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A Review On Effect Of Botanicals Against Brinjal Shoot And Fruit Borer Leucinodes Orbonalis (Guenee) Crambidae, Lepidoptera

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Abstract:
The most destructive pest of Egg plant is the fruit and shoot borer Leucinodes orbonalis Guenee (Lepidoptera: Crambidae) in almost every part of India, which lowers yield by 40–80% throughout both the vegetative and reproductive phases. Every year in the Indian subcontinent, this insect pest strikes either sporadically or in an epidemic. Fruits deteriorate both qualitatively and quantitatively throughout the year due to its infection, which peaks during the rainy season. Farmers currently struggle this pest with chemical insecticides, which might lead to environmental and health issues. Farmers continue to use pesticides to combat this problem, but excessive use of these chemicals has adverse impacts on the environment and beneficial creatures that are not targeted, as well as residues in the food chain, its phytotoxicity, pesticide resistance, pest rebound, bioaccumulation, and secondary eruption of pest outbreaks. This review summarizes current knowledge and developments to give a complete grasp of management techniques to fight this infamous pest. The environmentally friendly and potency of several botanical pesticides against shoot and fruit borer in egg plant are discussed in this paper.
Keywords: *Botanicals, Egg plant, Shoot and fruit borer, Leucinodes orbonalis.*

INTRODUCTION:

Egg plant is one of the foremost significant vegetable crops in South and South-east Asia. (Solanum melongena L.), sometimes referred to as "Begoon" in these regions. Initially known as eggplant in Europe, it is a member of the Solanaceae family. The United States, France, Italy, Bangladesh, Egypt, China, India, and Pakistan are important growing regions. (Anonymous, 2010). Egg pant is a great source of proteins, dietary fiber, mineral componds, vitamins, antioxidant substances, and other vital components for the body (Matsubara et al., 2005 and Oboh et al., 2005). Although brinjal is a summer crop, it is irrigated and produced all year round. Generally, depending on the irrigation facilities, the crop is seeded twice or three times a year. Known as the "King of Vegetables," Egg plant is the widely consumed and important vegetable crop. China is the world's top producer of brinjal, with India coming in second. India also grows it as a domestic garden crop and commercial crop. Grown in India as a "poor man's crop," it is a very popular and cosmopolitan veggie. (T. Abhishek and S. Dwivedi, 2021). One of the main reasons for the decline in yield and a warning sign for the development of brinjal crops are insect infestations. From the time of planting to till harvest, brinjal crops are attacked by a variety of insect pests (Aslam et al., 2019; Khan et al., 2019). Brinjal shoot and fruit borer, Brinjal stem borer, Leaf roller, Hadda beetle, Aphids , Whitefly, and Thrips are some of the principal insect pests of the brinjal crop in Pakistan (Srinivasan, 2009 and Javed et al., 2017b and Kassi et al., 2019).Shoot and fruit borer Leucinodes orbonalis Guenee is the main insect pest of Egg plant, causing serious damage in all areas where it is cultivated. It is an interior borer that harms the delicate fruits and shoots. Eggs are laid on young leaves, flowers, or the calyx of fruits by an adult moth with speckled patterns and filthy, white wings. The larvae begin bore into the shoot portion, midrib of the leaves, developing shoots, flower buds, and fruits as soon as they hatch, and they use frays to seal the bore hole. After getting inside, it will feed on the fruit pulp, midribs, blossom, and ovary. injured fruits decay from the inside out, and the blossoms and injured shoots droop. Fruit size and quantity decrease as a result of this slower plant development. A little depression is often seen, but

the entrance way on the fruits is not evident as they become minute as a result of their growing size. All that is apparent on the fruits are the bigger, rounder exit holes. These fruits become less valuable on the market (Verma et al., 2021). Since the beginning of time, biological and botanical techniques have been used to control insect pests because they are safer and more ecologically friendly than chemical treatments. According to field tests, botanicals and biological agents including karanj, azadirachtin, Bt, and Beauveria are effective against insect pest infestations of both fruit and shoots (Tripura et al., 2017 and Karmakar et al., 2018). Thus, this review's objective was to assess how well various botanical pesticides worked against the shoot and fruit borer of Egg plant.

MATERIALS AND METHODS:

1,M.M. Rahman conducted two experiments (2009), To determine the proper dosage of several compounds against the larvae, L. orbonalis, the first experiment was carried out in the lab. Three oils from native plants, such as mahogoni (Swietenia mahogoni), Pongania pinnata (Karanja), and neem (Azadirachta indica), were used as treatments at three different concentrations: 2%, 3%, and 4%. The experiment has a CRD design with ten replications. The second experiment examined the impact of botanicals in lowering Leucinodes orbonalis infestation and was conducted at the Field Laboratory of BAU. The brinjal cultivar utilized was BARI Begun-8. Neem oil (T1), karanja oil (T2), mahagoni oil (T3), neem cake (T4), neem oil combined with neem cake (T5), and 6th treatment (control) were the treatments utilized in the research. It was set up using three replications and the Randomized Complete Block Design. Neem cake was treated at a rate of 250 kg/ha, and the botanical oils were sprayed at 40 ml/L of water with Trix @ 5 gm/L. Each plot included twelve transplanted plants spaced 80 x 60 cm apart. Throughout the trial period, five administrations of the therapy were made at 15-day intervals.

