Bioecology and management of a Generalist Semilooper, *Anomis sabulifera*, Guenée 1852 (Lepidoptera: Erebidae): a review

Naznin Kamar[1, 2], Neha Chowdhury[2], Bratatee Sardar[2], Biplob Kumar Modak[3] and Nayan Roy[4*]

[1] Department of Zoology, Bolpur College, Birbhum, West Bengal, India

[2] Research Scholar, Ecology Research Unit, Department of Zoology, M. U. C. Women's College, Burdwan, West Bengal, India

[3] Department of Zoology, Sidho Kanho Birsha University, Purulia, West Bengal, India

[4] Ecology Research Unit, Department of Zoology, M. U. C. Women's College, Burdwan, West Bengal, India

Correspondence Author: Nayan Roy

Received 14 May 2025; Accepted 4 Jul 2025; Published 17 July 2025

DOI: https://doi.org/10.64171/JAE.5.3.14-23

Abstract

The generalist semilooper pest, *Anomis sabulifera*, Guenée 1852 (Lepidoptera: Erebidae) is one of the major pests of different economic crops throughout the world. Basic information on insect pest population growth is necessary before deciding any strategy to combat with the pest. Bioecology and population growth of *A. sabulifera* on different economic crops and several management strategies were studied for more than seven decades. Host preference of the generalist semilooper, *A. sabulifera* represent a clear correlation with their population growth and developmental pattern. It also provides information about the vulnerability of developmental stages of *A. sabulifera* on their host crops. Several management strategies mainly based on chemical pesticides, botanicals, biological as well as few biorationals were mentioned throughout more than 75 years. This review will also inform about the susceptibility and or severity of host cultivars towards *A. sabulifera* for their judicious management by using trap cropping system with higher production to promote IPM on their host crops. Now it is imperative to study the bioecology and alternative management of *A. sabulifera* on different crops to project population build-ups and predict pest outbreaks to formulate proper IPM tactics against this notorious pest, *A. sabulifera* for their sustainable management.

Keywords: Population growth, *Anomis sabulifera*, Trap crop, Management, IPM

Introduction

The human population is expected to rise until the latter half of this century, and to meet the global demands agricultural productions are required to be doubled by 2050. Numerous studies have recommended enhancing crop yield over clearing more land surface for crop production (Sarkar *et al*., 2018) [66]. Insect pests are one of the major constraints in limiting yield potential of different economic crops throughout the world (Schowalter, 2006) [67]. Worldwide, several crops are attacked by ecologically similar complexes of insect pests and their natural enemies in their production field (Ferino *et al*. 1982; Lal and Singh, 2019) [22, 36]. Among the pest complex, *jute semilooper, Anomis sabulifera* (Guenée 1852) [Lepidoptera: Erebidae] is the most destructive holo-metabolic insect pest in the South East Asian countries (Hath and Basak, 2000; Babu *et al*., 2021) [26, 1]. It's wide host range supports uninterrupted succession of generations. Generally, crop leaves are damaged by this pest and plant growth is adversely affected, resulting in a considerable reduction in the crop yield. The life-cycle of the jute semilooper, *A. sabulifera*, is completed within 28-34 days (Ferino *et al*. 1982; Senapati and Ghosh, 1991) [22, 68]. They completed their life cycle through four metamorphic stages and several generations are completed in a year (Sheikh, 2012) [69]. The larvae camouflage but are easily noticed when they crawl by producing a loop in the middle. For management several strategies like, hand removal of the larvae, ploughing the infested fields after harvest to kill the pupae, dislodge the caterpillars by drawing a rope across the young crop and spraying endosulfan 35 EC or phosalone 35 EC at first appearance of the pest, etc (Rao and Patel, 1973; Santos *et al*., 2012) [51, 64]. Use plant-derived products or commercial products that contain *Bacillus thuringiensis* can be used against their young larvae (Rahaman and Khan, 2010) [50]. Their natutal enemies include tachinid flies and parasitoids, like *Litomastix gopimobani* (Encyrtidae), *Tricholyga sorbillans* and *Sisyropa formosa* (Tachinidae) and few entomogenous fungi for biocontrol of the pest (Sadat and Chakraborty 2019) [61]. But unfortunately, most of the time management of the notorious pest, *A. sabulifera* is conducted by applying broad-spectrum synthetic pesticides (Carvalho, 2017) [5]. These result into secondary pest outbreak, pest resurgence and development of pesticide resistance (Kim *et al*., 2017) [34].

The basic information on bio-ecology of an insect pest is necessary before deciding any strategy to combat with the pest (Chen *et al*., 2017) [12]. Host plant quality influences larval growth and development of insect pests which are the key determinant of their adult longevity, fertility, fecundity and survivability (Genc and Nation, 2004) [24]. Host primary metabolites (PMs) are used only for general vitality, growth and reproduction of the herbivores (Dicke, 2000) [19]. Whereas, most of the secondary metabolites (SMs) have defensive role (War *et al*., 2012) [81]. Morphological and chemical characters of plant surface waxes also serve an important role in insect–plant interactions (Jetter *et al*., 2000; Mobarak *et al*., 2020) [28, 42]. Even, environmental factors always influence the growth, reproduction, longevity and survival of that population (Schowalter, 2006) [67]. Life table is a powerful tool for analysing and understanding the effect of different hosts for their management (Kakde *et al*., 2014) [29]. Thus, bioecology and population dynamics of the pests are very crucial for their sustainable management (Southwood and Henderson, 2000) [73]. In other instances, trap cropping is an attractive remedy for biological control by natural enemies over artificial bio-control or other conventional means of pest control through vegetative diversification (Midega *et al*., 2011; Gurr *et al*., 2017) [40, 25]. Considerable research has been conducted on different trap crops to develop improved pest management strategies for substantial reduction in pesticides uses throughout the world (Holden *et al*., 2012; Srinivasan *et al*., 2008) [27, 74]. Thus, objectives of the present review were to (i) find out the bioecology and host preference of *A. sabulifera*, (ii) unfold the impact of different host plants on their growth, (iii) find different management strategies of the pest and (iv) suggest new strategy for IPM of *A. sabulifera* in the field.

