Efficacy of Different Plant Extracts Against Diamondback Moth, *Plutella xylostella* (L.) on Cauliflower

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Abstract

The results of studies on the efficacy of different bio-pesticides against 2nd and 3rd instar *Plutella xylostella* larvae on cauliflower under laboratory conditions were carried out in the Department of Entomology. After 24 h the neem extract was found to be the most effective treatment with maximum (14.67%) mortality followed by tobacco extract, datura, akk and control treatments it was 13.33,10, 11.33 and 0.67%, respectively. It is evident from the data that mortality of 2nd instar larvae after 48 hours was observed increasing with the rate of 23.33, 16.67, 12.67, 14 and 0.67% for neem, tobacco, datura, akk extract and control treatment, respectively. It can be also observed from the data that on 72 hours increasing trend was remained continue with maximum 32, 25.33, 16.66, 20.66 and 4% for neem, tobacco, datura, akk extract and control treatment, respectively. The reductions in mortality in 2nd instar larvae, among plant extracts were observed after 96 hours and it was 21.33, 18, 13.33, 16.66 and 4% when treated with neem, tobacco, datura, akk extract and control, respectively. It was concluded from the data that mortality of L3 after 48 hours was observed increasing with the rate of 20.66, 14, 11.33, 12 and 0.66% for neem, tobacco, datura, akk extract and control treatment, respectively and after 72 hours increasing trend was remained continue with maximum 26, 19.33, 14, 17.33 and 3.33% for neem, tobacco, datura, akk extract and control treatment, respectively. The reductions in mortality in L3, among plant extracts were observed after 96 h and it was 18, 16, 12, 15.33 and 4% when treated with neem, tobacco, datura, akk extract and control, respectively.

Keywords: efficacy, plant extracts, diamondback moth and cauliflower

1. Introduction

The diamondback moth (DBM), *Plutella xylostella* (Linnaeus), is an important and multicultural pest that feeds exclusively on crucifers [1, 2]. It was [1] reported that in the tropics and subtropics region *P. xylostella* has become a common and a major obstacle in economic growth of cruciferous vegetables. Crucifers' grown-up in extensively hot and humid areas, where *P. xylostella* continues to cause severe loss and often causes a complete loss of the crop [3, 4 and 5]. It is the greatest threat to crucifer production in many parts of the world, sometime causing

more than 90% crop loss [6]. Pesticides have been the primary means to control *P. xylostella* for more than 40 years [7].

Due to indiscriminate use of pesticides it has developed a resistance, now it has been very difficult to control his increasing population, particularly in Southeast Asia and the Far East [8, 9]. It is also time intensifying concerns about the long-term environmental impact of vegetable production, focusing particularly on the heavy use of pesticides with local health hazards, pesticide residues for consumers, the build-up of resistance and contamination of the environment. These problems have increased the interest in alternative control methods, such as integrated pest management (IPM), crop rotation and biological control [10]. New technologies, such as plant extract pesticides, are starting to overcome the problem of resistance. Keeping the view the work was done in laboratory and studies were carded out specifically to determine the effect of different plant extracts on survival of 2nd and 3rd instar larvae of *P. xylostella* on cauliflower

2. Material and Methods

The present studies on the efficacy of different plant extracts against diamondback moth, *Plutella xylostella* (L.) on cauliflower under laboratory conditions were carried out in the Department of Entomology.

2.1. Culture of the host

P. xylostella adults were obtained from the laboratory of Agriculture Research Institute Tandojam to observe the efficacy of bio-pesticide on 2nd and 3rd instar larvae of *P. xylostella*. The Chinese cabbage leaves were boiled in a pan. The stock was used to soak parafilm which was then allowed to dry. This was placed inside a container ready for oviposition by adult Plutella. The adults were removed after 24 hours and the eggs given time to develop at 25 °C and 70% relative humidity. Upon hatching the first instar were transferred in screen cages (42cm X43cm X55cm) in laboratory room at a temperature of 25 (±5) ^{0}C. Their larvae were fed with Chinese cabbage leaves after emerging 2nd instar they were shifted to leaf discs in a 5 cm Petri dishes. Moist filter paper was laid underneath to the disc to delay desiccation. Four hundred µl of water applied to the filter paper to moisten it. Five larvae were placed into each Petri dish acting as one sample unit or replicate. Same procedure were used for 3rd instar

2.2. Plant materials

Extracts were prepared from 4 plants leaves of akk (*Calotropis procera*), datura or jimson weed (*Datura stamonium*), neem **(***Azadirachta indica* A. Juss**)** and tobacco (*N. tabacum*) were put in the local grinder (manually used). After that the extracts were set in the muslin cloth and squeezed them. The 100% of extracts preserved in well-cleaned bottles. Stock of distilled water was also obtained from local market for preparation of the solutions of suspension 2% solutions of extract were separately mixed with 98% distilled water of akk, datura, neem and tobacco respectively steeped in water.

