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Common cutworm (*Spodoptera litura* Fab.): The new emerging pest of Jute in Bangladesh

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A b s t r a c t

Spodoptera litura (Fabricius) (Lepidoptera: Noctuidae), known as the common cutworm, is a worldwide pest that causes severe damage to various crops and vegetables in Bangladesh. In this study, we investigated the abundance and incidence of *S. litura* in jute. The study was conducted in the experimental field of Bangladesh Jute Research Institute, Regional Station, Faridpur during the jute growing seasons in 2023 and 2024. Three different tosa jute varieties (BJRI tosa pat 8, BJRI tosa pat 9 and JRO-524, India) were used in this study. We recorded the incidence of *S. litura* on the crop as the percentage of plant and leaf infestation. The plant infestation ranged from 0.24 to 10.82 and 2.23 to 14.47 in 2023 and 2024, respectively. This insect was more prevalent from the last week of April to the first week of May, when the plant was 40 to 50 days old. The climatic factors, particularly temperature, relative humidity, and rainfall, played a pivotal role in the occurrence and existence of this pest on the jute crop. *S. litura* was significantly positively correlated with the maximum temperature. The information generated through this investigation could be useful for jute growers and researchers to advocate for management actions to keep this pest population below the economic injury level.

Keywords: *Spodoptera litura*, pest incidence, emerging pest and weather relationship.

Introduction

Jute, *Corchorus olitorius* (Malvaceae), is in the same family as cotton and is considered to be a important fiber crop. It is mostly cultivated in Bangladesh, India and other countries in South East Asia (Rahman *et al*. 2007). There is a negative impact on both the quantity and the quality of the fibers that are caused by biotic stress, particularly the insect pests. From the time of germination until the harvest, a large number of insect pests are associated with the jute crop. Among the pests, jute semilooper (*Anomis sabulifera* Guen.), Jute hairy caterpillar (*Spilarctia obliqua* Wlk.), stem weevil (*Apion corchori* Marshall), yellow mite (*Polyphagotarsonemus latus* Banks) and red mite (*Oligonychus coffeae* Nietner) are considered as the major pests causing economic damage to the crop every year. The avoidable losses in fibre yield due to multiple infestations by the pests were found to be 31–34% (Rahman and Khan 2006, 2009 & 2010).

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The common cutworm, *Spodoptera litura* (Fab.) (Lepidoptera: Noctuidae), is one of the most important pests of soybean in tropical Asia. A polyphagous pest with tremendous reproductive capacity and migratory ability, the cutworm is an economically important pest of agricultural crops across the world (Dhaliwal *et al.* 2010; Qin & Ye 2007). It has been reported to attack over 112 cultivated plant species, of which 60 are from India, including cotton, mungbean, groundnut, eggplant, rice, cabbage, leafy vegetables and soybean (Pogue 2003; Venette *et al.* 2003). Yield losses in soybean are directly associated with higher larval densities and increased defoliation (Prayogo *et al.* 2005).

In India, the common cutworm (*S. litura*) in major pest of jute but in Bangladesh, it is the major pest of mustard, aroid, cabbage, cauliflower and other vegetable crops. In recent years this pest has been found in jute. It sporadically assumes destructive nature in the early sown jute crop where its activity is confined to seedling or young jute plants. Occurrence is more prevalent in jute seed crop,