Review in detail

The bioecology and management of the notorious pest, *Anomis sabulifera* (Gn.), was studied for more than 75 years (1954-2025). Taxonomy, distribution and biology of the jute semilooper, *A. sabulifera*, is represented in the table 1-2 and figure 1. Whereas, the damage potential and host range of *A. sabulifera* is presented in table 3. The existing management strategies of *A. sabulifera* is also represented in table 4 with proper citation of existing research till date. Most of the important studies are included in this detail review through literature survey and mentioned bellow accordingly and chronologically:

- Routine dusting with 5 per cent. BHC did not provide adequate control of *Anomis sabulifera* (Gn.) on jute in West Bengal, and BHC and other organic insecticides were therefore compared at various rates (Banerjee, 1954) [4].
- *Bacillus thuringiensis* is effective in sprays against larvae of *A. sabulifera* on jute (*Corchorus olitorius*) in India (Chatterjee, 1965) [9].
- The LC50's were determined for the larvae of *A. sabulifera* (Gn.), a pest of jute (*C. capsularis* and *C. olitorius*), as endosulfan 9.5, endrin 3.8, parathion 2.22, aldrin 1.77 and γ BHC (lindane) l.34 times as toxic as DDT and that dieldrin, BHC and dichlorvos were rather less toxic than DDT (Tripathi, 1967) [79].
- *A. sabulifera* is one of the major pests of jute (*C. capsularis* and *C. olitörius*) in East Pakistan, and causes the heaviest damage to the apical leaves and buds of plants grown within three miles of a river. Emulsion concentrates of 25% bromophoïs and 57% malathion, also applied at 12 or 16 oz per acre, were too slow in action, the first giving 48-57.5% and the second 77-81.5% mortality after 144 hours (Khan and Ahmad, 1967) [32].
- Investigations were made to determine the efficiency of 2 rates of each of 4 insecticides for control of jute semi-looper (*Cosmophila sabulifera* [*A. sabulifera*]). Sevin at 20.4 oz/ ac and Lebaycide at 6 oz/ac resulted in 100% mortality within 24 and 144 h, respectively; malathion and Nexion were less effective (Khan and Ahmad 1968) [33].
- *A. sabulifera* is a serious pest of the top leaves of jute (*C. capsularis* and *C. olitorius*) in eastern districts of Uttar Pradesh. The sprays of 0.03% endosulfan (Thiodan), tetrachlorvinphos (Gardona), phosphamidon (Dimecron), dichlorvos (Nuvan) and monocrotophos (Azodrin) were applied at 1135 litres/ha. Population samples taken before and 72 h after treatment indicated that the first two compounds were significantly more effective than the rest (Srivastava, 1972) [75].
- Damage caused to jute (*C. capsularis* and *C. olitorius*) by larvae of *A. sabulifera* is described. Regeneration and losses in yield following an attack were investigated in *C. olitorius* in the laboratory in India in 1968-69. Groups of three larvae were confined for about 48 h (until the growing apical buds and leaves around them were eaten completely) on potted plants once, twice or thrice, starting at 40, 50 or 60 days and continuing up to 90 days after sowing (Tripathi and Ram, 1972) [78].
- Field trials were conducted against the major pests of jute from 1972 to 74. Endrin, endosulfan, phosalone, fenitrothion, carbaryl + molasses and fenitrothion + malathion had been applied five times at 15-day intervals against *A. sabulifera.* Endosulfan 0.075% a.i. proved superior to all other treatments. (Das and Singh, 1977) [16].
- Field-plot tests in Barrackpore, India, in 1965-74 showed that outbreaks of the major jute pests *A. sabulifera* could be attributed to the prevailing weather conditions. The bright sunshine during the day favored *Anomis*' attack (Chatterji *et al*., 1978) [11].
- The damage caused by larvae of *A. sabulifera* to the pods of jute in India is described in detail, since previous records of damage related mainly to the leaves in June-October. In September and October 1976, larvae of *A. sabulifera* were observed causing differing injuries to the pods and seeds of *C. capsularis* and *C. olitorius* in West Bengal. In tests based on percentage pod damage of 15 promising varieties, *C. capsularis* varieties were less susceptible than *C. olitorius* varieties (Sing and Das, 1979) [71].
- The relative effectiveness of insecticide sprays applied at high, low and ultra-low volume against *A. sabulifera* on jute was investigated during field tests in 1972-74 in West Bengal, India; the spray material used was a mixture of endrin (at 750 ml/ha) and endosulfan (at 285 ml/ha), applied 5 times at intervals of 15 days in 500, 50 and 5 litres of water/ha, respectively, and were found equally effective against the pests (Das *et al*., 1979) [15].
- A nuclear polyhedrosis virus of the jute pest *A. sabulifera* was identified for the first time from diseased larvae collected from jute fields in Maharashtra, India. The observed symptoms were similar to those of nuclear polyhedrosis virus infections in other Lepidopteran insects (Bakwad and Pawar, 1981) [3].

