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Evaluation of some botanical and chemical insecticides against the insect pests of okra

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Abstract
The efficacy of botanical insecticides i.e. Neem seed crude extract (2.5%), Turmeric (3.5%), Garlic extract (5%), Henge extract (2.5%) and Thiodan (0.07%) were evaluated against the insect pests (*Earias insulana*, *Amrasca devastans* and *Oxycaremus loetus*) of Okra at the New Developmental Farm (NDF) of the University of Agriculture Peshawar, Pakistan during 2012. Significant effect was recorded in all the treatments as compared to the control. The lowest mean number (2.0) of *E. insulana* larvae plant^{-1} were recorded in Neem and Thiodan whereas the highest mean number of 3.25 was recorded in control. Significant lowest mean number (2.00) of *A. devastans* was recorded in Thiodan and was highest (8.00) in control. *O. leotus* mean number were lowest (2.75) in Thiodan and highest (7.25) in control. It is also concluded that a highest yield (kg plot^{-1}) were recorded in Thiodan and Neem. Results also showed highest percent increase in yield over control in Neem and Thiodan. Based on the total yield and percent yield increase Thiodan and Neem were the most promising insecticides for the effective management of insect Pest of Okra.

Keywords: Botanical, insecticides, insect pest, Okra

1. Introduction
Okra (*Abelmoschus esculentus* L.) is the only vegetable crop of significance in the Malvaceae family and is widely grown in tropics and subtropics for its tender green pods [1]. The plant is rich in minerals, carbohydrates fibre, protein, fat and phenols [2]. The crop is grown in Pakistan during summer season and its average yield is 8 to 10 tons ha^{-1} only. The total area under okra cultivation is 14.00 thousands ha with a total production of 108.00 thousands tons [3].
Okra is attacked by various serious economic pests i.e. cotton aphid (*Aphis gossypii*), spotted bollworm (*Earias insulana*), American bollworm (*Helicoverpa armigera*), jassid (*Amrasca devastans*) and *Oxycaremus loetus* [4]. Farmers generally practice insecticides for pest management and higher yield. A wide variety of insecticides e.g. organophosphates, carbamates, organochlorine and pyrethroids are used for the control of Okra pests in many countries [5]. Extensive use of insecticides leads to the problems of pest resistance, resurgence, pesticides residues, destruction of beneficial fauna and environmental pollution [6].
In Pakistan particularly in Khyber Pakhtunkhwa Province, commercial use of botanical insecticides is very limited. Its utilization is restricted only to the home gardeners and small scale organic growers. Many of the botanicals have been explored having broad spectrum activity and have the potential to become alternatives to chemical insecticides. Since botanicals give effective control like the synthetic insecticides as they are environmental friendly, so the focus should be on the encouragement of the use of botanicals to tackle problems associated with other insecticides.
The present study is an attempt to evaluate and compare the efficacy of some botanicals and a chemical insecticide against the insect pest of Okra.

2. Materials and Methods
The research trial was conducted at the New Developmental Farm of the University of Agriculture, Peshawar during 2012. A randomized complete block design with 6 treatments and 4 replications was setup. Plot sizes were 12 m^2 and plot consisted of 3 lines. Sabz pari variety was planted on March 22nd, 2012. Recommended agronomic practices were applied and manual weeding and irrigation was carried out when necessary. The first spray was performed before the appearance of the pest, followed by a spray after 15 days interval.

Treatments

T_1 Neem seed crude extracts (2.5%)
T_2 Turmeric crude extracts (3.5%)
T_3 Garlic crude extracts (5%)
T_4 Asafetida (Henge) crude extracts (2.5%)
T_5 Thiodan (0.07%)
T_6 Control

Thiodan 3.5 E.C, Neem seeds, Turmeric and Asafetida (Henge) were purchased from local market. Neem seed crude extract (2.5%), Turmeric, Asafetida (Henge) and Garlic crude extract was prepared by the procedure adopted by Munir, 2006 [7].

