Original Research Article

Antifeedantand Insecticidal activity of different solvent extracts of *Vitexnegundo*(L) against *Spodopteralitura* (Fab.)

ABSTRACT

Spodopteralitura is a serious polyphagous pest causing damage to more than 150 species of host plants and it is distributed throughout the tropical and sub- tropical regions ofthe world including India, Japan, China and South East Asia. The chemical pesticides affect the non- target organisms and human beings, directly or indirectly.To find environmentally safe alternative there is need of considering the pesticides of biological origin to replace synthetic pesticides. Anti-insect activity check of plant extract can play important role in ecofriendly control of insect pest.*Spodopteralitura* is a dangerous polyphagous pest found throughout the world's tropical and subtropical regions, including India, Japan, China, and South East Asia(delete). It harms more than 150 species of host plants. Chemical pesticides have direct or indirect effects on both people and non-target creatures. Considering biological pesticides as a possible replacement for synthetic pesticides in order to develop an environmentally safe alternatives, plant extract with anti-insect efficacy can be crucial as sustainable eco-friendly control measure for insect pests(redundant!Pls delete).

The present work is(delete) aimed to identify a natural alternative to chemical pesticides for the control of insect pests by examining a variety of factors, including larval weight, duration, antifeedant activity, and mortality. Maximum larval mortality (10.30%) was noted in *Vitexnegundo* chloroform extract. The larval duration is much longer in the *Vitexnegundo* chloroform and methanol extracts (10.23 days and 10.56 days, respectively) as compared to the control group.The *Vitexnegundo* chloroform extract (59.42%) and acetone (37.68%) have the strongest antifeedant effects. In comparison to the control, the larval weight was significantly reduced in the *Vitexnegundo* chloroform (0.391 gm), acetone (0.401 gm), and methanol extract (0.420 gm) extracts (0.621 gms).

Key words- *Vitexnegundo*, anti-insect activity, *Spodopteralitura* ,plant extracts

Introduction

Insect population is a significant health and agricultural hazard(to what?). Ten to thirty percent of main crop loss in agriculture is attributable to insect pests, which inflict serious damage to crops and directly effect(change e to a)revenue (Ferry et al., 2004). The dangerous polyphagous pest Spodopteralitura, which is present in all tropical and subtropical parts of the world, including India, Japan, China, and South East Asia, damages more than 150 species of host plants (Rao, et. al. 1993, &Murgesanand Dhingara, 1995). Forty species of the 150 host plants are known to come from India (Mallikarjuna, et .al., 2004).Most farmers attempt to control the population of *S. litura* by using chemical insecticides. These insecticides have direct or indirect effects on both humans and non-target creatures. Due to a lack of host plant resistance to *S. litura* and inadequate management techniques, it is challenging to handle this pest in the fields. Consider biological pesticides as a possible replacement for synthetic pesticides in order to develop an environmentally safe alternative.(rephrase the sentence)The use of biopesticides to protect crops from insect pests has become more important in recent years due to rising awareness of the adverse effects of the chemical pesticides' indiscriminate use (Chari et. al., 1990).

The small tree(change to common name)*Vitexnegundo* L, a member of the Verbenaceae family, has thin, gray bark. The herb is abundantly available and has pharmacological effects against a variety of diseases in the conventional medical system. Numerous secondary metabolites, including alkaloids, phenols, flavanoids, glycosidicirridoids, tannis, and terpenes, are present in all plant sections, but particularly in the leaves. Hepatoprotective, anti-inflammatory, anti-tumor, antioxidant, insecticidal, antimicrobial, anti-androgenic, anti-osteoporotic, anti-cataract, and anti-hyperglycemic activity were among the promising bioactivities that the crude extracts and purified components of Vitexnegundo displayed (Zheng et al., 2015).