- During a laboratory study in India, 8 insecticides (carbaryl, formothion, monocrotophos, quinalphos, chlorfenvinphos, thiometon, oxydemeton-methyl and dimethoate) were tested against final-instar larvae of the jute pest *A. sabulifera*. Based on the LC50s, carbaryl was about 5.2276 times, formothion 2.4545 times, monocrotophos 2.4341 times, quinalphos 2.2463 times and chlorfenvinphos 2.0520 times as toxic as thiometon, while the remaining compounds were less toxic (Chatterji and Das, 1983) [10].
- Observations made in the laboratory in India on the life-history of *A. sabulifera* on jute are described. The egg stage averaged 2 days, the larval stage (consisting of 5 instars) 15.94 days and the pupal stage 5.75 days (Gaikwad and Pawar, 1983) [23].
- *A. sabulifera* is a major pest of the leaves of jute in India. The effects of topical application of hydroprene at 1, 10 or 100 µg/larva on larval food intake were studied in the laboratory in West Bengal. In treated larvae, the rate of consumption was initially lower, but increased after 48-96 h. Treatment with 1 µg/larva thus extended the feeding period by 24 h and treatment with 10 or 100 µg by 48 h. It is suggested that the initial decline in food consumption is caused by the toxic effects of hydroprene that are eventually counteracted by a detoxification mechanism permitting increased food intake and accumulation of reserves for the pupal stage (Samui *et al*., 1984) [63].
- The effects of different amino acids on the growth of the entomopathogenic fungus *Beauveria bassiana* on soyabean grits and its pathogenicity to insect pests of jute, roselle and kenaf collected in the field in West Bengal, India were investigated. The noctuid *A. sabulifera* had 68 % mortality 7 days after inoculation with spores of *B. bassiana* (Pandit and Som, 1988) [44].
- Methanol extracts of *Ocimum sanctum* at 0.5, 1, 2, 5 and 10% were tested for their effects on *Anomis sabulifera*. The 2 highest concentrations completely suppressed feeding by the larvae for 24 h, while 2% was highly effective in this respect for 48 h and 1% for 24 h. (Mallick and Banerjee, 1989) [39].
- Jute variety JRO 524 was sown in West Bengal in 1988 and given 3 treatments with 0.075% a.i. endosulfan. The insecticide successfully controlled *Apion corchori, Polyphagotarsonemus latus* and *Anomis sabulifera*. The initial endosulfan residue in the leaves after the 3rd spray was 6.891 ppm, which was reduced to 0.027, 0.012 and 0.004 ppm by 6, 10 and 15 days after the 3rd spray, respectively (Das *et al*., 1990) [13].
- On jute (*C. capsularis*) in the laboratory at 23.5-31°C and 67-90% RH, the egg, larval, female pupal and male pupal periods, and adult female and male lifespans of *A. sabulifera* were 2.0-2.5, 12-15, 5.0-5.5, 4.25-5.5, 5.5-6.5 and 4.25-5.0 days, resp. The eggs were laid singly, and the fecundity was 28-247 eggs/female. Larval head-capsule widths followed Dyar's rule (Senapati and Ghosh, 1991) [68].
- The morphology and reproduction of and damage by *A. sabulifera* on jute in India are described. Two sprays of 0.06% endosulfan (Endosulfan 35 EC) were applied, the first at 45 days after sowing and the 2nd 15 days later. A maximum of 3 sprays per year is recommended (Upadhyaya, 1992) [80].
- Ten *C. olitorius* and five *C. capsularis* varieties were screened against jute semilooper (*A. sabulifera*), yellow mite (*Polyphagotarsonemus latus*) and stem-weevil (*Apion corchori*). Three *C. olitorius* varieties (JRO 524, JRO 3690 and JRO S-19) were the least susceptible to yellow mite, jute semilooper and stem-weevil, respectively. Among the *C. capsularis* varieties, JRC 4444 was the least susceptible to semilooper (Das and Pathak, 1999) [14].
- A plot sampling technique for the estimation of the incidence of jute semilooper was determined in the 1997 jute season in a specially designed concentric square of 4.5×4.5 m, using the capsularis jute variety, JRC 321 (Hath and Basak, 2000) [26].
- Field experiments were conducted in India, in a specially arranged square plot (4.5×4.5) with 7 concentric squares at 30 cm row to row spacing during the 1999/2000, 2000/01 and 2001/02 kharif seasons on *C. capsularis* cv. UPC-94 and during the 2001/02, 2002/03 and 2003/04 kharif seasons on *C. olitorius* cv. JRO-524 to standardize plot sampling techniques for the estimation of semilooper (*A. sabulifera*) incidence (Prasad *et al*., 2004) [46].
- Bioefficacy of *B. thuringiensis* var. *kurstaki* (*Btk*-55000 SU mg-1) at 0.1% azadirachtin-1500 ppm at 0.3% and avermectin-1.8%w/v at 0.1% were studied in various combinations against *A. sabulifera* infesting jute during 1999-2000 (Chatterji, 2006) [8].
- The field experiments have been conducted on 'JRO-524' *C. olitorius* jute to find out the most effective integrated pest management practices against diseases and insect pests during crop seasons 2003-04,2004-05 and 2005-06 at Bahraich. The average incidence of semilooper, stem weevil, ash weevil and yellow mite was significantly lower in comparison to farmers' practice and untreated control (Prasad *et al*., 2007) [45].
- Field trials were conducted with six treatments against the pest complex of *C. olitorius* jute var. JRO-524 during 2004 and 2005 at Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India. The results revealed that the incidence of *A. sabulifera* was found to cause a minimum of 6.10% plant infestation (Rahman and Khan, 2010) [50].
- An experiment on jute crop was conducted during pre-*kharif* to *kharif* seasons (April to August) at Bidhan Chandra Krishi Viswavidyalaya (BCKV), West Bengal, India, with a view of recording the pest incidence on *C. olitorius* jute and to determine the weather parameters impacting on pest population in jute under West Bengal conditions. Seventeen different species of pests belonging to insects, mites and nematodes were found feeding on jute. Among them, jute semilooper (*A. sabulifera* was causing economic damage to the crop along with other pests (Rahman and Khan, 2011) [49].

- Among the pesticides evaluated against the jute pests under field conditions, endosulfan 35 EC at 350 g a.i./ha was found to be the most effective insecticide for controlling semilooper, Bihar hairy caterpillar and myllocerus weevil. Furthermore, almost similar efficacy of neemazal and chlorpyriphos was found against the pest complex of jute based on BCR; neemazal could be a choice over chlorpyriphos (Rahman and Khan, 2012a) [48].
- This study was conducted to understand the effect of plant characteristics on the incidence of pests on the most popular jute varieties, viz. JRO-524, JRO-632, JRO-878, JRO-7835 of *C. olitorius* jute and JRC-212, JRC-321, JRC-4444, JRC-7447 of capsularis jute. Correlation studies of plant characteristics with pest incidence in jute revealed that the basal girth of the plant exhibited a positive significant relationship with the incidence of *A. corchori* but not with other pests such as jute semilooper *A. sabulifera* (Rahman and Khan, 2012b) [47].
- Several common parasitoid species – *Elasmus flabellatus* (Fonscolombe), *E. nudus* (Nees) and *E. viridiceps* Thomson (Hymenoptera: Eulophidae), with potential as biological control agents for invasive tropical noctuids, like *A. flava* (Fabricius), *A. sabulifera, Earias vittella* (Fabricius), *E. biplaga* Walker, and *E. cupreoviridis* (Walker) are detected in Israel (Kravchenko *et al*., 2014) [35].
- India is one of the world's largest jute-producing countries. Insect pests are one of the main constraints for underscoring jute production. The current review is an engrossing view on the processes of effective management of major insect pests of jute by biological agents under modern IPM Practices (Sadat and Chakraborty, 2015) [60].
- Observation from Uttar Dinajpur, West Bengal, had shown that there was a significant positive correlation between the feeding option of jute semilooper, *A. sabulifera* and laminar distribution of jute (*C. olitorius*) leaf chlorophyll throughout the jute plant growth period. Distribution of chlorophyll along transects of jute leaf was observed in relation to insect herbivory (Sadat and Chakraborty, 2017) [62].
- Investigation showed that the life cycle of *A. sabulifeara* varied from 28-34 days in the field, while it was quite regular in laboratory conditions. Four generations of the pest were observed during the study period with different degrees of incidence. The 3rd generation pest population was found to be the most devastating to the host crop, with the highest infestation (1.65 larvae/leaf) (Sadat and Chakraborty, 2019) [61].
- The morphological and phytochemical defensive strategy of jute against *A. sabulifera* was determined. *C. olitorius* had no morphological defensive strategy against *A. sabulifera,* although it has evolved phytochemical mechanisms to protect itself from pest attack (Sadat *et al*., 2019) [59].
- Different species of pests belonging to insects, mites and nematodes were found feeding on jute. Among them, the jute Semilooper (*A. sabulifera*), Bihar hairy caterpillar (*S. obliqua*) and the yellow mite (*P. emuslatus*), are causing economic damage to the jute crops. Eleven jute varieties were selected to conduct varietal preference tests against the major pest of jute under field conditions. Among the eleven varieties, JRO-524 was found to be moderately resistant against the Semilooper (*A. sabulifera*) (Timsina and Karki, 2019) [77].
- Jute semilooper, *A. sabulifera*, is an important lepidopteran insect pest infesting jute and causing damage by defoliation. Epizootic caused by a nucleopolyhedrovirus (NPV) was observed in the jute field infested with *S. obliqua* and *A. sabulifera* during a routine survey in farmers' fields. Thus, spray application of both *Spob*NPV and *As*NPV can be used as biocontrol agents in the Integrated Pest Management of lepidopteran insect pests infesting jute (Babu *et al*., 2020) [2].
- A new IPM module consisting of cultural, chemical and biological components was tested against stem rot caused by *Macrophomina phaseolina* and yellow mite, semilooper, hairy caterpillar, apion and indigo caterpillar of jute (*C. olitorius*) crop during 2015-20 in the North 24 Parganas district of West Bengal. IPM treatment with all components compared to 20% in actual practice. Similarly, yellow mite was reduced to 0.8%, semilooper to 0.4%, indigo caterpillar to 1%, apion to 0.7%, hairy caterpillar to 0.6% using IPM compared to 4-8% in farmers' practice (De *et al*., 2021) [18].
- Identification and characterization of female released sex pheromone components of jute semilooper, *A. sabulifera,* from female pheromone gland extracts have been conducted. GC-MS profile of female pheromone gland extract revealed that the GC-EAD active region constituted (6Z,9Z)-heneicosadiene, (3Z,6Z,9Z)- heneicosatriene as active compounds. Preliminary wind tunnel studies on olfactory and behavioural responses showed a blend of (6Z,9Z)- heneicosadiene (3 parts) + (3Z,6Z,9Z)-heneicosatriene (1 part) enticed 60% male adults. (6Z,9Z)-heneicosadiene and (3Z,6Z,9Z)-heneicosatriene are likely to be active pheromone components present in female sex pheromone glands. Blending of these two compounds in a precise ratio can enhance the effective (Babu *et al*., 2021) [1].
- Jute and associated fibre (JAF) crops hold a special place in the Indian economy since they are recyclable and eco-friendly natural fibers. In this article, the information on major pests of JAF and its management is updated (Das *et al*., 2022) [17].
- Two semiloopers, *A. sabulifera* and *A. flava,* are the major pests of different economic crops throughout Southeast Asian countries. The stage-specific life table and population growth of *A. sabulifera* and *A. flava* on four Malvaceous crops, such as white jute (*C. capsularis*), kenaf (*Hibiscus cannabinus*), tree cotton (*Gossypium arboretum*) and okra (*Abelmoschus esculentus*), were observed. The population dynamics of *A. sabulifera* and *A. flava* were significantly affected by the hosts' phytochemicals in terms of host suitability or susceptibility (white jute > Kenf > okra > tree cotton) (Kamar *et al*., 2025) [30].