Observations recorded

The data were recorded on weekly basis for eight weeks. The number of insect pests was recorded on five randomly selected plants in each treatment. Number of damage fruits and yield of okra in each treatment were also recorded.

Data analysis

Statistical package MSTAT-C was used to analyze the data. Statistical significance was assessed by DMRT at 5% significant level [8].

3. Results and Discussion

Results of the effects of botanical and chemical insecticides on the insect pest of okra are described and discussed below.

3.1 Effect of insecticides on various insects of Okra

Figure1 revealed highest mean number of *Earias insulana* larvae fruit^{-1} in control as compared to all other treatments. The figure showed lowest number of larvae fruit^{-1} in Thiodan and Neem whereas same number of larvae fruit^{-1} was recorded in Garlic, Turmeric and Henge extracts. The pest appeared in the 1st week and its density started increasing in the subsequent weeks up to 4th week and peaked in 5th week. This highest number of *E. insulana* larvae fruit^{-1} may be due to the presence of host and favorable environmental conditions. Another important reason of the abundance may be the season of the pest. A gradual decline of pest density was recorded in the subsequent weeks and reached to lowest number in the eight week. Neem and Thiodan reduces the pest density and recorded lowest number of *E. insulana* larvae fruit^{-1} as compared to all other treatments and also with the control.

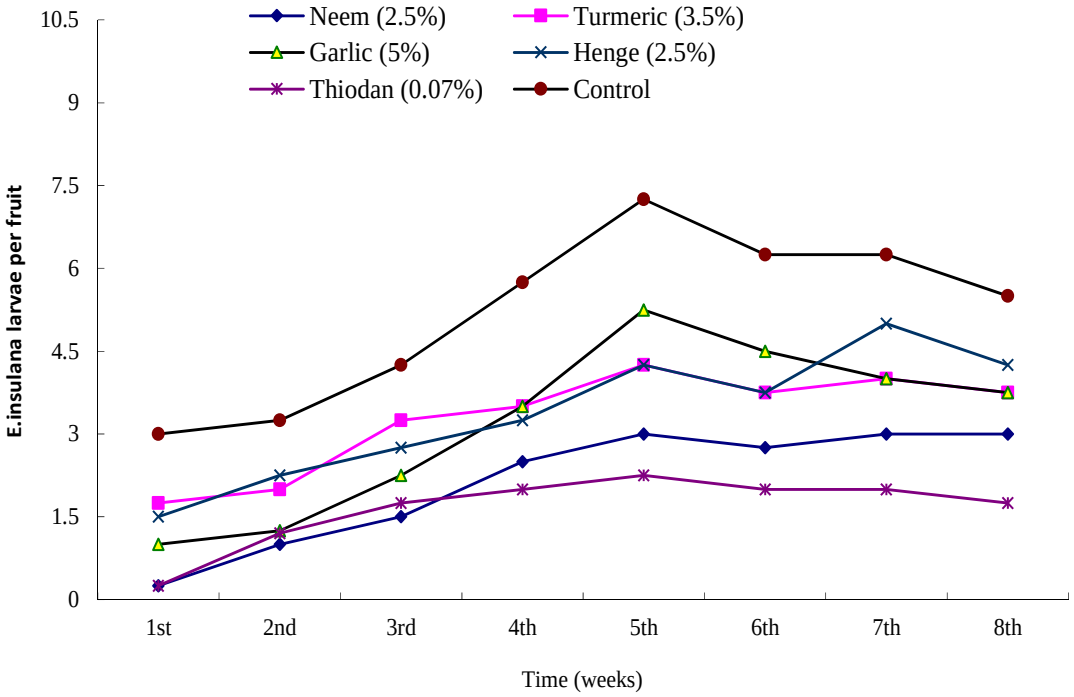

Fig1: Mean number of *E. insulana* larvae fruit^{-1}on Okra

Highest mean number of *Amrasca devastans* leaf^{-1} was recorded in control as compared to all other treatments where the mean number of *A. devastans* leaf^{-1} was lowest (Fig.2). The pest activities started in the 1st week and gradually increased up to 4th week. In the 5th week the mean number of *A. devastans* leaf^{-1} reached to its peak. The reason may be due to seasonal abundance of the pest and host availability. A decline in the pest density was recorded from 6th week and continued in the subsequent weeks up to the 8th week. The mean number of *A. devastans* leaf^{-1} was recorded lowest in Thiodan and Neem followed by Henge, Turmeric and Garlic. In control the highest mean number of *A. devastans* leaf^{-1} was recorded.