2.Dehariya et al. (2017) cultivated Egg plant Variety Pusa Purple Round by transplanted 26 days old seedlings in 4 × 4m plots with 45 x 60 cm plant and row spacing. Using Randomized Block Design, the experiment was designed with 7 treatments and 4 replications. Plant to plant and row to row were spaced 60 x 45cm apart. Beginning 30 days after transplanting, four sprayings were carried out at 15-day intervals. Using a hand compression sprayer, the spraying solution was taken at a rate of 500 liters of water per hectare. This experiment employs the following treatments: Triazophos 40 EC @0.04%, Neem oil @1%, Achook @0.5%, N.S.K.E. @3%, Karanj oil @1%, Eucalyptus oil @1%, and an untreated control should be used.3.The experiment was carried out by Tayya et al. (2024) using the Egg plant variety Hybrid 303. The seedlings were first planted in a nursery and then moved onto a 12-meter-square space. Within each plot, twelve seedlings were transplanted at intervals of 60 x 80 cm. An approximate area of 5.76 m2 was covered by each experimental plot. Five treatments total, each three times duplicated, were used in the Randomized Complete Block Design trial. The following oils are utilized in this experiment: 10 ml/L of neem oil @1%, 10 ml/L Karanj oil @1%, 10 ml/L of eucalyptus oil @1%, 10 ml/L of mahogoni oil @1%, and control.4.Sultana et al. (2018) experimented with the Egg plant variety Makra, which was grown in a 3 m × 1 m seedbed. The Complete Randomised Block Design was used to build up three replications of the experiment. Three blocks, each with seven unit plots, were created from the total experimental plot. The unit plots were 3 m × 2 m in size, with 50 cm separating each unit plot and 75 cm separating each block. 20 days after transplanting, the treatments were administered as foliar sprays, and they were repeated every 7 days. The treatments were: Untreated control for only water, Neem leaf extract @ 50 gl-1 water, Neem oil @ 40 ml l-1 water), Mahogany oil @ 40 ml l-1 water, Mahogany oil + Mahogany cake oil @ 40 ml l-1 water + cake @ 250 kg ha-1, Garlic extract @ 50 g l-1 water, and tobacco leaf extract @ 50 g l-1 water. The mahogany cake was incorporated with soil. The data was analysed using the MSTAT-C analysis of variance programme. The Duncan's Multiple Range Test was used for pair comparisons, and the F variance test was used for ANOVA.Taxonomic Classification and biology of Egg plant shoot and fruit borer:Guenee was the first to identify and classify the Egg plant Shoot and fruit borer, Leucinodes orbonalis, in 1854. Walker signed it as Leuinodes in 1859 (CABI 2007).

Phylum: Arthropoda
Class: Insecta Order: Lepidoptera
Family: Crambidae (Syn- Pyralidae)
Genus: Leucinodes

Species: orbonalis

Developmental biology of brinjal shoot and fruit borer:

Incubation period:

In a laboratory setting, the female of the shoot and fruit borer moth was shown to deposit eggs either by herself or in clusters of two to three batches. The eggs were adhered to both the surface and the tips of fragile leaves. Earlier, Wankhede et al., (2009) and Maravi et al., (2013) observed a similar pattern of egg laying. The average duration of the reported incubation time is 3.90±0.32, with a range of 3 to 4 days. The present results are also generally in agreement with those of Nayak (2022), who discovered an average incubation period of 3.81 days.Larval period:First instar:The average duration of the first instar larva was 4.20±0.63 days, with a ranged from 3 to 5 days. That of Nayak (2022), who found that the first instar larvae varied from 3 to 5 days with an average of 4.21±0.48, is quite similar to this. The average duration of first instar larvae was reported by Patel et al. (2018) to be 1.00±0.00, which somewhat aligns with the current data.Second instar:The average duration of second instar larvae was 4.40±0.52 days, with a ranged from 4 to 5 days. This aligns with the results of Nayak, who found an average duration of 4.40±0.32 and the present analysis is somewhat comparable with the average duration of 1.06±0.25, as reported by Patel et al., (2018).Third instar:The third instar larvae had an average duration of 4.10 ± 0.57 days, with a ranged from 3 to 5 days. The results of Nayak (2022), who discovered an average duration of 4.03 ± 0.41 days, are comparable to this. Similar to the current results, Bhoya and Patel (2018) likewise reported an average duration of larvae is 1.73 ± 0.44 days.Fourth instar:The average duration of fourth instar larvae was 3.70±0.67 days, with a ranged from 2 to 4 days. This is consistent with the results of Nayak (2022), who found that the average length was 3.61±0.52 and Patel et al., (2018) who noted an average duration of 2.66±0.47.Fifth instar:The fifth instar larvae had an average duration of 3.70±0.48 days, with a ranged from 3 to 4 days. The fifth instar larvae were sedentary and sluggish before pupation. After losing its body color, it started constructing its pupation cocoon. These results are in accordance with those of Bhoya and Patel (2018), Singla et al., (2018), and Nayak (2022), who noted that fifth instar larvae looked similar to those in the present research.Total larval period:The average larval development time for L. orbonalis was 20.10±1.20 days, with a ranged from 15–23 days. These results are in contrast to those of Nayak (2022), who reported an average larval development time of 20.07±1.92 days, with a range of 17 to 25 days.Pupal period:The pupal stage was found to last between 5 and 8 days, with an average of 6.80±0.79 days. Nayak (2022) and Rohokale et al., (2018) reported average pupal durations of 6.82±0.75 and 6.90±1.37 days, respectively, which are in good agreement with the results of the present research. However, the average pupal durations given by Patel et al., (2018) and Radhakrishore et al., (2010) were 5.76±0.77 and 5.22±0.07 days, respectively, which barely agree with the current study's results.