Table 1: Recorded names and taxonomy of *Anomis sabulifera*, Guenée 1852 (Sadat and Chakraborty 2017, 2019) [61,62]

Scientific name- *Anomis sabulifera*, Guenée 1852 **Common names**- Jute semilooper **Paleotropical distribution:** Widespread in the African and Indo-Malaysian regions, in the Palearctic locale in Morocco and Afghanistan. A single record was found from Britain. **India:** It is the most serious pest in West Bengal, Assam, Orissa and Uttar Pradesh. **Predator:** *Dolichogenidea hyposidrae* was the most prevalent parasitoid of semilooper larvae.	**Taxonomy:** Domain: Eukaryota Kingdom: Metazoa Phylum: Arthropoda Subphylum: Uniramia Class: Insecta Order: Lepidoptera Superfamily: Gelechioidea Family: Erebidae Genus: *Anomis* Species: *A. sabulifera*

Table 2: Biology of *Anomis sabulifera*, Guenée 1852 (Sadat and Chakraborty 2017, 2019) (61,62)

Life stages	Descriptions	Developmental Duration (days)
Egg	Minute, pale creme coloured	2-3
1st instar larva	Minute, Pale crème yellow colored translucent with apical black spot	3-4
2nd instar larva	Pale greenish yellow coloured translucent appearance with black head	3-4.5
3rd Instar larva	Greenish coloured without any black spot or stripe	2-3
4th instar larva	Dark green in colour	2.5-3.5
5th instar larva	Dark green in colour	4.5-5.5
Pupa	Shiny, dark brown in colour with conical abdomen	7-8
Adult Female	Deep grey in colour with pale margin on the forewing and with conical blunt abdominal tip	6-8
Adult Male	Deep grey in colour with pale margin on the forewing and with pointed abdominal tip	5-7

Table 3: Bioecology of *Anomis sabulifera* Guenée (1852) on different Host crops

Pest (Order/Family) Lepidoptera Erebidae	Host (Family) Malvaceae	Life Stages	References
Anomis.sabulifera	Jute, *Corchorus olitorius* L.	Egg, Larva, Pupa, Adult	Chatterjee (1965) [9]
A.sabulifera	Jute, *C. capsularis* L. and *C. olitorius*	Egg, Larva, Pupa, Adult	Das and Singh (1977) [16]
A. sabulifera	Jute, *C. capsularis and C. olitorius*	Egg, Larva, Pupa, Adult	Sing and Das (1979) [71]
A. sabulifera	Jute, *C. capsularis*	Egg, Larva, Pupa, Adult	Bakwad and Pawar (1981) [3]
A. sabulifera	Jute, *C capsularis* and *C. olitorius*	Egg, Larva, Pupa, Adult	Pandit and Som (1988) [44]
A. sabulifera	Jute, *C. olitorius* and C. *capsularis*	Egg, Larva, Pupa, Adult	Das and Pathak (1999) [14]
A. sabulifera	Jute, *C. capsularis*	Egg, Larva, Pupa, Adult	Rahman and Khan (2012a) [48]
A. sabulifera	Jute, *C. olitorius* and *C. capsularis*	Egg, Larva, Pupa, Adult	Sadat and Chakraborty (2015) [60]
A. sabulifera	Jute, *C. olitorius*	Egg, Larva, Pupa, Adult	Sadat and Chakraborty (2017) [62]
A. sabulifera	Jute, *C. olitorius* and C. *capsularis*	Egg, Larva, Pupa, Adult	Roy *et al*. (2019) [53]
A. sabulifera	Jute, *C. olitorius*	Egg, Larva, Pupa, Adult	Timsina and Karki (2019) [77]
A. sabulifera	Jute, *C. olitorius*	Egg, Larva, Pupa, Adult	Sadat *et al*. (2019) [59]
A. sabulifera	Jute, *C. olitorius* and *C. capsularis*	Egg, Larva, Pupa, Adult	De *et al*. (2021) [18]
A. sabulifera	Jute, *C. olitorius*	Egg, Larva, Pupa, Adult	Babu *et al*. (2021) [1]
A. sabulifera	Jute, *C. olitorius*	Egg, Larva, Pupa, Adult	Das *et al*. (2022) [17]
A. sabulifera	Cotton, *Gossypium sp.*	Egg, Larva, Pupa, Adult	Dutta (1958) [20]
A. sabulifera	Cotton, *Gossypium sp.*	Egg, Larva, Pupa, Adult	Rahman and Khan (2010) [50]
A. sabulifera	Cotton, *Gossypium sp.*	Egg, Larva, Pupa, Adult	Yadav (2010) [84]
A. sabulifera	Cotton, *Gossypium sp.*	Egg, Larva, Pupa, Adult	Rahman and Khan (2011) [49]
A. sabulifera	Cotton, *Gossypium sp.*	Egg, Larva, Pupa, Adult	Rahman and Khan (2012b) [47]
A. sabulifera	Cotton, *Gossypium sp.*	Egg, Larva, Pupa, Adult	Sadat and Chakraborty (2019) [61]
A. sabulifera	Cotton, *Gossypium sp.*	Egg, Larva, Pupa, Adult	Babu *et al*. (2020) [2]