In the present investigation,the(change to an) attempt has(change to was) made to study the effect of extract of *Vitexnegundo* leaf against *Spodopteralitura.*

Material and Methods

Collection and Rearing of *Spodopteralitura* –

The eggs of *S.litura* were purchased from National Bureau of Agriculture Insect Resources (ICAR), Bangalore. The larvae were fed with castor leaves (*Ricinuscommunis*. L).

Please state what filial generation were the eggs..Please describe the rearing procedure such as the measurement of the rearing tray,what part of the castor leaves were used ,how many larvae were reared per rearing container.?

Collection and Extraction of plant extract

The fresh leaves of *Vitexnegundo*were collected from the areas of Nivkane, DiwashiKhurd, Helwak, Rasati from talukaPatan district Satara (M.S).Please spell out MSThe leaves were washed separately with distilled water, shade dried, cut into small pieces and air dried for 14 days in the laboratory before pulverized into fine powders using an industrial electric pulverizing machine at the Department of Zoology, SGM College, Karad. The powders were further sieved to pass through mm2 perforations and kept in an air-tight plastic containers for storage before use at ambient temperature (28 ± 2) °C.

About 300 g of *V. negundo*leaf powders were soaked separately in an extraction bottle containing 500 ml of chloroform, acetone and methanol for 72 hours. The mixture was stirred occasionally with a glass rod and extraction was terminated after three days. Filtration was carried out using a double layer of Whatman No. 1 filter papers and solvent evaporated using a rotary evaporator at 30 to 40 °C with rotary speed of three to six rpm for eight hours. The resulting extracts were air dried in order to remove traces of respective solvents. The extracts were kept in labeled plastic bottles till when needed.

Standard stock solutions were prepared by dissolving 1 g of the crude extracts in 100 ml of solvent.

Larvicidal activity-

1% mg/ml concentration of crude extract of *Vitexnegundo*was applied using leaf disc method.Please provide a brief description of the method.

The treated leaves were exposed to the 3rd instar larvae. After 24 hrs of treatment, the larvae were continuously maintained on the non- treated castor leaves. Later the larvae were provided with fresh castor leaves at(delete)every 24hrs. Larval mortality was recorded after 96 hrs of treatment. Five replicates were maintained for each treatment with 10 larvae per replicates(del.)Pls describe the control or untreated treatment.Percent mortality was calculated by using Abbott's formula. (Abbott, 1925).(Please elaborate why corrected mortality will be used) The experiment was conducted at laboratory temperature of 27$\pm$ 2^{o} C with 75 $\pm$ 5 % relative humidity.

$$\% \text{ Larval Mortality} = \frac{\text{Number of dead larvae}}{\text{Number of larvae introduced}} \times \frac{100}{1}$$

Percentage larvae mortality was calculated using Abbott corrected mortality formula

$$PT = \frac{Po\text{-}Pc}{100\text{-}Po} \times \frac{100}{1}$$

Where P_T = corrected mortality (%)

P_O = observed mortality (%)

P_C = control mortality (%)

Antifeedant activity

Leaf discs no choice methods (Shrivastava., et al, 1990) were used for bioassaytest, after washing with tap water. The crude extractswere dissolved in respective solvents. Fresh castorleaf discs of 4 cm diameter were punched using aborer. The leaf discs were dipped in different solvent extracts. Negativecontrols were dipped in the representative solvent.Treated leaves were air dried at room temperature andkept in petri plates (9cm diameter). Pre-starved(3 hours) larvae of (del.)third instar larvae were allowed to feed onthe treated leaf disc for 24hours. Five replicates d(del.) weremaintained. For each treatment ten larvae perreplicates(del.)(total number=50) with one control weremaintained. Progressive consumption of the leaf areaby the larvae after 24hours were recorded in controland treated discs using the leaf area metre. Area of theleaf eaten by the larvae in plant extract treatment wascorrected from the control. Percentage of antifeedantactivity was calculated using the formulaof Ismanet. al (1990).

$$\text{Antifeedant activity} = \frac{\text{Control - Treatment}}{\text{Control + Treatment}} \times \frac{100}{1}$$

Larval duration-

The survived(change to ing) larvae were further continuously fed with non- treated castor leaves. The larval duration was calculated after treated larvae became pupae (Baskar,K., et al,2011).Please provide a brief description of the calculation.Pls describe the control or untreated treatment.