active throughout the crop growth stages. The young larvae after hatching web either margin of the same leaf or two top leaves, shelter inside and start voraciously feeding the green matters (Rahmam, *et al.* 2007). The damage is noticed even from distance especially border plants. Within these webs the young larvae live gregariously only for two or three days and thereafter they separate and spread out. The feeding activity of grown up larva is generally confined to morning hours and late evening. They are quite large patches of foliage are quickly stripped and top plants are webbed together. The leaves are skeletonized; the older caterpillars often devour the entire lamina and March-April is the peak period of its infestation (Selvaraj *et al.* 2026). The pest has very high fecundity and the caterpillars are destructive defoliators and damage the leaves. The extent of damage may go up to 20% fibre yield loss (Das *et al.* 1999) and the yield loss varies with the intensity of infestation, host plant quality and weather conditions. Timely management is very important as delay may even lead to complete defoliation of crop if remains unchecked. Being a polyphagous pest, the population builds up and consequent damage in jute is largely dependent on other parallel and overlapping hosts grown under climatic conditions. Insects are physiologically sensitive to temperature, have short life cycle and great mobility, and their developmental rate and geographical distribution are therefore highly responsive to changes in temperature (Lange *et al.* 2006). In this study, we investigated the abundance, incidence and pest-weather relationship of common cutworm in jute crops of the major jute growing areas in Bangladesh.

Material and methods

Study site and establishment of Jute

Experiment was conducted in the experimental field of Bangladesh Jute Research Institute (BJRI), Regional Station of Faridpur (23.58903407456592N, 89.81080133968753E) during March to July in 2023 and 2024. The soil was sandy loam and slightly acidic (pH 6.6) in Faridpur. The weather parameters were recorded during the experimental period (temperature: 22.8–40.88^{0}C; RH: 43.6–98.6%; total rainfall: 744-1000 mm in Faridpur). For natural occurrence and incidence of pests on *olitorius* jute, variety BJRI tosa pat 8, BJRI tosa pat 9 and JRO 524 was grown in small plots of 2 m x 2.1m with three replications followed by Randomized Complete Block Design (RCBD). Jute seeds were sown on the 20th day of March in every year. Irrigation was applied for seven times and weeding was done for three times. Nitrogen, phosphorus and zinc fertilizers were applied as recommended in Fertilizer Recommendation Guide (2012). The seeds were sown in a row spacing of 25 cm and finally plant to plant distance was maintained at 5–7 cm apart after thinning.

Abundance and incidence of *S. litura*

The observation on incidence of common cutworm was taken. The incidence of common cutworm in different experimental field was monitored from seedling stage to the harvest of the crop. Monitoring was done by using pheromone trap at every week after sowing of jute seeds. Incidence of the pest on the crop was recorded as the percentage of plant and leaf infestation. For this purpose, 1 m^2 area in each spot were observed for a particular pest attack and then percentage of plant infestation was calculated based on total number of plants/m^2. The percentage of leaf infestation was also worked out based on the number of leaves damaged, out of top eight leaves of the infested plants by a particular pest in the sampled unit area.

Meteorological data

Weekly mean of the meteorological data on maximum and minimum temperature, morning and evening relative humidity (RH) and total rainfall during the crop growing period were recorded from the nearest (within 100 m) meteorological observatory.

Data analysis

Data obtained for pest incidence were statistically analysed using analysis of variance. The test of significance or non-significance of the treatment differences was calculated by 'F' test (Cochran and Cox 1963). The correlation of the pest incidence with the weather parameters was worked using standard methodology to establish the pest– weather relationship. The significant correlations between different pest's incidence and weather factors were further subjected to fitting regression analysis. The pooled mean data of 2023 and 2024 on the incidence of pests and weather factors were used to draw the regression lines by using Origin 9 Pro software.

Results

Abundance of *S. litura*

The initial appearance of *S. litura* in a jute plot occurred during the second week of April, and it was captured until the first week of June (Figure 1). In the year 2023, the maximum adult male moth (26) was captured during the first week of May (Figure 1A). However, in the year 2024, the maximum adult male moth (62) was captured during the last week of April (Figure 1B). After the first week of June, no adult was found in jute plot either of the two years.