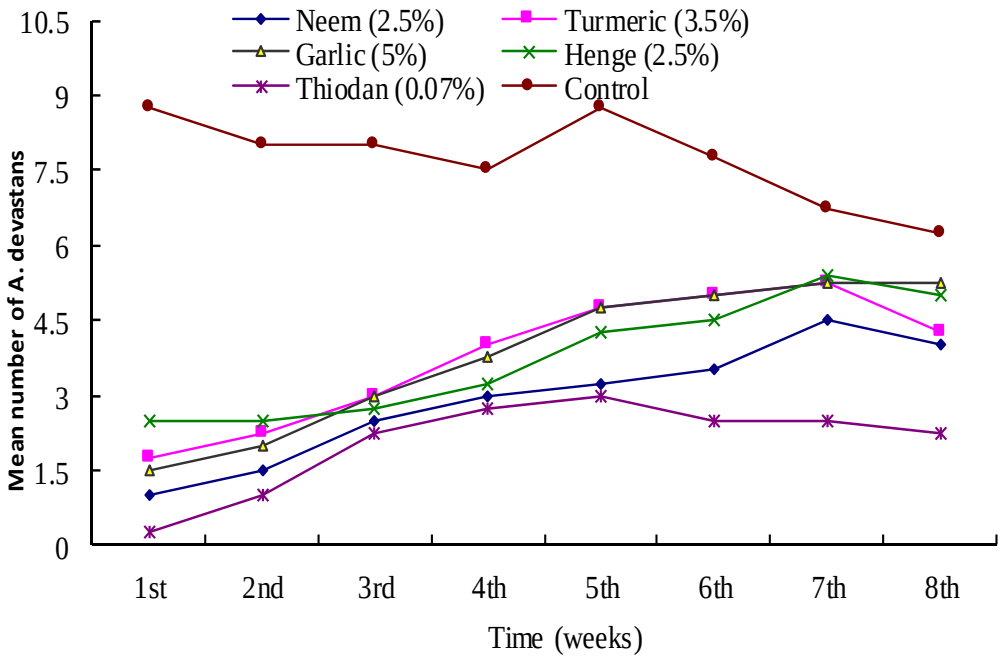

Fig 2: Mean number of *A. devastans* leaf^{-1}on Okra

Figure3 indicates highest mean number of *Oxycaremus loetus* plant^{-1} in control as compared to all other treatments. In Thiodan and Neem the mean number of pest plant^{-1} was recorded lowest as compared to Garlic, Turmeric and Henge extracts. The pest appeared in the 1st week and started increasing in the subsequent weeks up to 4th week and peaked in 5th week to a highest number. This may be due to the host presence and favorable environmental conditions. A gradual decline of pest density was recorded in the subsequent weeks and reached to lowest number in the eight week. In treatments (Neem and Thiodan) lowest number of *O. leotus* plant^{-1} was recorded as compared to all control and other treatments.

