ISSN: 0067-2904

# Biological activity of some plants extract against in the survival of rate adult *Oryzaephilus surinamensis* (Coleopteran Silvanaidae)

**May 'I. Yonus*, Shaimaa Abdul-Kareem, Beadaa Abdalqader Mahdii**
Department of Biology, College of Science, University of Baghdad, Baghdad, Iraq

**Abstract**

A laboratory study was conducted to evaluate the effect of crud extracts from seven plant species (*Nigella sativa*, *Eugenia caryophylota*, *Corianderum sativum*, *Piper nigrum*, *Peganum hermala*, *Achillea santolina*, *Citrullus colocynthis*) belong to different families tested as food feeding toxicity against adult of *Oryzaephilus surinamensis*. The results of the current study showed that hexane extracts from all plants used were more influential in all used concentrations than, the alcoholic extract, and hexane extract of Hanzal was more effective reaching survival rate of adult to 58.3% at concentration of 10% then the plant yarrow and black pepper about 66.2%, and 67.3% respectively, at the same concentration. While the survival rate was approximate in black bean, cloves, and rue at the same concentration 76.4%, 71.3%, and 77.3%. Respectively. The alcoholic extract of Hanzal was less effects on the survival of the adults it 70.0%, while the coriander plant least in fluently of all plants used in the study, as were 80%. In additional to the toxic action and anti-fed ant effect, preliminary results indicated that many of plant extracts have potential in giving good protections of stored plant from attacking by insect, they are indigenous and many be safe and readily available to protection granaries from attacking by insect pestes.

**Keywords:** plants, alcoholic extract, hexane extract, Control, coleopteran silvanaidae.

# الفعالية الاحيائية لبعض المستخلصات النباتية في نسبة بقاء يالغات خنفساء الحبوب المنشارية *Oryzaephilus surinamensis*

**مي ابراهيم يونس*، شيماء عبد الكريم ، بيداء عبد القادر مهدي**
قسم علوم الحياة، كلية العلوم، جامعة بغداد، بغداد، العراق

**الخلاصة**

اجريت دراسة مختبرية لتقييم التأثير بعض المستخلصات الخام من سبع انواع من النباتات التي تعود لعوائل مختلفة في يالغات خنفساء الحبوب المنشارية ***Oryzaephilus surinamensis*** . بينت نتائج الدراسة ان المستخلص الهكساني لجميع النباتات المستخدمة في الدراسة (*Nigella sativa*, *Eugenia caryophylota*, *Coriandrum sativum*, *Piper nigrum*, *Peganum hermala*, *Achillea santolina*, *Citrullus colocynthis*) كانت أكثر تأثيرا وفي جميع التراكيز المستعملة من المستخلص الكحولي. وان المستخلص الهكساني لنبات الحنظل كانت اكثر فعالية، اذ بلغ نسبة بقاء البالغات 58.3 % عند التركيز 10% ، ثم نبات القيصوم والفلفل الاسود اذ بلغ 66.2% و 67.3% على التوالي عند نفس التركيز في حين نسبة البقاء كانت متقاربة في النباتات الحبة السوداء، القرنفل، والحرمل وعند نفس التركيز اذ بلغت 76.4% ، 71.3%،77.3% على التوالي. اما المستخلص الكحولي فكان اقل تأثير على بقاء البالغات وان نبات الحنظل

*Email: May_Yonus@yahoo.com

ايضا كان اكثر تأثيرا في البالغات من النباتات الاخرى، اذ كانت نسبة بقاء البالغات 70.0% في حين نبات الكزبرة الاقل تأثيرا من بين جميع النباتات المستخدمة في الدراسة اذ بلغ 80.0%، 92.9% عند نفس التركيز المذكور للمستخلص الهكساني والكحولي على التوالي. وتبين من خلال الدراسة امكانية استخدام هذه النباتات كمصادر طبيعية لمكافحة قد تكون سليمة بيئيا والتي يمكن ادراجها في برامج وقاية آفات مخازن الحبوب من الافات الحشرية.

## Introduction

The *Oryzaephilus surinamensis*( Coleoptera: Silvanidae) is considered one of the most common pest in grain stores all over the world [1]. This insect has the ability to incur huge mechanical damages to different kinds of grain such as Rice Grain.

The high inflictions and large numbers of this insect caused many problems and huge economic losses due to the weight loss of the infected grains [2-4].