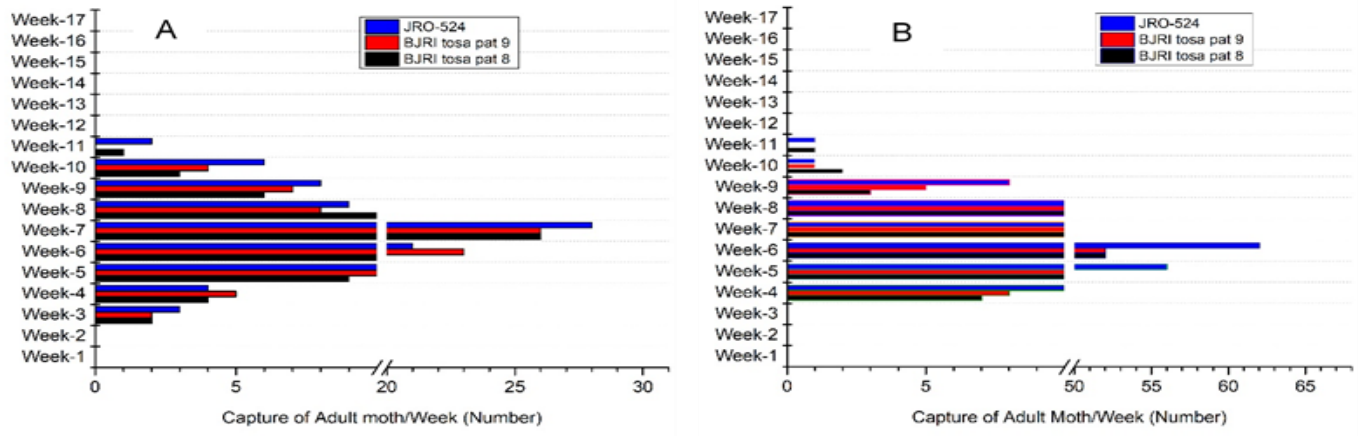

Figure 1. The number of adult males of common cutworm caught per trap per week from the jute plots during a) 2023 and b)2024 at BJRI, Faridpur

Table 1. Plant and leaf injury (%) caused by *S. litura* on different Jute varieties at BJRI, Faridpur during 2023

Date of Observation	BJRI tosa pat 8		BJRI tosa pat 9		JRO-524	
	Plant	***Leaf***	***Plant***	***Leaf***	***Plant***	***Leaf***
26.03.23 (1st)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
02.04.23 (2nd)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
09.04.23 (3rd)	2.23 (1.65)	1.37 (1.37)	2.24(1.66)	1.19(1.30)	4.08(2.14)	1.98(1.57)
16.04.23 (4th)	4.45 (2.22)	2.87 (1.84)	4.63(2.26)	2.36(1.69)	4.45(2.22)	2.34(1.69)
23.04.23 (5th)	8.83 (3.05)	6.67 (2.68)	7.81(2.88)	4.43(2.22)	8.87(3.06)	5.43(2.44)
30.04.23 (6th)	9.34 (3.14)	7.89 (2.90)	9.04(3.09)	4.09(2.14)	10.82(3.36)	8.09(2.93)
07.05.23 (7th)	2.23 (1.65)	1.67 (1.47)	3.09(1.89)	2.07(1.60)	2.23(1.65)	1.67(1.47)
14.05.23 (8th)	2.43 (1.71)	1.12 (1.27)	2.42(1.71)	1.08(1.26)	2.56(1.75)	1.19(1.30)
21.05.23 (9th)	0.24 (0.86)	0.12 (0.79)	0.48(0.99)	0.24(0.86)	1.23(1.32)	0.92(1.19)
28.05.23(10th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
04.06.23 (11th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
11.06.23 (12th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
18.06.23 (13th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
25.06.23 (14th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
02.07.23 (15th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
09.07.23 (16th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
16.07.23 (17th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
SEM ±CD	1.76	2.42	3.01	2.90	2.03	2.88
p value	0.057	0.09	0.051	0.051	0.05	0.059

Figure in parenthesis are $(x+0.5)^{1/2}$ transformed values

Incidence of *S. litura*

The incidence of *S. litura* was recorded on second week of April (21 DAS) in 2023 and third week of April (28 DAS) in 2024 (Table 1 & 2). In BJRI tosa pat 8, the infestation was started in second week of April with 2.23% in plant, 1.37% of leaf in 2023 and 6.80 % in plant, 2.90% of leaf in 2024. The peak infestation with 9.34% plant injury was found in the last week of April and declined thereafter to cause 2.23% plant injury in the first week of May in 2023 (Table 1).