Larval weight-

The data on the leaf area consumed was recorded and used for the calculation of the larval weight gain at 3 days after feeding.Pls describe the control or untreated treatment.

Statistical analysis

The data obtained in present study was subjected to analysis of variant(change to ce)(ANOVA) significant difference between treatments and controlled(del.)were determined by Tukey's multiple range test ($P \leq 0.05$).

Result and Discussions

The *Vitexnegundo* leaf extract in chloroform (10.30%) showed the highest level of larval death, followed by the extract in acetone (7.7%). The leaf extract in methanol showed the lowest mortality (3.09%). (Table 1 & Fig 1). In *P. xylostella*, the aqueous leaf extract of *A. squamosa* at 10% resulted in 66.70% larval death (Chandrashekharaiah et al., 2015). When used to combat *S. litura*, *Artemesianilagrica's* ethyl acetate extract resulted in a 40.24% larval mortality rate (Raja et al., 2003).(So what can you conclude about V. negundo's effect on mortality as compared to the above mentioned botanical extracts)

To evaluate the antifeedant activity of *Vitexnegundo* leaf extracts, the amount of leaf area that was consumed by larvae was noted. By comparing the leaf area consumed by the larvae in the treated and untreated groups (13.15%), it is evident that *Vitexnegundo's* chloroform leaf extract (59.42%) and acetone leaf extract (37.68%) exhibit significant antifeedant activity, while the methanol leaf extract of *Vitexnegundo* exhibiteds(del)nonsignificant results (Table 2 & Fig.2). Our findings are consistent with Cassi's earlier observation from(replace to in) 1983 that an aqueous extract of *A. tagala* had antifeedant effect against *S. litura*.What are the possible anti feedant chemical components in V. negundo?

The larval duration significantly increases(change to d) in the *Vitexnegundo* chloroform and methanol extracts (10.23 and 10.56 days, respectively) when compared to the control group. Results comparing the control group (9.2 days) with the acetone extract of *Vitexnegundo* demonstrate the larval duration (Table 3,Fig. 3).What about the result of the test .Pls discuss the possible cause(s) of longer days inchloroform and methanol extracts.The larval life of *H. armigera* was lengthened by the ethyl acetate extract of *Munduleasericea* (Vendan et al., 2008). (Any explanation or hypothesis on longer larval duration?)When treated group and control group were compared, it appeared that the chloroform extract of *Vitexnegundo* (0.391 gms), which was followed by acetone (0.401 gms), methanol extract (0.420 gms), and then the control group (0.621 gms), had dramatically decreased larval weight(Pls reconcile the statement related to the claim of increase weight above)(Table 4 & Fig 4).

Table. 1 Percent larval mortality observed after treatment of *S. litura*(with what)

Treatment	Acetone	Chloroform	Methanol
***Vitexnegundo* (1%)**	7.7 ± 0.95 [a]	10.30 ± 0.69 [b]	3.09 ± 0.78 [b]
Control	0	0	0

Within column ± SD followed by the same letter donotdiffer significantly using Turkey's test, P ≤ 0.05.

a- No significance
b- Significant
c- Highly significant
d- Very highly significant

Table.2 Percentantifeedant activity of plant extracts against S. litura

Treatment	Acetone	Chloroform	Methanol
***Vitexnegundo* (1.0mg/ml)**	37.68 ± 3.19 [b]	59.42 ± 2.62 [b]	28.81 ± 3.83 [a]
Control	13.15 ± 1.72 [a]		

Within column ± SD followed by the same letter donotdiffer significantly using Turkey's test, P ≤ 0.05,

a- No significance
b- Significant
c- Highly significant
d- Very highly significant