3. Leaf disc bioassay

Bioassays were conducted with 2nd and 3rd instar larvae of *P. xylostella* on Chinese cabbage leaf discs. Test solutions were prepared in 98 ml distilled water with 2 ml pure extract as an additional surfactant. Each leaf disc (4.8 cm dia.) was immersed in a test solution for 10 s. For control, leaf disc were dipped in surfactant solution without any test solution. The leaf discs were placed in individual Petri dishes (5 cm dia.) containing a moistened filter paper and Five larvae (L2) were placed in each dish 6 replicates were made per treatment including the control. The mortality was assessed after 24, 48, 72 and 96 h. same procedure was used for L3. For all residual analysis data were corrected for mortality, using Abbott formula [11]

4. Results

4.1. Effect of different plant extracts on mortality of 2nd instar larvae

The regression analysis depicted that efficacy of extracts was less in initial hours against 2nd instar larvae and there was positive correlation between extracts efficacy with time intervals, it increased with increasing time and reached their highest on 72 hours. The regression model further indicated that the mortality reached their peak just few hours before 72 h on 67.58 h for neem followed by tobbaco, dhatora and akk it was 69.46, 69.68 and 68.61. R-squire of regression was about 0.75 for neem followed by tobbaco, dhatora and akk it was 0.49, 0.44 and 0.43, respectively. It revealed that 75, 49, 44 and 44% variation in mortality was counted by time interval.

The neem extract was found to be the most effective treatment with maximum (14.67%) mortality followed by tobacco extract, datura, akk and control treatments 13.33,10, 11.33 and 0.67%, respectively after 24 h. It is evident from the data that mortality of 2nd instar larvae after 48 hours was observed increasing with the rate of 23.33, 16.67, 12.67, 14 and 0.67% for neem, tobacco, datura, akk extract and control treatment, respectively. It was also observed from the data that on 72 hours increasing trend was remained continue with maximum 32, 25.33, 16.66, 20.66 and 4% for neem, tobacco, datura, akk extract and control treatment, respectively. The reductions in mortality in 2nd instar larvae, among plant extracts were observed after 96 hours and it was 21.33, 18, 13.33, 16.66 and 4% when treated with neem, tobacco, datura, akk extract and control, respectively.

4.2. Effect of plant extracts on mortality of 3rd instar larvae

The regression analysis also depicted that efficacy of extracts was less in initial hours against 3rd instar larvae and reached their peak on 72 hours. The regression model further indicated that the mortality reached their peak just few hours before 72 h on 66.08 h for neem followed by tobbaco, dhatora and akk it was 73.68, 78.62 and 95.37. R-squire of regression was about 0.66 for neem followed by tobbaco, dhatora and akk it was 0.54, 0.19 and 0.52, respectively and it revealed that 66, 54, 19 and 52% variation in mortality was counted by time interval, respectively.

Extracts derived from various plant leaves affected the survival of 3rd instar during 24 hours. The neem extract was found to be the most effective treatment with maximum mortality (14.66%) followed by tobacco extract, datura, akk and control treatments 11.33,10, 11.66 and 0%, respectively (fig- 2).