In 2024, the peak infestation with 12.86% plant injury in the last week of April and declined thereafter to cause 11.14% plant injury in the first week of May (Table 2). No plant or leaf injury caused by *S. litura* were noticed after last week of May in both years. The trends of plant and leaf injury (%) were similar on other two varieties (BJRI tosa pat 9 and JRO-524) in both years.

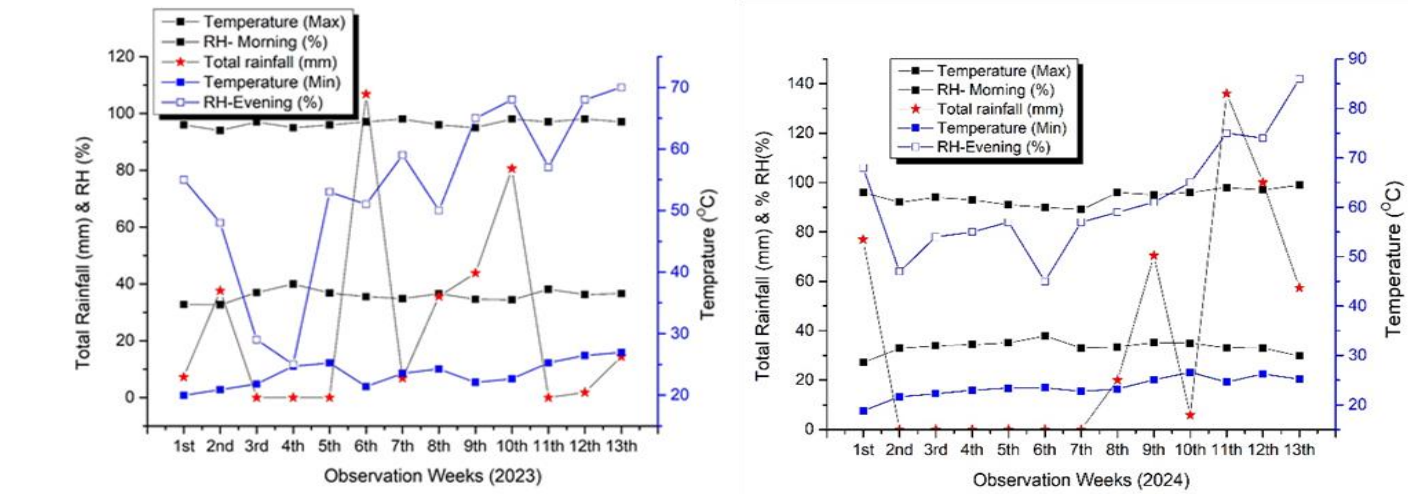

Figure 2. Weather conditions during the crop growing seasons (2023 &2024).

Table 2. Plant and leaf injury (%) caused by S. litura on different Jute varieties at BJRI, Faridpur during 2024