Adult period:Male adults lived an average of 3.67±0.58 days, with a range of 2–4 days. Female longevity, on the other hand, averaged 4.50±0.53 days and ranged from 3 to 5 days. These results are in good agreement with those that Nayak (2022) reported.Fecundity: A female's average egg-laying capability throughout this investigation was 216.60 ± 26.68 eggs, with a range of 170 to 248 eggs. These results are in good agreement with those of Nayak (2022), who found that each female produced an average of 219 ± 19.25 eggs. Laichattiwar et al., (2017), on the other hand, reported an average of 160.2 ± 32.42 eggs per female, which slightly matches the findings of the present study.Total life span:The average lifetime from the egg stage to the adult's death was 35.90±1.85 days, with a ranged from 25 - 40 days. This result is consistent with Nayak's (2022) study, which found that the average developmental time was 35.90±1.85 days.

Mode of action of Botanicals against pest:

Botanicals	Action	Reference
1.neem oil	Killing effect	(Chiga et al., 2019)
2. Neem derived products	Repellent, Antifeedants and also act as a Deterrents	(Atwal and Dhaliwal, 2008)
3. Chilli and Lantana	Antifeedent	(Duza et al., 2019)

4.Mahogony oil	Killing effect, antifeedant	(Tayyab 2024)
5.karanji oil	Killing effect	(Tayyab 2024)
6.Pungam leaf extract	Repellent	(Pandey 2016)
7.Eucalyptus oil	Insecticidal and repellent	(Javed 2017)

RESULT AND DISCUSSION:

This review represent the comparative study of different botanicals like neem oil , karanji oil mahogony oil , eucalyptus oil and leaf extracts etc,. The minimum infestation on Leucinodes orbonalis was found by Sangma et al., (2019) in neem oil (13.44% and 15.88%) @2%, followed by papaya leaf extract product (15.03% and 16.66%) and jatropha leaf extract product (14.19% and 16.28%). Neem oil, karanj oil, and eucalyptus oil have been shown to be among the most successful botanicals against the Egg plant shoot and fruit borer (Dehariya et al., 2017 and Singh, 2003). Additionally, Dehariya et al. (2017) discovered that the third and fourth neem oil sprays had the least proportion of fruit damage, whereas the control plot with the eucalyptus oil spray had the highest rate. Tayyab (2024) Neem oil showed promise as a potential botanical pesticide against L. orbonalis. Neem oil treatment yielded the most nutritious fruits, followed by 1% eucalyptus oil, 1% karanj oil, and 1% mahogany oil. Finally, the best natural solution for controlling fruit borer and brinjal shoots is neem oil. Rahman, 2009 Neem oil and neem cake combination were the most successful remedies for the pest, whereas mahogoni oil and neem cake alone had little effect. Additionally, neem and karanja oils considerably reduced fruit borer and shoot infection. Sultana et al. (2018) found that the mahogany oil and mahogany cake treated plot in the vegetative stage had the largest percentage decrease in shoot infestation compared to the control (62.39%). However, in the mid-fruiting stage, the fields sprayed with garlic extract had the lowest percentage of shoot infestation decrease compared to control (31.82%), while the areas treated with mahogany oil and mahogany cake had the greatest percentage (67.86%).

CONCLUSION:

About this review for controlling of Egg plant shoot and fruit borer managed by combination of neem oil and neem cake are generally considered more effective than any other botanicals. Compare to the other botanicals like Karanj oil, Mahogany oil, Eucalyptus oil, other leaf extract products etc.

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