Table 4: Different management strategies of *Anomis sabulifera* Guenée (1852) for protection of crops

Pest	Control measures	Effects; LC_{50}/LD_{50} Mortality %	Stage effects	References
Anomis sabulifera	Folidol E 605	0.01%	Different stages	Dutta (1958) [20]
A.sabulifea	*Bacillus thuringiensis* Berliner		Larvae	Chatterjee (1965) [9]
A. sabulifera	Endrin, endosulfan, phosalone, fenitrothion, carbaryl + molasses and fenitrothion + malathion	Endosulfan 0.075%	Larvae	Das and Singh (1977) [16]
A. sabulifera			Larvae	Sing and Das (1979) [71]
A. sabulifera			Larvae	Bakwad and Pawar (1981) [3]
A. sabulifera	entomopathogenic fungus *Beauveria bassiana*	68% mortality after 7days with spores of *B.bassiana*	Adult	Pandit and Som (1988) [44]
A. sabulifera				Das and Pathak (1999) [14]
A. sabulifera	Endosulfan (0.07%), Carbaryl (0.1%) Cypermethrin (0.03%)			Mahapatra *et al*. (2009) [38]
A. sabulifera	Pesticides		Adult	Rahman and Khan (2010) [50]
A.sabulifera			Adult	Yadav (2010) [84]
A. sabulifera			Adult	Rahman and Khan (2011) [49]
A.sabulifera	Endosulfan 35 EC at 350 g a.i./ha	Most effective	Adult	Rahman and Khan (2012a) [47]
A. sabulifera				Rahman and Khan (2012b) [48]
A. sabulifera			Third generation	Sadat and Chakraborty K. (2019) [61]
A.sabulifera			Larvae	Sadat *et al*. (2019) [59]
A.sabulifera			Adult	Timsina and Karki (2019) [77]
A. sabulifera	SpobNPV and AsNPV. LC50 of AsNPV as 5.37 × 104 OBs/ml and 2.44 x 104 OBs/ml at 72 HAT	SpobNPV at the highest POB count @3.2 x106 OBs/ml AsNPV with POB		Babu *et al*. (2020) [2]
A. sabulifera	IPM strategies		Larvae	De *et al*. (2021) [18]

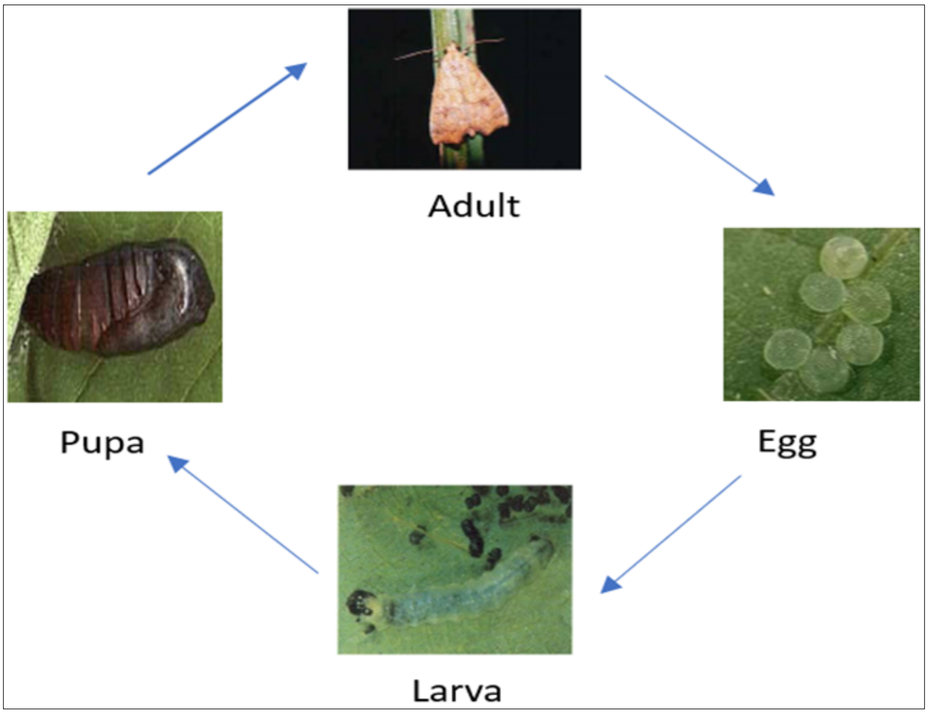

Fig 1: Life cycle of *Anomis sabulifera*, Guenée 1852

Discussions

Insect-plant interaction and interrelationship between these two is ecologically important and it evolved from a long run of evolutionary arm race. Insects always look for a true and healthy host plant for proper nutrition, oviposition for their neonates (Dicke, 2000) [19]. Whereas, plants have evolved a regulatory mechanism to maintain a balance between growth and defence responses (Wu and Baldwin 2009) [82]. Plant structural traits form the first physical barrier and the SMs form the next barrier against the herbivores (Mithofer *et al*., 2005)

[41]. Whereas, herbivore also use some volatiles and or non-volatile compounds for host finding and oviposition (Kessler and Baldwin, 2001; Roy, 2025) [31, 55]. Pest population growth is regulated by host phytoconstituents and both are highly dynamic in nature (Shobana *et al*., 2010, Roy and Barik, 2013) [70, 54]. The effect of different food sources on population growth were observed in *Diacrisia casignetum* (Roy, 2019) [57], *Spilosoma obliqua* (Mobarak *et al*., 2019) [43], *Spodoptera litura* (Xue *et al*., 2010) [83], *Helicoverpa armigera* (Liu *et al*., 2004) [37], *Plutella xylostella* (Sarfraz *et al*., 2007) [65], *Papilio polytes* (Shobana *et al*., 2010) [70], *Podontia quatuordecimpunctata* (Roy, 2015) [56], *Epilachna vigintioctopunctata* (Roy, 2017), *Leptocorisa acuta* (Dutta and Roy, 2016) [21] and many more separately on different host plants. The population parameters were also in good agreement with the findings on the generalist semilooper, *A. sabulifera* (Kamar *et al*., 2025) [30]. Modern agriculture includes integrated crop management (ICM) as well as integrated pest management (IPM) for ecofriendly, sustainable and smart agriculture (Subedi *et al*., 2019) [76]. Despite this, it also relies primarily on habitat manipulation through farm scaping, trap cropping and other biological control practices to avoid detrimental effects of chemical insecticides on the total environment (Holden *et al*., 2012) [27]. Different trap crops can release different volatiles which can attract and enhance the foraging efficacy of natural enemies in an agro-ecosystem (Rhino *et al*., 2016) [52]. Egg plants act as a trap crop and field corn as a barrier crop for management of *Bemisia argentifolii* on common bean (Smith and Mcsorley, 2000) [72]. Moreover, nectar and pollen producing plants as trap crop were inter-planted with broccoli to manage cabbage worm (*Pieris rapae*), diamondback moth (*P. xylostella*) and cabbage looper (*Trichoplusia ni*) in the field (Sarkar *et al*., 2018) [66]. This review will obviously support the use trap crop for sustainable production of main crop against the generalist semiloopers for their sustainable cultivation. Now it is imperative to study the bioecology and alternative management of *A. sabulifera* on different crops to predict pest outbreaks to formulate proper IPM tactics against this notorious pest, *A. sabulifera*, for their sustainable management in near future.