Date of Observation	BJRI tosa pat 8		BJRI tosa pat 9		JRO-524	
	Plant	*Leaf*	*Plant*	*Leaf*	*Plant*	*Leaf*
26.03.24 (1st)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
02.04.24 (2nd)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
09.04.24 (3rd)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
16.04.24 (4th)	6.80 (2.7)	2.90 (1.84)	5.76 (2.50)	3.27 (1.94)	4.94 (2.33)	2.24 (1.66)
23.04.24 (5th)	9.34 (3.14)	7.82 (2.88)	8.94 (3.07)	4.38 (2.21)	10.72 (3.35)	5.03 (2.35)
30.04.24 (6th)	12.86 (3.66)	10.36 (3.30)	12.17 (3.56)	5.58 (2.47)	14.47 (3.87)	10.88 (3.37)
07.05.24 (7th)	11.14 (3.41)	10.12 (3.26)	12.06 (3.54)	4.88 (2.32)	13.92 (3.80)	7.79 (2.88)
14.05.24 (8th)	5.62 (2.27)	6.63 (2.67)	6.84 (2.71)	3.56 (2.01)	8.34 (2.97)	6.26 (2.60)
21.05.24 (9th)	2.23 (1.65)	2.44 (1.71)	2.73 (1.80)	1.14 (1.28)	3.39 (1.97)	2.34 (1.69)
28.05.24 (10th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
04.06.24 (11th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
11.06.24 (12th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
18.06.24 (13th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
25.06.24 (14th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
02.07.24 (15th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
09.07.24 (16th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
16.07.24 (17th)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)	0 (0.71)
SEM ±CD	2.05	1.89	2.56	2.33	2.64	2.98
p value	0.062	0.087	0.056	0.059	0.071	0.064

Figure in parenthesis are $(x+0.5)^{1/2}$ transformed values

Table 3. Correlation of pest incidence with weather parameters in different jute varieties during crop season 2023.

Weeks	*Incidence of S. litura (%)*			*Metrological factors*				
	BJRI tosa pat 8	*BJRI tosa pat 9*	*JRO-524*	Temperature^{0}C		*RH (%)*		*Total rainfall (mm)*
				Max	*Min*	*Morning*	*Evening*	
1st	0 (0.71)	0 (0.71)	0 (0.71)	32.74	19.99	96	55	7.2
2nd	0 (0.71)	0 (0.71)	0 (0.71)	32.64	20.91	94	48	37.6
3rd	2.23 (1.65)	2.24(1.66)	4.08(2.14)	36.97	21.8	97	29	0
4th	4.45 (2.22)	4.63(2.26)	4.45(2.22)	39.89	24.7	95	25	0
5th	8.83 (3.05)	7.81(2.88)	8.87(3.06)	36.79	25.23	96	53	0
6th	9.34 (3.14)	9.04(3.09)	10.82(3.36)	35.5	21.4	97	51	106.8
7th	2.23 (1.65)	3.09(1.89)	2.23(1.65)	34.77	23.54	98	59	6.8
8th	2.43 (1.71)	2.42(1.71)	2.56(1.75)	36.57	24.24	96	50	35.6
9th	0.24 (0.86)	0.48(0.99)	1.23(1.32)	34.6	22.09	95	65	43.8
10th	0 (0.71)	0 (0.71)	0 (0.71)	34.4	22.65	98	68	80.6
11th	0 (0.71)	0 (0.71)	0 (0.71)	38.07	25.25	97	57	0
12th	0 (0.71)	0 (0.71)	0 (0.71)	36.24	26.45	98	68	1.8
13th	0 (0.71)	0 (0.71)	0 (0.71)	36.59	26.94	97	70	14.4
BJRI tosa pat 8: Correlation coefficient (r)=				0.318	-0.006	-0.047	-0.374	0.251
BJRI tosa pat 9: Correlation coefficient (r)=				0.313	-0.022	-0.029	-0.393	0.255
JRO-524: Correlation coefficient (r)=				0.294	-0.083	-0.039	-0.411	0.293

*Significant at 0.05 level; figures in parentheses are (x + 0.5) ½ transformed values

Relationship of *S. litura* with meteorological factors

Correlation studies were made to establish the relationship between pests' incidence and meteorological factors such as maximum and minimum temperature, morning and afternoon RH and total rainfall (Figure 2). Weekly mean of these factors were correlated with the percentage of plant infestation of various pests