The adult insects and larvae attacks grain products in general such as Flour as well as Biscuits, Fruits, Dried Meat, and others [5] . This research was commenced, due to the economic damages they inflict, and the effect of some plant extracts on the adult insects. *Achillea santoline* is a small plant with flowery heads. There are 200 kinds of it in the northern hemisphere as well as Baluchistan, Afghanistan and Iran [6, 7]. There are more than 12 kinds of plants grown in Iraqi plantations; one of them is *Achillea santoline* [8, 9]. The parts of the plant have a strong aroma which repels insects. Researches indicate that the chemical ingredients of most of the *Achillea* kind is Volatile Oils which consist of Monoterpeniods, Sesquiterpene , And Taninine , as well as , Bitter Principals and Flareniod , Fottyacids , In addition to little of Amino Acids [10].

*Peganum harmala* Plant is very common in pastures , but it is poisonous to cattle because of its effect on the digestive system . There are 5 kinds of this plant in middle Asia and North America [11]. *Peganum harmala* consists of fixed oils and Alkaloids in all parts of the plant [6, 12]. Alkaloids in *Peganum harmala* Plant, which grows naturally in Iraq are more than the other kinds growing in other countries. Alkaloids such as Harmaline, Pegonine, Vascicine and Harmol are found 6.5% in the seeds, 2.54% in the roots, and 3% in the stem. [12]. Black seeds *Nigella sativa* is from the .family Runmulaceae. The seeds consist of many organic and mineral materials mainly Proteinthat form 20% of Black Seeds. They consist of basic and none basic Amino Acids [13], while oil form 29 – 32 % depending on the circumstances they were planted in and the aria they are planted. It is found that black seeds consist of saturated and unsaturated fatty acids , furthermore , oils contains Thymobydroguinone And Thymol [14, 15], they also consist of Sterolat, as well as mineral components , Iron , Sodium , Calcium , Zink , Manganese And Copper [16], they also contain Lipiz Enzyme. It is found that its biological influence is done by Nigella Oil which has the role of inhibiting all bacteria races. [17]. *Coriandrum sativum* powder attracted the *Tregoderma granarm* Larvae rather than expelling them, and the same result has been reached [18]. *Engenia Caryophylata* belongs to family myrtaceae. The flower buds have 14-20% Volatile oil , 10 -13% Callotannic acid, and small amounts of Caryophylline , Vanilline and Eugenin [19, 10, 20] . Found that *Engenia caryophylata* oil of 1000 µ /ml helped suppress the growth of bacteria in 72 hours.

*Citrullus colocynthis* is oily seeds crops which are used in medical and industrial purposes. its fruit contains a Resinous substance, Alkali, Pectine, Saponine, And Colosyntine as well as, Cterol, Colosynithene and Flafinoyd [21]. [22], showed that the seeds of *Citrullus colocynthis* contain high proportion of oil up to 17-19%, which was used in the past for lighting, *Piper nigrum* Palnt is one of the richest plants in Volatile oils, Its main constituents are Filandrene and Lysythene who is responsible for the aroma. It contains Prine Alkaloid which gives it the spicy taste, and Starch Protein.

## Material and Methods

### Sources of the Insect and Methods of Breeding

Adult Saw Toothed Grain beetles *Oryzacphilus surinamensis* were obtained from infected dates in a date store at a Palms Research Center. The isolated adult insects were placed in plastic jars 6.5 cm diameter and 10 cm height , covered by white cotton cloth , wrapped by rubber adhesive band to prevent the adult insects from getting out , then we put clean dates in the jars so that the adult insects feed on them .

**Collecting the Plant Samples**

The plants used in the research were collecting from different places in Baghdad at blossoming season such as *Achillea santoline, Peganum harmala* and other plants which were collecting from the local markets. Afterwards, they were washed with water then put on big filter papers in an open space at room temperature with constant flipping to avoid decomposing. The samples were crushed after they were dried and then grinded by electric grinder type Willey Mill Standard, model no.3 Arthar Thomas. Co., then they were kept in the freezer to be used later.