Conclusions

Pest populations can be effectively managed by manipulating the conditions that ensure survival of the pest in the field. Numerous studies have recommended use of resistant crop cultivars with protection measures against the notorious pest, *A. sabulifera*. Fitness is also influenced by the genetic traits specific to the population and abiotic factors like temperature and RH. Population parameters of this pest vary accordingly and different researchers obtained different results for even similar host systems. It is imperative to study the bioecology and alternative management of *A. sabulifera* on different crops to project population build-ups and predict pest outbreaks. Future researches can use this information to formulate proper IPM tactics against this notorious semilooper pest, *A. sabulifera*, for their sustainable management.

Statements and Declarations

Competing Interests: The authors declare that there is no competing interest other than publication of this paper.

Author's contributions: NK, NC, BS, BKM and NR designed the whole study including sample collection, chemical analysis, index calculation, data analysis and drafts the manuscript with the help of institutional support.

Disclosure: The author declares that there is no conflict of interest other than publication of this paper.

Acknowledgements

We wish to express our deep sense of gratitude to M.U.C. Women's College, Burdwan, West Bengal, India, for institutional support. We must acknowledge the farmers who help us in every way during our fieldwork.

References

1. Babu VR, Satpathy S, Reddy BVS. Identification and characterisation of female released sex pheromone components of jute semilooper, *Anomis sabulifera* Guenee (Lepidoptera: Noctuidae). J Environ Biol. 2021;42:254-64. https://doi.org/10.22438/jeb/42/2/mrn-1501.
2. Babu VR, Sivakumar G, Satpathy S, Gotyal BS. Isolation and characterization of baculoviruses from major lepidopteran insect pests infesting jute, *Corchorus olitorius* Linn. J Entomol Zool Stud. 2020;8(5):122-6.
3. Bakwad DG, Pawar VM. A new record of nuclear polyhedrosis virus (NPV) of jute semilooper, *Anomis sabulifera* (Guenee). Indian J Entomol. 1981;43(1):39-43.
4. Banerjee SN. Experiments on the control of jute pests in West Bengal. Indian J Entomol. 1954;16(2):199-202.
5. Carvalho FP. Pesticides, environment, and food safety. Food Energy Secur. 2017;6(2):48-60.
6. Chakraborty K. Spatial variation of leaf chlorophyll and consequences of leaf damage by *Anomis sabulifera* Guen. in jute field. JFAV. 2017;7(3):17-25.
7. Chakravorty S, Deb DC, Samui TN. Feasibility of hormonal control of some insect pests: a laboratory-based conclusion. Indian J Entomol. 1989;51(2):139-49.
8. Chatterjee H. Management of *Anomis sabulifera* (Guen) (Noctuidae; Lepidoptera) with some biopesticides under terai region of West Bengal. Indian J Entomol. 2006;68(1):23-6.
9. Chatterjee PB. The utilization of *Bacillus thuringiensis* Berliner in the control of *Anomis sabulifera* Guenée (Lepidoptera, Noctuidae) on jute plant (*Corchorus olitorius* Linnaeus). J Invertebr Pathol. 1965;7(4):512-3.
10. Chatterji SM, Das LK. Relative toxicity of some insecticides to the larvae of jute semilooper, *Anomis sabulifera* Guen. J Entomol Res. 1983;7(1):80-1.
11. Chatterji SM, Rao PV, Singh B, Tripathi RL, Das K, Bhattacharya SP. Effect of environmental factors on the incidence of major pests of jute, *Corchorus olitorius* L. J Entomol Res. 1978;2(2):163-6.