Table 4. Correlation of pest incidence with weather parameters in different jute varieties during crop season 2024

Weeks	*Incidence of S. litura (%)*			*Metrological factors*				
	BJRI tosa pat 8	*BJRI tosa pat 9*	*JRO-524*	Temperature^{0}C		*RH (%)*		*Total rainfall (mm)*
				Max	*Min*	*Morning*	*Evening*	
1st	0 (0.71)	0 (0.71)	0 (0.71)	27.15	18.82	96	68	77
2nd	0 (0.71)	0 (0.71)	0 (0.71)	32.9	21.63	92	47	0
3rd	0 (0.71)	0 (0.71)	0 (0.71)	33.96	22.26	94	54	0
4th	6.8 (2.7)	5.76 (2.50)	4.94 (2.33)	34.37	22.98	93	55	0
5th	9.34 (3.14)	8.94 (3.07)	10.72 (3.35)	35.06	23.40	91	57	0
6th	12.86 (3.66)	12.17 (3.56)	14.47 (3.87)	37.93	23.47	90	45	0
7th	11.14 (3.41)	12.06 (3.54)	13.92 (3.80)	33.00	22.75	89	57	0
8th	5.62 (2.27)	6.84 (2.71)	8.34 (2.97)	33.47	23.2	96	59	20.00
9th	2.23 (1.65)	2.73 (1.80)	3.39 (1.97)	35.17	25.09	95	61	70.40
10th	0 (0.71)	0 (0.71)	0 (0.71)	34.99	26.6	96	65	5.9
11th	0 (0.71)	0 (0.71)	0 (0.71)	33.12	24.63	98	75	136
12th	0 (0.71)	0 (0.71)	0 (0.71)	33.03	26.24	97	74	100
13th	0 (0.71)	0 (0.71)	0 (0.71)	29.77	25.22	99	86	57.4
BJRI tosa pat 8: Correlation coefficient (r)=				0.531*	-0.118	-0.789*	-0.556*	-0.533*
BJRI tosa pat 9: Correlation coefficient (r)=				0.505*	-0.116	-0.774*	-0.541*	-0.519*
JRO-524: Correlation coefficient (r)=				0.514*	-0.107	-0.763*	-0.531*	-0.512*

*Significant at 0.05 level; figures in parentheses are (x + 0.5) ½ transformed value