**Table 1**- local name, scientific (Latin) name and family of plant species used.

| Name of plant | Scientific name | Family | Using part |
|---|---|---|---|
| Black bean | *Nigella sativa* | Ranunculaceae | Seeds |
| Cloves | *Eugenia caryophylota* | Myrtaceae | Bud vase |
| Coriander | *Corianderum sativum* | Umbellifora | Seeds |
| Black pepper | *Piper nigrum* | Piperaceae | Fruits |
| Rue | *Peganum hermala* | Zygophy llaceae | Stalks. Blossoms. seeds |
| Yarrow | *Achillea santolina* | Compositae (Asteracea) | Flower. Stalks. Leaves |
| Hanzal | *Citrullus colocynthis* | Cucurbit aceae | Fruits |

**Preparation of the Alcoholic Extract**

The extraction was made by using [23] method , as 100 gm. of the plant powder was put in a 500 ml glass flask , then added 200 ml of Alcohol Ethylene 95% at room temperature . The sample was shaking for 24 hours by Electric Shaker, and then the extract was filtered by a filtering paper (Watman No.1) through Buchner Funnel. Afterwards, the extract was gathered and condensed by rotary vacuum evaporator to get rid of the solvent. The extract was put in dark distilled glass jars with labels stating each plant, the part from where it was extracted weight and date.

**Preparation of Hexane Extract**

100 gm. of the dry plant powder were added to 200 ml of hexane, followed the same procedure of alcoholic extraction [23]. Obtained 2 ml of oil extracts of each plant use in this study.

We put 1gm of each extract in 10 ml of solvent (Alcohol Ethylene or Hexane), this is considered the stock solution, to prepare the required concentrations for study by Dilution [23, 24].

**Method of Breeding the Insect**

The insect was bred at the laboratories of the College Of Sciences / Biology Department. Each five pairs of male and female were put in plate 11 cm diameter with processed food (a mixture of 100gm ground Palm Dates with dry yeast / 10gm yeast + 100 ml water , after mixing the yeast solution with the ground dates, the mixture was put in plastic jars to be used later ).

**Processing Adult Insects with Plant Powders**

We prepared 18 glass plates 2cm height, 7 cm diameter, then we mixed the oil alcoholic extract (1, 5 /10%) with the food agent , then divided into three refineries for each case . 10 adult insects were admitted to each refinery randomly, then the plates were covered with rubber wrappers.

**Statistical Design**

The results were compared by using the least significant difference under the probability of 0.05, according to the Complete Randomized Design C.R.D.

**Results and Discussion:**

Table-2 showed that the rate of survival of the adult *Oryzaephilus surinamensis* has been affected when treated with different concentrations of the alcoholic extract in the different kinds of plants, while the survival ratio of the adults was 96.60% when treated by control treatment**.** The results of statistical analysis confirmed lack of any substantial differences between the different concentrations and the comparisons on the different kinds of plants.

As for the *Nigella sativa*, there was no clear difference between Control treatment and treatment of 1%, 5%, and 10% concentrations. It was also clear , as in the table below , that there is an Extrusive relation between the concentrations of the extracts and ratio of mortality of the adults , it is found that when concentrations are increased to 10% for all plants the survival rate of the adults was increased as well up to 90.0 , 82.0, 92.0 , 28.5 , 86.0 , 75.0 , 70.1 % for Nigella sativa , *Engenia cayophylata* , *Corianderum sativum , Piper nigrum , Peganum harmala , Achillea santoline* and *Citrullus colocynthis* Respectively . The higher survival rate of the adults was found when using *Citrullus colocynthis* and *Achillea santoline*. The percentage of survival of the adults was 70.1, 75.3 % respectively. Statistical analysis confirmed substantial differences between the concentrations of

alcoholic extracts of the used plants in the research of 10%, while there was no substantial difference for all concentrations of *Nigella sativa* and *Corianderum sativum in* the comparison treatment. The rate of survival of the adults was 90.0, 92.0 % when using 10% concentrations of alcoholic extract for each of *Nigella Sativa* and *Corianderum sativum* respectively.

**Table 2-** Percentage of adult survival (week- two week) when treated food alcoholic extract of plants used in the experiment.

| Name of plant | Control | 1% | 5% | 10% | LSD |
|---|---|---|---|---|---|
| Black bean ( *Nigella sativa*) | 96.66 | 93.33 | 90.0 | 90.0 | N.S. |
| Cloves (*Eugenia caryophylota*) | 96.66 | 89.33 | 84.47 | 82.0 | 4.25 |
| Coriander ( *Corianderum sativum*) | 96.66 | 94.0 | 92.0 | 92.0 | N.S. |
| Black pepper ( *Piper nigrum*) | 96.66 | 92.05 | 89.47 | 88.50 | 3.22 |
| Rue ( *Peganum hermala*) | 96.66 | 90.0 | 87.0 | 86.0 | 4.25 |
| Yarrow ( *Achillea santolina*) | 96.66 | 84.80 | 81.20 | 75.30 | 6.43 |
| Hanzal ( *Citrullus colocynthis*) | 96.66 | 89.0 | 78.50 | 70.10 | 7.23 |