12. Chen Q, Li N, Wang X, Ma L, Huang JB, Huang GH. Age-stage, two-sex life table of *Parapoynx crisonalis* (Lepidoptera: Pyralidae) at different temperatures. PLoS One. 2017;12(3):e0173380. https://doi.org/10.1371/journal.pone.0173380.
13. Das LK, Das AK, Pradhan SK, Bhattacharya A. Residues of endosulfan spray schedule in jute crop with reference to the control of jute pests. Environ Ecol. 1990;8(1A):68-72.
14. Das LK, Pathak S. Resistance behavior of some jute varieties against their pests. Environ Ecol. 1999;17(2):456-7.
15. Das LK, Singh B, Pradhan SK. Comparative efficacy of ultra-low-volume, low volume and high-volume sprays against pest complex of jute. Pestic Res J. 1979;13(6):47-8.
16. Das LK, Singh B. Economic control measures against the major pests of jute. Int J Pest Manag. 1977;23:159-61. http://dx.doi.org/10.1080/09670877709412422.
17. Das R, Bhaskar A, Sameera GVH, Singh MK, Prasad S. Major and emerging pest complex of jute and allied fibers and its integrated management approach. Just Agric, 2022, 3(2). e-ISSN:2582-8223.
18. De RK, Babu VR, Shamna A. New IPM module against stem rot and insect pests of jute (*Corchorus olitorius* L.). Indian J Plant Prot. 2021;49(1):18-25.
19. Dicke M. Chemical ecology of host-plant selection by herbivorous arthropods: a multitrophic perspective. Biochem Syst Ecol. 2000;28:601-17. https://doi.org/10.1016/S0305-1978(99)00106-4.
20. Dutta N. *Anomis sabulifera* Guen. and *Apion corchori* Marsh – incidence and control. J Bull. 1958;21(5):121-8. e-ISSN:2582-8223.
21. Dutta S, Roy N. Life table and population dynamics of a major pest, *Leptocorisa acuta* (Thunb.) (Hemiptera: Alydidae), on rice and non-rice system. Int J Pure Appl Biosci. 2016;4(1):199-207. doi:10.18782/2320-7051.2202.
22. Ferino MP, Calora FB, Magallona ED. Population dynamics and economic threshold level of the cotton semi-looper, *Anomis flava* (Fabr.) (Noctuidae, Lepidoptera). Philipp Entomol. 1982;5:401-46.
23. Gaikwad BB, Pawar VM. Life history of jute semilooper, *Anomis sabulifera* Guen. Bull Entomol Res. 1983;24(2):133-5.
24. Genc H, Nation JL. Influence of dietary lipids on survival of *Phyciodes phaon* butterflies (Lepidoptera: Nymphalidae). J Entomol Sci. 2004;39:537-44.
25. Gurr GM, Wratten SD, Landis DA, You M. Habitat management to suppress pest populations: progress and prospects. Annu Rev Entomol. 2017;62:91-109.
26. Hath TK, Basak S. Plot sampling technique for the estimation of jute semilooper (*Anomis sabulifera* Guen.) incidence in terai agroecology of West Bengal. Environ Ecol. 2000;18(2):299-301.
27. Holden MH, Ellner SP, Lee DH, Nyrop JP, Sanderson JP. Designing an effective trap cropping strategy: the effects of attraction, retention and plant spatial distribution. J Appl Ecol. 2012;49:715-22.
28. Jetter R, Schäffer S, Riederer M. Leaf cuticular waxes are arranged in chemically and mechanically distinct layers: evidence from *Prunus laurocerasus* L. Plant Cell Environ. 2000;23(6):619-28. https://doi.org/10.1046/j.1365-3040.2000.00581.x.
29. Kakde AM, Patel KG, Tayade S. Role of life table in insect pest management – a review. IOSR J Agric Vet Sci. 2014;7(1):40-3. https://doi.org/10.9790/2380-07114043.
30. Kamar N, Chowdhury N, Sardar B, Dutta S, Modak BK, Roy N. Life cycle and population growth of two semiloopers of the genus *Anomis* (Lepidoptera, Erebidae) on four Malvaceous plants. Biol Bull Rev, 2025, 1-9. https://doi.org/10.1134/S2079086425600134.
31. Kessler A, Baldwin IT. Plant responses to insect herbivory: the emerging molecular analysis. Annu Rev Plant Biol. 2002;53:299-328.
32. Khan DU, Ahmed AK. Control of jute semi-looper (*Anomis sabulifera* Ga.). Agric Pakistan. 1967;3:303-7.
33. Khan DU, Ahmed AK. Comparison of some new insecticides for the control of jute semi-looper. Int Pest Control. 1968;10(5):26-7.
34. Kim KH, Kabir E, Jahan SA. Exposure to pesticides and the associated human health effects. Sci Total Environ. 2017;575:525-35.
35. Kravchenko VD, Müller GC, Allan SA, Yefremova ZA. Seven invasive owlet moths (Lepidoptera: Noctuidae) in Israel and their potential parasitoids (Hymenoptera: Chalcidoidea). Phytoparasitica. 2014;42:333-9. https://doi.org/10.1007/s12600-013-0364-3.
36. Lal S, Singh S. Seasonal abundance of major sucking insect pests of okra and their natural enemies in relation to abiotic factors. Int J Chem Stud. 2019;7(3):2173-8.
37. Liu Z, Li D, Gong P, Wu K. Life table studies of the cotton bollworm, *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae), on different host plants. Environ Entomol. 2004;33:1570-6. https://doi.org/10.1603/0046-225X-33.6.1570.
38. Mahapatra BS, Mitra S, Ramasubramaniam T, Sinha MK. Research on jute (*Corchorus olitorius* and *C. capsularis*) and kenaf (*Hibiscus cannabinus* and *H. sabdariffa*): present status and future perspective. Indian J Agric Sci. 2009;79(12):951-67.
39. Mallick N, Banerji A. Effects of methanol extracts of *Ocimum sanctum* Linn. on jute semilooper, *Anomis sabulifera* Guen. Indian J Entomol. 1989;51(1):84-9.
40. Midega CA, Khan ZR, Pickett JA, Nylin S. Host plant selection behavior of *Chilo partellus* and its implication for effectiveness of a trap crop. Entomol Exp Appl. 2011;138:40-7.
41. Mithofer A, Wanner G, Boland W. Effects of feeding *Spodoptera littoralis* on lima bean leaves. II. Continuous mechanical wounding resembling insect feeding is sufficient to elicit herbivory-related volatile emission. Plant Physiol. 2005;137:1160-8.