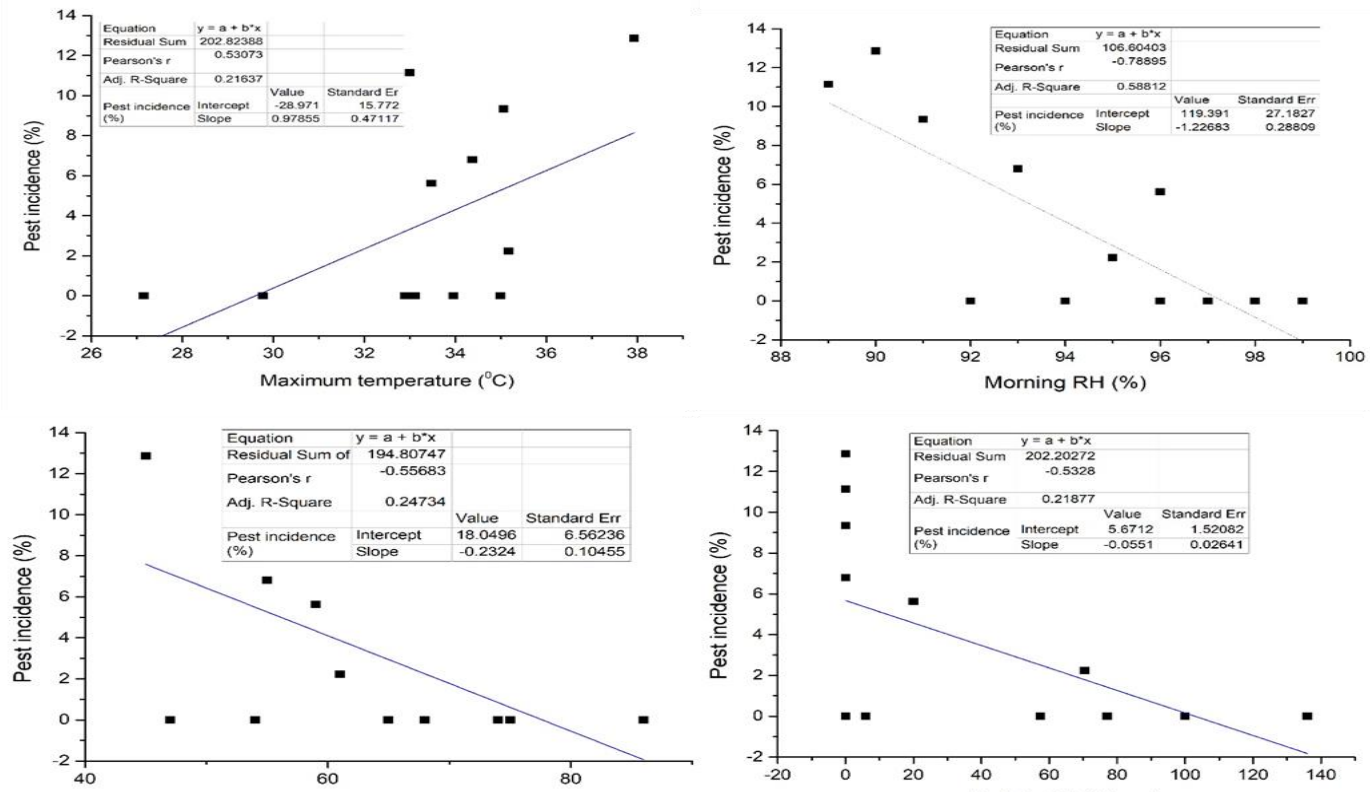

Figure 3. Relationships between *S. litura* incidence and weather conditions in BJRI tosa pat 8

recorded during the corresponding week. Table 3 showed correlation of the major pests' incidence with the weather factors during 2023. The results revealed that incidence of common cutworm (*S. litura*) was positive correlated with the maximum temperature (r = 0.328, 0.313 and 0.294) and total rainfall (r = 0.251, 0.255, 0.293) in all experimental jute varieties but had negative association with minimum temperature, morning and evening RH (%).

Table 4 represented correlation of the major pests' incidence with the weather factors in 2023. The results revealed that incidence of common cutworm (*S. litura*) was significantly positive correlated with the maximum temperature (r = 0.531, 0.505 and 0.514) in all experimental jute varieties but had significantly negative association with total rainfall and morning and evening RH (%). Minimum temperature showed negative association (Table 4).

Discussions

Spodoptera litura is a highly polyphagous and destructive insect pest, damaging economically important crops like tobacco (*Nicotiana tabacum* L.), castor (*Ricinus communis* L.), cotton (*Gossypium* sp. L.), soybean (*Glycine max* L.) and groundnut (*Arachis hypogea* L.) including jute crop throughout the tropical and temperate Asia, Australia and the Pacific Islands (Thakur *et al.* 2017). It sporadically assumes destructive nature in the early sown jute crop where its activity is confined to seedling or young jute plants. Occurrence is more prevalent in jute seed crop, active throughout the crop growth stages (Thakur *et al.* 2017). In this study, *S. litura* was more active in last week of April to first week of May in tosa jute varieties when the plant age was 40 to 50 days (Photo 1 & 2).

