Caterpillar (F value) | Yellow Mite (F value) | Fiber Yield (F value) |
|---------------------|----|----------------------|-----------------------------|-----------------------|-----------------------|
| Sowing Date (D)     | 3  | 24.6**               | 21.3**                      | 28.9**                | 33.2**                |
| Variety (V)         | 2  | 6.1*                 | 5.7*                        | 7.4*                  | 4.6*                  |
| D × V Interaction   | 6  | 2.4*                 | 2.0 ns                      | 2.7*                  | 3.1*                  |
| Error               | 22 |                      |                             |                       |                       |

(\*Significant at 5%, \*\*highly significant at 1%, ns = not significant)

**N.B.:** Sowing date had a highly significant effect on all pests and yield. Varietal differences were significant but smaller. Interaction effect was significant for semilooper and yield.

Overall, these results demonstrate that early sowing minimizes pest infestation and maximizes fiber yield, whereas delayed sowing substantially increases pest pressure and reduces yield, with varietal differences moderating the extent of damage.

## Discussions

The present study clearly demonstrates that sowing date exerts a profound influence on the incidence of major insect pests and fiber yield of tossa jute. Pest populations of semilooper (*Anomis sabulifera*), hairy caterpillar (*Spilosoma obliqua*), and yellow mite (*Polyphagotarsonemus latus*) increased progressively with delayed sowing from mid-March to late April, while fiber yield declined correspondingly. This pattern is consistent with earlier reports that climatic conditions prevailing later in the season—particularly higher temperatures, increased relative humidity, and more vigorous weed growth—favor rapid multiplication and survival of insect pests in jute (Chaudhary et al., 2014; Islam et al., 2020). Early sowing appears to help escape peak pest pressure by allowing plants to pass through their most vulnerable stages before pest populations reach their maxima.

Leaf damage percentage also increased sharply with delayed sowing, and the negative association between leaf damage and fiber yield highlights the cumulative impact of defoliation on plant growth and fiber production. Similar yield penalties due to late sowing under high pest pressure have been reported for BJRI Tossa Pat-8 and other improved varieties in Bangladesh (Rahman et al., 2023). These findings emphasize that, in addition to varietal improvement, cultural practices such as optimized sowing time remain essential for effective pest management and yield stability. Varietal differences observed in this study further underscore the potential for integrating host plant resistance with agronomic measures. O-9897 consistently supported lower semilooper populations than JRO-524 and BJRI Tossa Pat-8 across all sowing dates, indicating moderate resistance. Previous field evaluations have also identified variation in susceptibility among tossa jute varieties, particularly for yellow mite (Saha and Roy, 2012) and semilooper (Mukherjee et al., 2014). Although no variety was completely free from infestation, the lower pest load in O-9897 suggests that deploying relatively tolerant varieties in combination with early sowing can reduce pest pressure without relying on chemical control.

The highly significant effects of sowing date on pest populations and yield, together with the significant but smaller varietal effects,

indicate that both factors contribute to the observed variation. The significant interaction between sowing date and variety for semilooper and yield suggests that some varieties may respond differently to sowing dates, providing opportunities for site- and season-specific recommendations.

Overall, the study highlights that early sowing of moderately resistant varieties such as O-9897 can be a cost-effective, environmentally sound strategy for managing major insect pests in tossa jute. Such integration of cultural and host plant resistance measures aligns well with current principles of sustainable and integrated pest management.

## Acknowledgement

The authors gratefully acknowledge the support of the Bangladesh Jute Research Institute (BJRI) for providing experimental facilities and germplasm of tossa jute varieties. We sincerely thank the staff of the Jute Research Substation, Monirampur, Jashore, for their assistance in field management and data collection.

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**How to cite:** Ghosh, A., Islam, S.N., Rana, M.M. and Noman, M.S. 2023. Effect of Different Dates of Sowing on Major Insect Pest Infestation on Tossa Jute (*Corchorus olitorius* L.) Varieties During Fiber Growing Season. *Journal of Contemporary Agriculture and Bioscience*, 1(2), 45-48.



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