Effect of Bitter lactuce (*Lactoca serriola*) on two spotted Spider mite infestation on Cucumbers.

Research Project
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By:
Sipan Abdolkhalq Zada

Supervised by:
Asst. Lecturer: Mr.Omar Osman

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CERTIFICSATE

This research project has been written under my supervision submitted for the aware of the BSc.degree in Agricultural Science Plant protection with my approval as a supervisor .

Signature
Name Ass.Lectuer Omer Osmad
Data 3-4-2023

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Abstract

The research was carried out to investigate the occurrence and destroying of two spotted spider mite *Tetranychus urticae* using different concentrations plant extract Bitter lactuce against spider mite infestation on cucumber. The results showed that the highest percent mortality of mites was 33.91% after 24 hour when 100ml/ 1 litter was used. While, the lowest mortality percent was 6.67% by using 50lm plant extract.

1. INTRODUCTION: 1

The cucumber (*Cucumis sativus*) belongs to the Cucurbitaceae plant family, it is one of the most important plant families. The genus Cucumis contains nearly 40 species, cucumber is one of the most important cultivated crop and have a lot benefits of cucumber for example which contains alkaline forming minerals and an excellent source of ascorbic acid, (antioxidants) and lesser amounts of vitamin B complex. (Maheshwari *et al*., 2014).

The two-spotted spider mite, Tetranychus urticae (Acari: Tetranychidae), is one of the world's most harmful agricultural pests, and feeds on over 1,100 plant species from over 140 botanical families, including species known to produce toxic compounds (Ricardo 2019, Mohamed 2019). This pest responsible for significant yield loss in economic crops, in agricultural crops worldwide (Abd El-Moneim 2012, Jonckheere 2018, Flore 2019). Field crop hosts include soybean, corn, and cotton, horticultural crops include apples, pears, peaches, and hops, greenhouse host plants include cucumber, tomato, eggplant, pepper and zucchini and ornamental crops include roses, carnations and chrysanthemums. Perennial cultures affected by spider mites include strawberries, grapes, plums and alfalfa (Eziah 2016).

T. urticae is one of the most serious agricultural pests in the world. This mite is polyphagous and attacks the a wide range of crops. The importance of this mite pest is not only due to its direct damage to plants including defoliation, leaf burning, and even in excessive outbreaks plant death but also indirect damage to plants which decreases in photosynthesis and transpiration. The rapid developmental rate and high reproductive potential of *T. urticae* allows them to achieve damaging population levels very quickly when growth conditions are good, resulting in an equally rapid decline of host plant quality (Skorupska, 2004).

Plants of the genus Lettuce (*Lactuca serriola*.) are representatives of the Astros family and have about 150 plant species, among which there is a wide variety of life forms: these are annual, biennial, perennial herbaceous plants, as well as shrubs from 20 to 190cm in height.

A common feature that combines plants of the genus Lettuce is the presence of milky juice located in the corresponding vessels, which form a system of tubes anastomosing with each other, arising from elongated cells, while there are no transverse septa between them (Elshar Kawy E and Alshathly, 2013).

2. Main objects of study:

- Use plant extract Bitter Lactoca (*Lactoca serriola*) extract to control Spider mite.
- Effect of Bitter Lactoc (*Lactoca serriola)* extract on the two spotted Spider mite infestation on Cucumbers.

3. LITERATURE REVIEW 4

3.1 Spider Mite (*T. urticae*)

The most important spider mite is the two spotted spider mite (TSSM) *Tetranychus urticae*. It was first described by Koch in 1836 (Pritchard and Baker, 1955). It is thought to originate from temperate climates (Fasulo and Denmark, 2000). It is a ubiquitous agricultural pest with a global distribution (Nauen *et al*., 2001).

T. *urticae* belongs to an assemblage of web spinning mites and the name 'spider' highlights their ability to produce silk like webbing (Gerson, 1985). As mites move around, their webbing can span leaves and stems. Eggs are deposited beneath the webbing and larvae and nymphs develop within it. The webbing defines the colony boundaries (Brandenburg and Kennedy, 1987), serves as a means of protection from rain, wind, and predators (Gerson, 1985).

T. *urticae* is the most notorious pest responsible for significant yield losses in many economic crops, vegetables and fruit trees (Ahmed, 1988) and also horticultural, ornamental and agronomic crops worldwide (James and Price, 2002) and this is because of its feeding habits on the underside of leaves, removing vital chlorophyll and causing a reduction in photosynthetic activity (Steinkraus *et al*., 2003).

