Study of The Effect of Hot Water Extract of Garlic and Pepper Plants, With Different Concentrations Saline Solution on The Mortalityon Parlatoria Blanchardi (Targioni-Tozzetti) on Date Palms

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Abstract

The scale insect Parlatoria blanchardi (Homoptera : Diaspididae) is one of the important pests, that cause damage to all parts of the date palm in the central and southern governorates of Iraq. In order to reduce the negative effects of pesticides on the environment. Two types of hot water extracts, of Capsicum annuam and Alliu sativum, were used in the field at three concentrations of 5, 10 and 15 g/liter of water, in addition to the use of the saline solution in three concentrations of 15, 20 and 25 g/liter of water, to reduce the population density of P. blanchardi. The results showed that the plant extracts and the saline solution, had high efficiency in reducing the population density of P. blanchardi after one week of spraying, as the saline solution registered the best mortality of 100% at the three concentrations used and with a significant difference from A. sativum extract, which recorded the highest mortality of 80% for the insect at the concentration of 15 g/L and the lowest mortality was 56% over the concentration of 10 g/L, while the C. annuam extract recorded the highest mortality of 80% at a concentration of 15 g/L, and the lowest mortality at a concentration of 5 g/L was 55%.

Keywords: Scale insect, Plant extracts., Parlatoria blanchardi, Saline solution.

1. Introduction

The date palm (Phoenix dactylifera L.), is a monocotyledon of the palmaceae family. It is one of the fruit species cultivated since ancient times. The date palm is the pillar of oasis ecosystems. It plays a very important ecological and socio-economic role. In the old world, the major dates producing regions are the Middle East, in Iraq, Iran, Egypt, Saudi Arabia, Algeria, Tunisia, Morocco, and Libya [1].

The Iraqi horticultural heritage is confronted with several pests, which reduce and quantity of quality of the production, such as Apate monachus, date moth Ectomyelois ceratoniae Zeller and white scale Parlatoria blanchardi Targioni-Tozzetti[2,3,4].

The white scale is a stingling, sucking insect, causes quite significant damage to the palms and fruits. The latter weakens the tree by taking up the sap, reducing the surface area available for photosynthesis [5]. This phenomenon hinders the process of chlorophyll assimilation by its accumulation and causes a reduction in the yield and the commercial quality of dates [6,7]. Many methods have been used to, reduce losses from pests, that attack the date palm, the important of which are chemical pesticides. However, the intensive use of these chemical pesticides has caused side effects on public health and the environment and the multiplication of resistant species [8,9]. These issues have prompted researchers to use alternative means to chemical pesticides to reduce the damage of these pests. The best clean control alternative for this pest is the use of herbal biopesticides. Many plants exhibit toxicological effects against many insect species, reducing their development and population growth [10,11]. According to [12] more than 2000 plant species with insecticidal activity have been identified. study aims to the effect of two extracts of Capsicum annuam and, Alliu sativum, and saline solution in the field against Parlatoria blanchardi of the date palm.
2. Materials and Methods

The experiment was conducted in orchards of Al-Muthanna governorate during the second and third weeks of January 2021. The treatments were applied in the field on ten palms infested with *Parlatoria blanchardi*, with three palms (replicates) for each concentration and 3 palm left without spraying for the control treatment.

![Figure 1. Parlatoria blanchardi](image)

2.1 Preparation of plant extract concentrations

Half kilo of *C. annuum* and *A. sativum* were brought, washed, cleaned and ground by a blender, and three weights (5, 10 and 15) gm of *C. annuum* and *A. sativum* powder were added to one liter of hot distilled water for each concentration at the boiling point. The solution was left for 24 hours, the solution was filtered using filter paper. Three concentrations of *C. annuum* and *A. sativum* extracts of 5 g/L, 10 g/L and 15 g/L were prepared.

2.2 Prepare the saline solution concentrations

Three weights of table salt sodium chloride (NaCl) (10, 20 and 25) g were taken and added to 1 liter of distilled water, and three concentrations of brine were prepared: 10 g / l, 20 g / l and 25 g / l. The sodium chloride, was selected for the study because it is very cheap, easily available in market as, common salt and is approachable to all categories of people in Iraq. Moreover, common salt in low concentration, is eco-friendly and long lasting.

2.3 Testing the efficiency of plant extracts and saline solution in controlling *P. blanchardi* in the field

Samples were taken from wicker infested with *P. blanchardi* to calculate the numerical density of *P. blanchardi* on the leaves of palms for two weeks by three readings every week before starting the spraying process, where the density was taken from all sides and by three replications for each palms. The extracts and the saline solution were sprayed by a 1-liter manual sprayer to ensure the distribution of the concentrations evenly on the palm leaves infected with the *P. blanchardi*, with 3 replicates for each concentration, in addition to spraying three replicates with distilled water as a control treatment. The readings were taken by three readings every week for two weeks in total.