Table. 3 Total larval duration (days) of *S. litura*after treatment

Treatment	Acetone	Chloroform	Methanol
***Vitexnegundo* (1.0mg/ml)**	9.3 ± 0.83 [a]	10.23 ± 0.28 [b]	10.56 ± 0.52 [b]
Control	9.2 ± 0.44 [a]		

Within column ± SD followed by the same letter donotdiffer significantly using Turkey's test, P ≤ 0.05.

a- No significance
b- Significant
c- Highly significant
d- Very highly significant

Table.4 Effect of plant extracts on weight of larva (g)

Treatment	Acetone	Chloroform	Methanol
***Vitexnegundo* (1.0mg/ml)**	0.401 ± 0.52 [b]	0.391 ± 0.81 [b]	0.420 ± 0.27 [b]
Control	0.621 ± 63 [a]		

Within column ± SD followed by the same letter donotdiffer significantly using Turkey's test, P ≤ 0.05.

a- No significance
b- Significant
c- Highly significant
d- Very highly significant

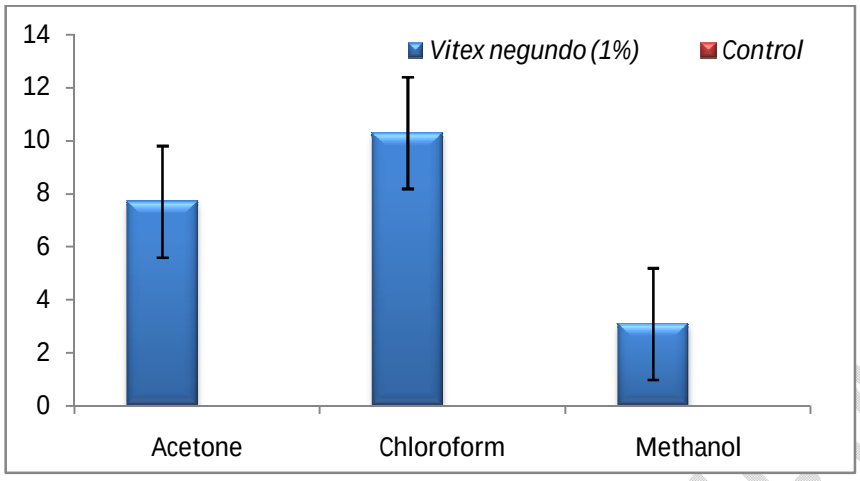

Figure No.(del.)1.Histogram showing Percent larval mortality observed after treatment of *S. litura*

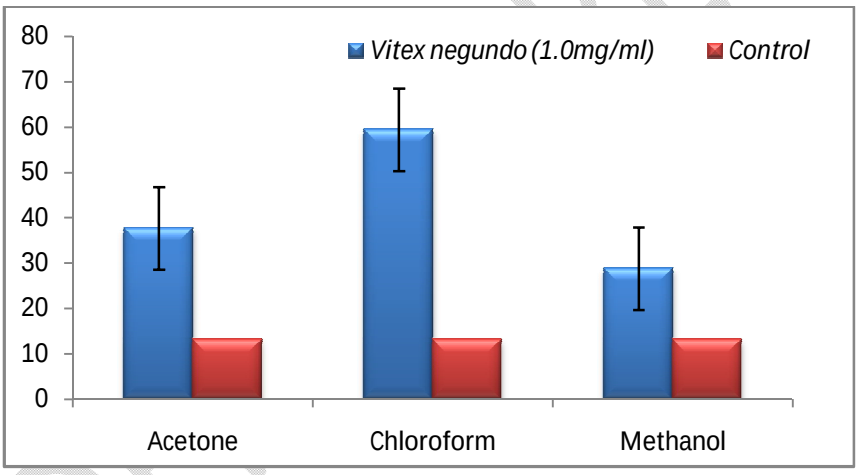

Fig.No.2 –(Pls follow the changes above together with the rest of the figures))Histogram showingpercentantifeedant activity of plant extracts against *S. litura*