3.2 Spider Mite Classification

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The T. urticae according to Hoy, 2011 are classified:

Kingdom Animalia

Phylum Arthropoda

Subphylum Chelicerata

Class Arachnida

Subclass Acari or Acarina

Order Trombidiformes (or Acariformes)

Suborder Prostigmata

Superfamily Tetranychidae

Family Tetranychidae

Genus *Tetranychus*

Species urticae

Tetranychus urticae Koch, 1836

All mites are classified as Acari, the most diverse taxon within the subphylum Chelicerata, with over 40,000 described species representing a de range of life histories, from human and veterinary impact to agricultural damage (Grbic, 2011).

Taxonomy of spider mites is not completely understood. There are still many undescribed species, and some known species are difficult to identify accurately because of within species variation, the strong similarity among closely related species, the difficulty of properly mounting male specimens, and the rarity of males. It is therefore advised that the specimens are compared with other material identified by a specialist of Tetranychidae, and that they are kept for future reference or taxonomic studies (NAPPO, 2014).

3.3 Life Cycle of the T. *urticae*

The life cycle of Tetranychid mites are progresses through a series of five stages, egg, larva, protonymph, deutonymph, before finally molting into an adult male or female (Crooker 1985). Sexes are dimorphic: males are smaller with a tapered posterior end to their body, while females are larger and more rounds in shape. Eggs appear as translucent pearl-like spheres, 0.1mm in diameter, and are deposited singly (Van Leeuwen 2012). The developmental period of the eggs varies from 3 days at 24 C to 21 days at 11 C (Cagle 1949).In the other hand the life cycle of T. urticae has been studied by several authors (Helle and Sabelis, 1985) which passes through five developmental stages: egg, larva, protonymph.deutonymph, and adult. Eggs are round and translucent, turn orange and larvae hatch in about 5 days under optimum conditions of 25-30 C° and 45-55% relative humidity. One generation is completed in 10-14 days when the temperature is between 21-23C (Meyer, 1981) and in 7 days when temperature is higher than 30 C° (Herbert, 1981).Egg laying by females can begin as early as one or two days following maturity. Each female may lay up to 100 eggs in her 30 days life span. Fas become reddish as they develop, until hatching into

six-legged Jarvae The larvae, along with the next two eight-legged nymphal stages protonymph and deutonymph) are all active immature stages that feed on the host plant, that are followed by a period of quiescence. During quiescence a mite is inactive and attaches itself to the leaf substrate (Crooker, 1985).

3.4 Economic damage of two spotted Spider mite on Cucumber.

Two spotted Spider mite *Tetranychus urticae* Koch, is a common pest of glasshouse vegetables, including cucumbers.*T. urticae* injures individual leaf cells, causing the reduction of total chlorophyll content and net photosynthetic rate of leaves (Hall and Ferree 1975). Such leaf cell and tissue injury alters carbon allocation patterns of plant organs (Wyman *et al*. 1979) (Figure1).

Figure (1): Symptom two spotted Spider mite on Cucumber.

https://vegcropshotline.org/article/two-spotted-spider-mite-control/

3.5 Plant Bitter Lactoca.

Bitter Lactoca is a winter or summer annual, meridional temperate, and west-euroasiatic species, although it has a synanthropic world-wide distribution nowadays. The taxon displays considerable morphological, geographic, and genetic variation and ranges over a broad spectrum of different habitats. There are two forms within *L. serriola* L., viz., *L. serriola* L. *f. serriola* and *L. serriola* L. *f. integrifolia*. Recently, *L.serriola* has spread throughout Europe as an invasive weed. It is considered a progenitor of cultivated lettuce (*Lactuca sativa* L.). (LebedaI *et al*.,2007).

3.6 Effect of pesticide and plant extraction on the Environments.

The management of insect pests has always been and will continue to be a constant challenge to agricultural researchers and producers alike. As insect resistance to commonly used pesticides builds and the removal of more toxic pesticides from the market continues, con-trolling insect pest infestations will become increasing glymore difficult. Therefore, as farmers struggle to remain profitable in a highly competitive global economy, they will be constantly faced with the dilemma of producing ghigh quality, pest-free crops within economical means,and without endangering the environment and the worker's safety. This struggle has resulted to increased research into alternative control methods, which are cost-effective, environmentally-friendly and capable of keeping insect pests at bay. As plants constitute a rich source of bioactive chemical compounds, botanical insecticides may present at-tractive alternatives to currently used synthetic chemical insecticides for pest management (Pavela, 2016). Besides their insecticidal potential, they have been reported to pose little threat to the environment or to human health as compared to synthetic pesticides (Pavela, 2016). Several secondary metabolites present in plants serve as a defense mechanism against insect attacks and it has been demonstrated that the pesticidal properties of plant chemicals can be specific to particular target species, biodegradable to non-toxic products