42. Mobarak SH, Roy N, Barik A. Two-sex life table and feeding dynamics of *Spilosoma obliqua* Walker (Lepidoptera: Arctiidae) on three green gram cultivars. Bull Entomol Res, 2020, 1-13. https://doi.org/10.1017/S0007485319000452.
43. Mobarak SH, Roy N, Barik A. Two-sex life table and feeding dynamics of *Spilosoma obliqua* Walker (Lepidoptera: Arctiidae) on three green gram cultivars. Bull Entomol Res, 2019, 1-13. doi:10.1017/S0007485319000452.
44. Pandit NC, Som D. Culture of *Beauveria bassiana* and its pathogenicity to insect pests of jute (*Corchorus capsularis* and *C. olitorius*) and mesta (*Hibiscus cannabinus* and *H. sabdariffa*). Indian J Agric Sci. 1988;58(1):75-7.
45. Prasad SS, Yadav US, Srivastava RK. Efficacy and economics of integrated pest management against insect pests and diseases of *olitorius* jute (*Corchorus olitorius*) in eastern Uttar Pradesh. Indian J Agric Sci. 2007;77(10):652-6.
46. Prasad SS, Yadav US, Srivastava RK. Standardization of plot sampling techniques for the estimation of incidence of jute insect pests in eastern Uttar Pradesh. J Entomol Res. 2004;28(4):283-9.
47. Rahman S, Khan MR. Effect of plant characteristics of jute varieties on incidence of pests in West Bengal, India. Arch Phytopathol Plant Prot. 2012;45(5):608-19. http://dx.doi.org/10.1080/03235408.2011.588055.
48. Rahman S, Khan MR. Evaluation of pesticides against major pests of jute (*Corchorus olitorius* L.) in West Bengal, India. Arch Phytopathol Plant Prot. 2012;45(6):620-34. https://doi.org/10.1080/03235408.2011.588056.
49. Rahman S, Khan MR. Incidence of pests in jute (*Corchorus olitorius* L.) ecosystem and pest-weather relationships in West Bengal, India. Arch Phytopathol Plant Prot. 2011;45(5):591-607. https://doi.org/10.1080/03235408.2011.588053.
50. Rahman S, Khan MR. Integrated management approach for control of the pest complex of *olitorius* jute, *Corchorus olitorius*. J Plant Prot Res. 2010;50(3):340-6. doi:10.2478/v10045-010-0058-5.
51. Rao MS, Patel RC. Biology and control of okra semilooper, *Anomis flava* Fabricius (Noctuidae: Lepidoptera) on okra. Indian J Entomol. 1973;35(3):198-205.
52. Rhino B, Verchère A, Thibaut C, Ratnadass A. Field evaluation of sweet corn varieties for their potential as a trap crop for *Helicoverpa zea* under tropical conditions. Int J Pest Manag. 2016;62:3-10.
53. Roy A, Rahman MS, Rahman MA, Ahmed KS, MahirUddin M. Screening of jute varieties against jute apion (*Apion corchori* Marshall) and its management using chemical and botanical pesticides. J Bangladesh Agric Univ. 2019;17(3):274-80. https://doi.org/10.3329/jbau.v17i3.43195.
54. Roy N, Barik A. Influence of four host plants on feeding, growth and reproduction of *Diacrisia casignetum* (Lepidoptera: Arctiidae). Entomol Sci. 2013;16(1):112-8. https://doi.org/10.1111/j.1479-8298.2012.00546.x.
55. Roy N. Behavioural responses of four generalist pests to crops and exotic weeds for their sustainable management. Bull Entomol Res, 2025, 1-10. https://doi.org/10.1017/S0007485325000094.
56. Roy N. Host phytochemicals in regulation of nutritional ecology and population dynamics of *Podontia quatuordecimpunctata* L. (Coleoptera: Chrysomelidae). Int J Hort. 2015;5(4):1-11. https://doi.org/10.5376/ijh.2015.05.0004.
57. Roy N. Jute leaf physicochemical cues mediated behavioral responses of *Diacrisia casignetum* Kollar. Agric Res. 2019;8:287-96. https://doi.org/10.1007/s40003-018-0362-2.
58. Roy N. Life table and nutritional ecology of *Epilachna vigintioctopunctata* Fab. (Coleoptera: Coccinellidae) on three host plants. Int J Hort. 2017;7(2):7-19. doi:10.5376/ijh.2017.07.0002.
59. Sadat A, Bhattacharyya S, Roy S, Chakraborty K. Defensive response of *Corchorus olitorius* in relation to infestation of *Anomis sabulifera*. J Entomol. 2019;16(1):23-9. https://doi.org/10.3923/je.2019.23.29.
60. Sadat A, Chakraborty K. Insect pest constraints of jute and its control by biological agents under modern eco-friendly sustainable production system. Multidiscip Int J Res Dev. 2015;2(3):316-21.
61. Sadat A, Chakraborty K. Life cycle study of jute semilooper (*Anomis sabulifera* L.) and generation of pest calendar in Uttar Dinajpur district. Pharma Innov J. 2019;8(2):150-4.
62. Sadat A, Chakraborty K. Spatial variation of leaf chlorophyll and consequences of leaf damage by *Anomis sabulifera* Guen. in jute field. Int J Food Agric Vet Sci. 2017;7(3):17-25.
63. Samui TN, Deb DC, Chakravorty S. Hydroprene induced changes in food consumption by the larvae of *Anomis sabulifera* Guenée (Lepidoptera: Noctuidae). Sci Cult. 1984;48(10):369-70.
64. Santos RL, Torres JB, Pontes IVAF, Barros EM, Bastos CS. The lesser cotton leafworm, *Anomis impasta* (Guenée) (Lepidoptera, Noctuidae), in cotton. Biol Control Crop Prot, 2012, 56(4). https://doi.org/10.1590/S0085-56262012000400015.
65. Sarfraz M, Dosdall LM, Keddie BA. Resistance of some cultivated Brassicaceae to infestations by *Plutella xylostella* (Lepidoptera: Plutellidae). J Econ Entomol. 2007;100:215-24.
66. Sarkar SC, Wang E, Wu S, Lei Z. Application of trap cropping as companion plants for the management of agricultural pests: a review. Insects. 2018;9:16-128. https://doi.org/10.3390/insects9040128.
67. Schowalter TD. Insect ecology: an ecosystem approach. 2nd ed. Tokyo: Academic Press, 2006.
68. Senapati SK, Ghose SK. Biology and morphometrical studies of larvae of jute semilooper, *Anomis sabulifera* (Guenther), (Noctuidae: Lepidoptera). Ann Entomol. 1991;9(1):35-9.

69. Sheikh MS. Studies on life cycle and population structure of jute semilooper (*Anomis sabulifera* Guenee, Lepidoptera, Noctuidae) on tosa jute (*Corchorus olitorius* L.) in the district of Barpeta, Assam, India. Ecoscan. 2012;6(3-4):129-31.
70. Shobana K, Murugan A, Kumar N. Influence of host plants on feeding, growth and reproduction of *Papilio polytes* (the common mormon). J Insect Physiol. 2010;56:1065-70. https://doi.org/10.1016/j.jinsphys.2010.02.018.
71. Singh B, Das LK. Semilooper (*Anomis sabulifera* Guen.) escalating on jute pods. Sci Cult. 1979;45:121-3.
72. Smith HA, McSorley R. Potential of field corn as a barrier crop and eggplant as a trap crop for management of *Bemisia argentifolii* (Homoptera: Aleyrodidae) on common bean in North Florida. Fla Entomol. 2000;83(2):145-58. https://doi.org/10.2307/3496150.
73. Southwood TRE, Henderson PA. Ecological methods. 3rd ed. Oxford: Blackwell Science, 2000.
74. Srinivasan K, Moorthy PK, Raviprasad TN. African marigold as a trap crop for the management of the fruit borer *Helicoverpa armigera* on tomato. Int J Pest Manag. 2008;40:56-63.
75. Srivastava AS, Nigam PM, Awasthi BK. Control of *Anomis sabulifera* Guen. attacking jute crop. Labdev J Sci Technol B Life Sci. 1972;10:148-9.
76. Subedi R, Bhatta LD, Udas E, Agrawal NK, Joshi KD, Panday D. Climate-smart practices for improvement of crop yields in mid-hills of Nepal. Cogent Food Agric. 2019;5:1631026. https://doi.org/10.1080/23311932.2019.1631026.
77. Timsina GP, Karki S. Field screening of common jute (*Corchorus olitorius*) varieties against major pests in Eastern Terai region of Nepal. Int J Agric Inv. 2019;4(2):130-4. https://doi.org/10.46492/IJAI/2019.4.2.2.
78. Tripathi RL, Ram S. Loss in yield due to damage by larvae of jute semilooper, *Anomis sabulifera* (Guen.) (Lepidoptera: Noctuidae). Indian J Agric Sci. 1972;42(4):334-6.
79. Tripathi RL. Relative contact toxicity of some insecticides to the larvae of jute semilooper, *Anomis sabulifera* (Guen.) (Lepidoptera: Noctuidae). Indian J Entomol. 1967;29(3):234-6.
80. Upadhyaya VK, Yadav US, Singh RPN. Timely action helps ward off the jute semilooper. Indian Farming. 1992;42(5):17.
81. War AR, Paulraj MG, Ahmad T, Buhroo AA, Hussain B, Ignacimuthu S, *et al*. Mechanisms of plant defense against insect herbivores. Plant Signal Behav. 2012;7:1306-20.
82. Wu J, Baldwin IT. Herbivory-induced signalling in plants: perception and action. Plant Cell Environ. 2009;32:1161-74. doi:10.1111/j.1365-3040.2009.01943.x.
83. Xue M, Pang YH, Wang HT, Li Q-L, Liu T-X. Effects of four host plants on biology and food utilization of the cutworm, *Spodoptera litura*. J. Insect Sci. 2010;10:1-14. https://doi.org/10.1673/031.010.2201.
84. Yadav US. Resistance behaviour of Olitorius jute germoplasm against their pests. Res. Crops. 2010;11(1):106–108.