2.4 Statistical analysis

The data were analyzed according to a Complete Randomized Blocks Design under the significance level of 0.05, and the significance of differences between the means was tested according to the least significant difference test (L.S.D) at a probability of 0.05.
3. Results and Discussion

3.1 Relative efficacy of plant extracts of C. annuum, garlic and saline solution in killing P. blanchardi

Figure (2) shows that the population density of P. blanchardi on palm leaves before spraying the pepper extract, where it is noted that the population density of P. blanchardi was (27, 26.33 and 40.66) insects leaf and this corresponds to what was found [14,15], and a decrease in the P. blanchardi population density is also noted as a result of using pepper extract, where the lowest density was recorded at 8.33 insects leaf at a concentration of 15 g/liter, while the highest density was 12 insects leaf at a concentration of 5 g/l.

Figure 2. The density of P. blanchardi before and after using three concentrations of C. annuum extract.

Figure (3) shows that the highest density of P. blanchardi on palm offshoots before spraying with garlic extract was (16.66, 25 and 30) insects leaf, and this matches what was found by [14], while the use of garlic extract resulted in the insect population density decreased to 5 insects leaf at the concentration of 15 g/l, while the concentration of 5 g/l recorded the highest density of 10 insects leaf.

Figure 3. The density of P. blanchardi before and after using three concentrations of Alliu Sativum extract.
Figure 4 shows that the highest population density of *P. blanchardi* before using the saline solution was (16.66, 20.33, 27.33) insects/leaf, and this matches what was found by [16], and the lowest population density was 0 insects/leaf for the three concentrations of the saline solution.

![Figure 4](image)

**Figure 4.** The density of *P. blanchardi* before and after using three concentrations of saline solution.

![Figure 5](image)

**Figure 5.** Density of scale insects after spraying.

![Figure 6](image)

**Figure 6.** Density of scale insects before spraying.

| Concentrations | Density before spraying | Density after spraying | Death rate | Mortality Percentage |
|----------------|-------------------------|------------------------|------------|---------------------|
| C. annuum      |                         |                        |            |                     |
| 5 g            | 27                      | 12                     | 15         | 55%                 |
| 10 g           | 26.33                   | 9.33                   | 17         | 65%                 |
| 15 g           | 40.66                   | 8.66                   | 32         | 80%                 |
| 5 g            | 30                      | 10                     | 20         | 66.6%               |
| A. Sativum     |                         |                        |            |                     |
| 10 g           | 16.66                   | 6                      | 9.44       | 56%                 |
| 15 g           | 25                      | 5                      | 20         | 80%                 |
| 10 g           | 16.66                   | 0                      | 16.66      | 100%                |
| Solution       |                         |                        |            |                     |
| Concentrations |                        |                        |            |                     |
| 20 g           | 20.33                   | 0                      | 20.33      | 100%                |
| 25 g           | 27.33                   | 0                      | 27.33      | 100%                |
The results in Table (1) showed that the different concentrations of saline solution and plant extracts of *C. annuum* and *A. Sativum* had a significant impact on the population density of scale insects, as their use in different concentrations led to a decrease in the population density of the insect, and the three concentrations of saline solution had the highest killing rate of 100% with a difference significant about the hot water extracts of garlic and chili, which had the highest killing rate of 80% at a concentration of 15 g/L. The reason for the high killing rate of the saline solution is due to its effect on the organisms, as it draws water from the organisms’ bodies, which leads to dehydration of the bodies and this impedes the proper functions of the vital organs. Absorption of potassium, calcium and magnesium ions [17]. Salt solutions lead to different feeding behaviors, as they act as inhibitors or stimuli for feeding[18]. Mentioned [19,20]potassium salts affect soft insects such as aphids, whiteflies, scale insects and mealy bugs, while their effect is less on insects with thick body walls like ladybirds, beetles, and bees. Red pepper contains a pungent resin known as capsaicin 0.25%. Capsaicin stimulates the release of several colored glucosides, vitamin C, volatile oil, an active substance at 2%, and carotene pigment. It is known that the active substance with a spicy taste increases the ripening of the fruits [21]. Many studies have been conducted on the extraction of active substances from garlic, where studies have indicated that the active substances in garlic are called Allicin, and this substance consists of neurotransmitters. Without these neurotransmitters, it is not possible to send signals to the brain for translation. It also contains the substance Alliin, which is found in the garlic plant, with the help of the enzyme Allinase [22]. The superiority obtained by the garlic and chili plant lies in the aqueous extracts of this plant retain their effectiveness for (72) hours after their extraction [23].

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