Devastating outbreaks of common cutworm have been common in Bangladesh (Alam and Dutta 2011). Outbreaks of common cutworm were recorded in mustard at Chalan Bill area of Natore, Sirajgong and Sunamganj districts in Bangladesh during the winter seasons of 2007–08 (Alam *et al.* 2010). During the same period similar outbreaks were also recorded from some other crops (e.g., okra, aroids, summer tomato, and grass pea). In the last few years the pest status of *S. litura* in terms of regularity of occurrence and the extent of damage in jute have enhanced in India (Thakur *et al.* 2017). In our present study, the incidence of this pest is increasing. In 2023, the plant infestation was 0.24 to 10.82 (Table 1) and it was 2.23 to 14.47 in 2024 (Table 2).

With a changing climate, there is the potential for *S. litura* to become an increasingly severe pest in certain regions due to increased habitat suitability (Fand *et al.* 2015). Reproductive biology of an insect may be affected both positively and negatively. Temperature has strong influence on the development, reproduction and survival of insect pests and as a result it is likely that these organisms will be affected by any change in climate (Bale *et al*. 2012). Being poikilothermic organism, the developmental rate in insects is highly contingent on external temperature conditions. Hence, temperature is generally considered the single most significant environmental factor influencing behavior, distribution, development, survival and reproduction in insects (Bale *et al*. 2012).

It was evident from correlation studies that climatic factors particularly temperature, RH and rainfall played a significant role on occurrence and incidence of *S. litura* on jute. The maximum temperature during the crop growing season reduced pest incidence but the minimum temperature provided congenial conditions for the *S. litura* in jute (Figure 3). Likewise, morning and evening RH were found to have stimulating effect on the incidence of this pest. It is of the utmost importance to have knowledge on

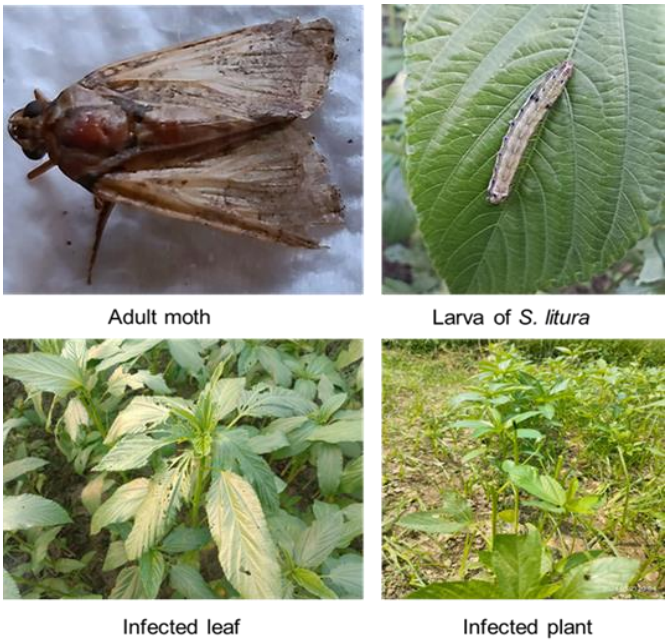

Photo 1. Infected leaf and plant by *S. latura*

Photo 2. Captured adult *S. latura* by pheromone trap

the temperature-dependent population and growth capacity of this pest in order to comprehend the dynamics of their population and to apply pest management tactics that are particular to agroecoregions. This is especially true in the context of the anticipated changes in the current global climate.

Conclusions

A number of plants, including cabbage, cauliflower, mustard, maize, aroid, and other vegetables are the most commonly affected by *Spodoptera litura* in our country. It has recently been discovered that this pest is present in jute and other fiber crops.

However, it has not been able to be regarded as the most significant jute pest. Within the scope of this investigation, it was discovered that the prevalence of this pest in jute crops is growing at an alarming rate. Consequently, in the not too distant future, jute crops might be one of the primary host plants.

Conflict of interest

The authors affirm that they have no financial or other conflicts of interest that could affect their decision to publish this work.

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