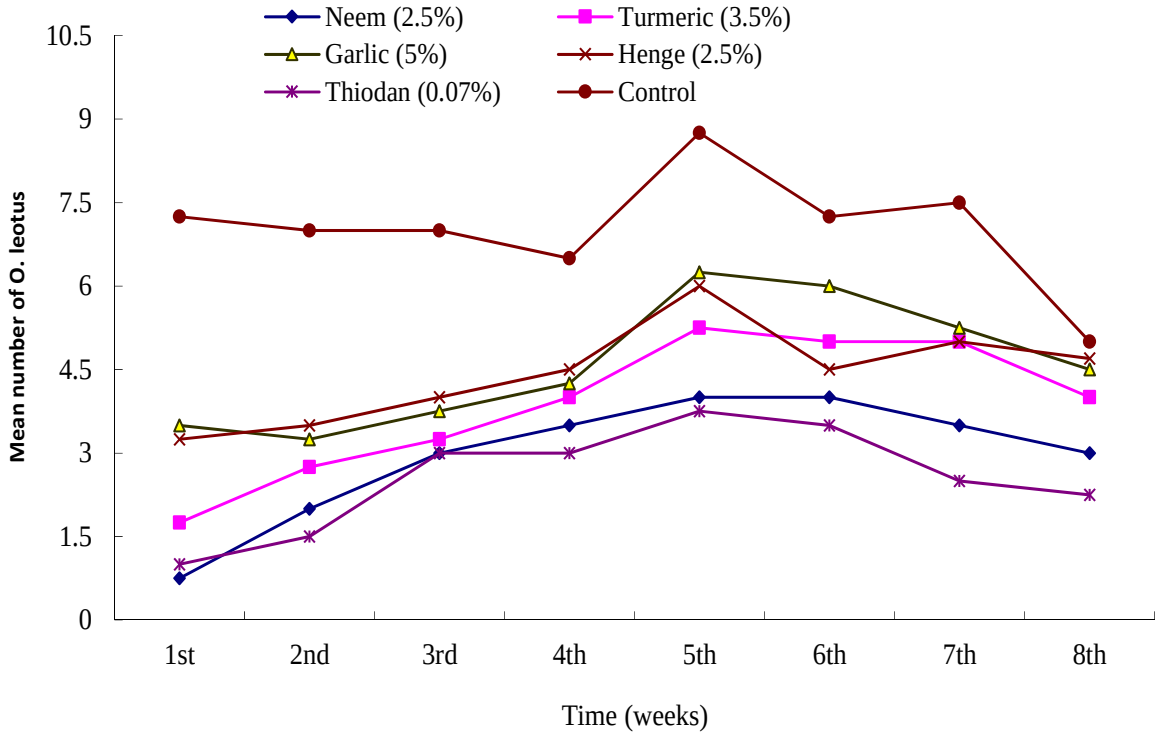

Fig 3: Mean number of *O. leotus* plant^{-1} on Okra

Evaluation of the tested insecticides revealed significance difference between the control and treatments. Both Neem and chemical insecticide have significantly reduced the larval population of *E. insulana*. Turmeric, Garlic and henge were not significant among each other. Mean number of larvae fruit^{-1} recorded in Neem and Thiodan were 2.00 in both as compared to control where the mean numbers of larvae fruit^{-1} were 5.25. Larval population of *E. insulana* larvae fruit^{-1} recorded on turmeric, garlic and henge were 3.25, 3.00 and 3.50 respectively. Both the Neem and chemical insecticides are effective in controlling the larval population. These results coincide with the findings of Ambekar *et al.* (2000) [9] wherein they concluded that Neem product Achok was best in reducing the fruit borer infestation. Mudathir and Basidow (2004) [10]

used Neem kernel water extract (5%) containing Azadirachtin and reported significant reduction in the attack of okra pests as well as increase in yield. Similarly Pun *et al.* (2005) [11] reported that spraying with Neem seed kernel extract proved most effective in reducing the load of whitefly population on okra and also increased the yield.

Singhem *et al.* (2008) [12] evaluated the efficacy of some biopesticides and chemical insecticides against *E. vitella* and *H. armigera* in Okra. They indicated that Endosulfan+ monocrotophos and NPV + Endosulfan significantly managed both borer pests and gave significant higher yield of Okra.