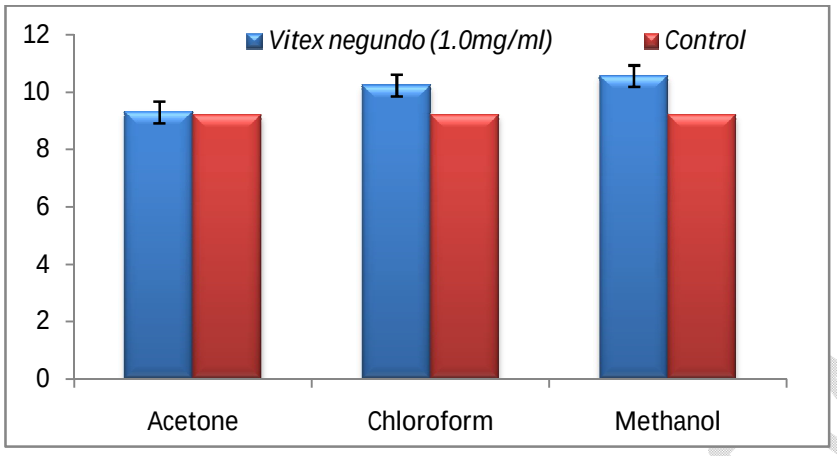

Fig.No.3- Total larval duration (days) of *S. litura*after treatment

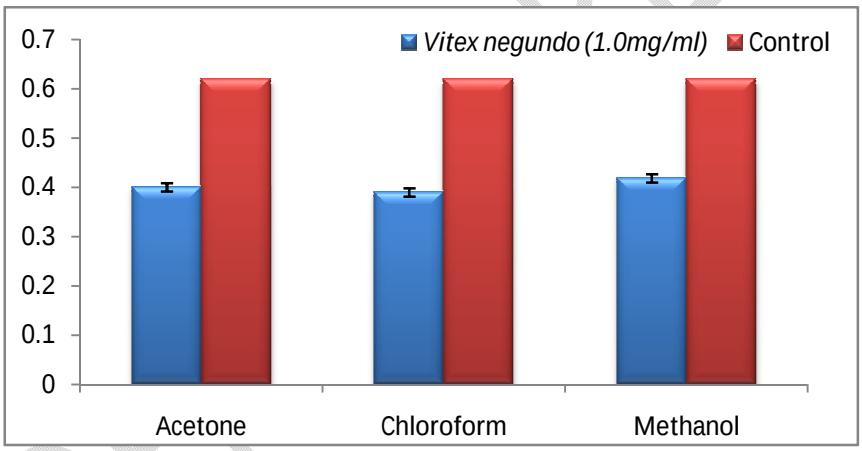

Fig.No.4- Effect of plant extracts on weight of larva (g)

Conclusion

For the management of insects, pest control professionals(change to practitioners or operators) are increasingly turning to pesticides generated from natural sources like botanicals as an alternative to traditional chemical pesticides. When the effectof leaf extract of *Vitexnegundo* (L) was investigated for evaluation of percent mortality, larval duration, percentage of antifeedant activity, and larval weight, it was shown that the plant extracts displayed

pesticidalcapabilities.(please rework the sentence.).According to the findings of the current experiment, *Vitexnegundo* leaf solvent extracts with 1.0 mg/ml concentrations of effective antifeedant properties. While studying all aspects of *Spodopteralitura's* life cycle, the chloroform extract of *Vitexnegundo* leaf shown the greatest impacts.(del.)The leaf extract of *Vitexnegundo* in various solvents will be the most effective, according to the findings of the current investigation. As a result of the current experiment, it has been determined that(del.).Therefore the leaf extract of *Vitexnegundo* in various solventsmediums will be the ideal(del.) can be considered as alternative substitute(del,)for chemical pesticides against *Spodopteralitura*due to its various effect on the larval development of *S. litura*.anti-insect potential.(del)

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