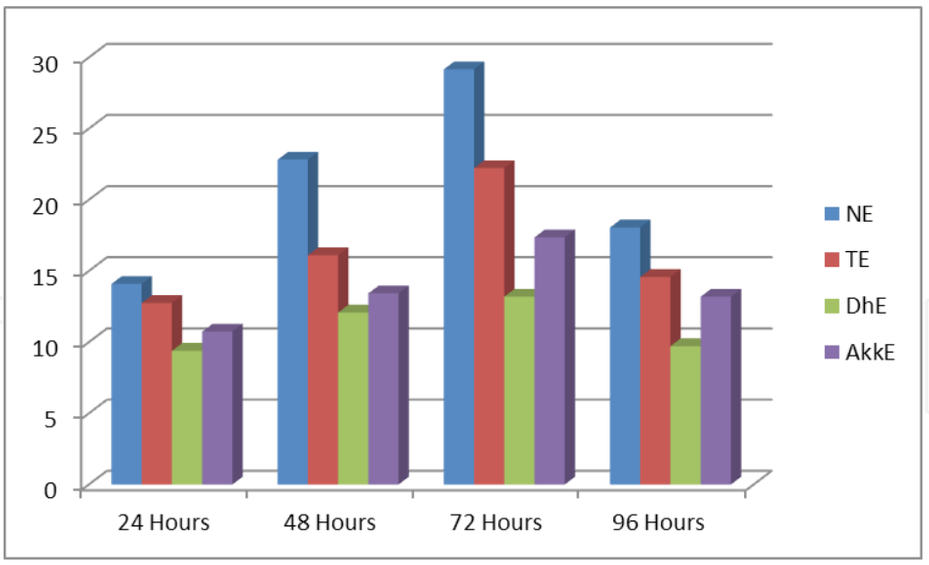

Fig 1. Efficacy of different plant extracts against 2nd instar larvae on different time intervals

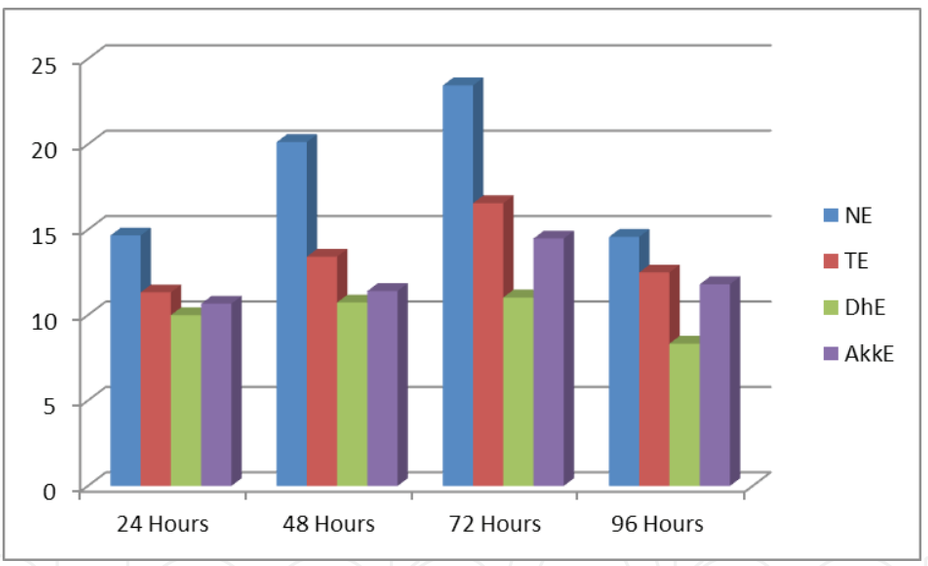

Fig 2. Efficacy of different plant extracts against 3rd instar larvae on different time intervals

5. Discussion

Different plant extracts caused different percentage of reductions of the target pest on different time intervals. The present study showed that neem extracts found to be more effective control of 2nd and 3rd instar larvae of the of *P. xylostella* when compared with other plant extracts.

The results of our study, which suggest neem extract as a better pest control it is in accordance with previous studies, where neem extract marginally increased the mortality of *P. xylostella* larvae [12]. It is also reported by many researchers that neem extracts limiting different pest species

in the world [13, 14]. It was [14] observed that neem extracts can be successfully used as an excellent substitute to synthetic insecticides.

In our studies the tobacco extracts were also found to be the most active against these larval instars, affecting their survival. The results supported by the findings of the earlier workers [12] they reported that the use of tobacco extract is effective for control of larval instar of diamondback moth.

During the study it was observed that there is effect of akk extract on the survival of 2nd and 3rd instar larvae of diamondback moth. It is also in agreement with [15] who reported that leaf extract of *C. procera* decreased mosquito larvae population may be due to the different compounds present in the extract possessing different bioactivities.

The study also indicate that dhatora extracts effect the activity of larval instars during the experiment conducted in the laboratory It is clearly proved by the researchers that dhatora plant extracts are less expensive and highly effective for the control of insect pests [16, 17]. The extract of *D. alba* could be used as an effective botanical insecticide to be included in the Integrated Pest Management Programme for *P. americana* and other insect pests as well.

6. References

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