Data (Table 1) indicated significance difference between the treatments and the control. No significant difference was recorded among the treatments. Lowest population (2.00) of *A. devastans* leaf^{-1} was recorded in Thiodan and Neem (3.00) as compared to the control where the population of *A. devastans* leaf^{-1} was recorded 8.00. Turmeric, garlic and henge were equally effective in controlling the Jassids population (4.00 jassid leaf^{-1}). All the treatments were equally effective in reducing the *A. devastans* population as compared to the untreated plot. These findings are in accordance with the report of Patel *et al.* (1996) [13] who concluded that Neem seed kernel 5% showed a repellent effect against jassids. Bindu *et al.* (2005) [14] found that Achok (A Neem product) provided effective control against jassids in okra crop.

Table 1: Effects of insecticides on mean population of various insects, yield and yield increase over control in Okra during 2008.

Treatments	*E. insulana*	*A. devastans*	*O. loetus*	Yield (kg plot^{-1})	Yield increase over control (%)
Neem (2.5%)	2.00 c	3.00 bc	3.25 bc	7.40 a	13.50
Turmeric (3.5%)	3.25 b	4.00 b	3.75 bc	6.97 bc	6.90
Garlic (5%)	3.00 b	4.00 b	4.50 b	6.80 cd	4.29
Henge (2.5%)	3.50 b	4.00 b	4.75 b	6.90 bcd	5.83
Thiodan (0.07%)	2.00 c	2.00 c	2.75 c	7.25 ab	11.20
Control	5.25 a	8.00 a	7.25 a	6.52 d	-

Treatments means with common letters are non-significant by DMRT at 5% level of significance

Data in Table 1 indicated that all the treatments were significant in reducing the mean number of *O. loetus* as compared to the control treatment. The lowest number (2.75 plant^{-1}) was recorded in Thiodan (0.07%) whereas the highest number (7.25 plant^{-1}) was recorded in control. Mean number of *O. loetus* plant^{-1} recorded on Neem, Turmeric, garlic and henge were 3.25, 3.75, 4.50 and 4.75, respectively. Both the chemical and botanical insecticides were effective in reducing the mean number of *O. loetus*. *O. loetus* is considered as a minor pest of Okra crop, therefore no special attention has been paid regarding its damage.

3.2 Effect on yield and percent yield increase

Fruit yield increased significantly in all the insecticidal treated plots over the untreated (control) plots (Table 1). Highest average yield of 7.40 kg plot^{-1} was recorded in the plot treated with Neem seed extract as compared to the control where the lowest average yield of 6.52 was recorded. Yield obtained from Turmeric, garlic, henge and Thiodan were 6.97, 6.80, 6.90 and 7.25 kg plot^{-1}, respectively. The significant effect of Neem seed crude extract (2.5%) in increasing yield in the present study agreed with the finding of Mudathir and Basedow (2004) [10], Pun *et al.* (2005) [11] and Adilakshmi *et al.* (2007) [6]. According to Mudathir and Basedow (2004) [10], the Neem seed water extract effectively reduced the population of okra pests and increased the yield. Similarly, Pun *et al.* (2005) [11] reported that Neem seed kernel extract not only significantly reduced the whitefly population but also increased its yield. Adilakshmi *et al.* (2007) [6] also found significant yield increase with Neem seed kernel extract. Singhem *et al.* (2008) [12] reported for higher yield of marketable Okra with chemical insecticides. A highest percent yield increase of 13.50 was recorded in Neem followed by Thiodan with percent yield increase of 11.20%. The lowest percent yield increase over control was recorded in Garlic (4.29%). The percent increase in yield in Turmeric and Henge was 6.90 and 5.83%, respectively.

4. Conclusion and Recommendations

The present study revealed that Thiodan and Neem seed crude extract were the most effective insecticides against the insect pest of Okra. Lowest mean population of *E. insulana*, *A. devastans* and *O. leotus* were recorded in Thiodan and Neem. Yield and percent yield increase over control were also highest in Neem and Thiodan. Farmers can utilize Neem seed crude extract for the effective control of Okra pests in field as having low mammalian toxicity, low cost and less environmental hazard.

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