and potential-ly suitable for use in an integrated pest management(IPM) program (D'Incao et al. 2013). Despite the attractive insecticidal potential of phytochemicals and the abundant scientific literature documenting the bioactivity of plant deriva-tives against insect pests, there still remain few pros-pects for commercial development of new botanical products. This is partly due to regulatory barriers andthe availability of competing products (newer syn-thetics, fermentation products, microbials), and principally due to lack of knowledge about the many other existing plants with insecticidal properties against insect pests. Over 6000 plant species are known to have insecticidal properties and many of these plants are used by farmers in developing countries (Walia and Koul 2008).Furthermore, only a small percentage of these plants has been screened for insecticidal activity, out of which many of the studies were either not complete or the bioassay procedures used were inappropriate or unsuit-able (Isman 2013).In this study, seven plant species, namely Daphne mucronata (Thymelaeaceae), Tagetes minuta (Asteraceae), Calotropis procera (Apocynaceae),Boenninghausenia albiflora (Rutaceae), Eucalyptus sideroxylon (Myrtaceae), Cinnamomum camphora (Lauraceae) and Isodon rugosus (Lamiaceae), were screened for their insecticidal potential against important agricultural pests (Table 1). These plants are unique in comparison to several other plant species grown in northern Pakistan. The folk or ethno botanical uses of these particular plant species in the area as medicine and insect repellents are common and have been so for decades. With a variable degree of bioactivity, all of the seven plant species showed considerably higher repellent activities in comparison to other plants grown in the area. Exploring the scientific bases of this important trait and transforming local knowledge into commercial uses was the major and long term goal of this study.

4. Material and Methods

We use a plant extract called bitter lactuce to control two spotted spider mites on cucumber crops in plastic houses.

First, plants needed to be collected from each part of the stem and leaves of the plant, then samples should be taken that are rich with many chemical component, next it is placed under the shade at a temperature of below 27 Celsius degree for 7 days to dry. After that, we put 100g of the dried plant in 1 liter of filtered water and leave for 24 hours at a temperature below 25°C. After 24 hours, filter the plant extract in the in-vitro.

Then we apply the plant extract to the cucumber crop in plastic houses at three different concentrations against spider mites to control them.

Each of the concentrates have to be used in three different houses by spraying. After use for 24 hours, three leaves from each plant are taken from the top, middle and bottom and we transport the leave samples to the vitro ،determine the proportion of living and dead number of mite under a dissecting microscope.

Finally, we count the number of the mite on the leaves to see the plant extraction effects on the two spotted spider mites as well as the effects of plant extraction on the leaves.

5. Result and Discussion

The effect of three different concentrations on two spotted spider mites after 24h showed that in the table (1). After 24h 100ml concentrate was the most effective in reducing the numbers of mites were the mortality percentages which were 31.25, 41.3 and 29.19 on lower, middle and upper part of plant respectively, and the mortality per plant was 33.91 mite/ plant. While the lowest mortality percentage was recorded by using 50% concentration of plant extract in reducing the numbers of mites were the mortality percentages which were 11.1, 4.8 and 4.12 on lower, middle and upper part of plant respectively, and the mortality per plant was 6.67 mite/ plant.

Table (1): Effect of different concentrations of Lactuca extracts on mortality of two spotted spider mite on different parts of plant.

Concentration of plant extract	Mortality percentage of TSSM on plant parts (%)			Mortality /plant
	Lower part of plant	Middle part of plant	Upper part of plant	
50ml	11.1	4.8	4.12	6.67
75ml	12.8	6.97	9.26	9.68
100ml	31.25	41.3	29.19	33.91

The results were agreement with AHN et al., (1996) who evaluated the plant extract activity against two spotted spider mite in the laboratory and field. In laboratory was highly effective against egg, immature and adult

Stages of two spotted spider mite in a field study had no repellent activity. Also our results are similar with findings by Duchovskiene, (2007), who reported that the plant extract with abamectin mitecide reduce the number of two spotted spider mite and highly efficient 3-14 days after application. On other hand, he showed that the persistence of abamectin efficacy depends on the dose applied. Thus he observed that approximately 37% of two spotted spider mite population was killed three weeks after application.

Conclusion

The occurrence of two spotted spider mite is widespread on *cucumis sativus* L. in greenhouse. The present study showed that the 100ml concentrate of *Lactuca serriola* was the most effective in reducing the numbers of mites on greenhouse grown Cucumber plants.

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