As for the plants hexane extracts the results in Table-3 showed that decrease of the adults survival by increasing the concentration of the extract each separately. It was found that more decrease in the number of adults was on *Achillea s* and *Citrullus colocynthis*. The survival ratio of the adults was 58.3, 66.2% respectively then on *Pepper Nigrum* , *Engenia cayophylata* , *Peganum harmala t*he survival ratio was 67.3 , 71.3 , 77.3 % , respectively when we treated the insects food with 10% of the extract.The reason for the mortality of the adults might be due to the dissimilarity in the active compositions of the plants or that they have active substances which inhibits nutrition or its effect on Protease enzyme and the membrane of the middle digestive tract in addition to the reduction in sugar levels and the total protein of hemoline [25]. The differences in the mortality rate might be due to the differences in the active components in the plants and the accumulation of these components in the digestive tract, in this respect, [26] pointed out that the Epithelial cells of the digestive tract of the insects contain Microsomal Oxidases Enzyme which functions to remove the toxic effect of the natural components of the plants, and that any component which effect those enzymes causes their death. It is noticed in the research that the alcoholic extract of the *Nigella sativa* did not show any effect on all of the concentrations used in the study , the reason for that might be alcohols do not extract all the oils exist in the seeds there by the concentration of thymoquinone in the extract be reduced [27, 28] .

It is clear in the table that the survival rate levels of the adults were of the hexane extract of *Citrullus colocynths*. The adults survival level was 58.3% when using 10% concentration. This result proves what [22, 29] in the study of toxic effect of some plants in the immature stages of *Culex meletus*. They pointed out that *Citrullus colocynthis* extracts caused mortality rate between 50-100% amongst the Larvae of the fourth stage of the oinsect cycle by the concentration of 1000 part per million . It is found that our results is similar to the results of [30] , they indicated in the Dynamic Rating of the Phenols of many plants used in the study , including *Citrullus colocynthis* and *Achillea santoline* , and that they effected to the fourth instar of *Trogoderma granarium* and caused the prolongation of Parthenogenesis phase of the insect .[31] Indicated the extermination and expulsion effects of both alcoholic extract and volatile oil extracted from floral buds of *Achillea biebersteinii* which grows in Iraq . Its effect was exterminating to many kinds of economic and medical insects amongst which was *Tribolium confusum, C. maculatus*, and *Musca domestica*. This matches our results in this research which indicates that extracts of *Achillea santolinehas* has high levels of insecticidal effects.

**Table 3-** Percentage of adult survival (week- two week) when treated food hexane extract of plants used in the experiment.

| Name of plant | Control | 1% | 5% | 10% | LSD |
|---|---|---|---|---|---|
| Black bean ( *Nigella sativa*) | 96.66 | 81.30 | 81.50 | 78.4 | 8.25 |
| Cloves (*Eugenia caryophylota*) | 96.66 | 79.70 | 78.20 | 71.30 | 8.35 |
| Coriander ( *Corianderum sativum*) | 96.66 | 82.14 | 81.0 | 80.0 | 7.22 |
| Black pepper( *Piper nigrum*) | 96.66 | 76.67 | 71.33 | 67.30 | 11.24 |
| Rue ( *Peganum hermala*) | 96.66 | 81.30 | 79.40 | 77.30 | 9.11 |
| Yarrow ( *Achillea santolina*) | 96.66 | 76.30 | 73.80 | 66.20 | 10.21 |
| Handal ( *Citrullus colocynthis*) | 96.66 | 70.80 | 67.20 | 58.30 | 12.52 |

This study showed that there is a significant effect of *Engenia cayophylata* when used as alcoholic or hexane extract, the ratio of survival of the adults was 82.0% and 71.3% respectively. This was confirmed by [32, 33, and 34]. They indicated that the components of the aromatic oil of *Eugenia cayophylata* was 70 – 90% , which is a Phenol and the prime component of the oil is Sesquiterpene - Alfa and Beta Carpophlen are the most important components – and small amount of fovole and ester substarce. Our results were similar to that mentioned by [34, 35], as they found that the *Engenia cayophylata* oil prevented the growth of *Aspergillus flaves*, and noticed the formation of aflatoxine in the nutrition media.

As for *Peganum harmala*, it is found that it has an adulticidal effect on presence of many alkaloids compounds on *Oryzaephilus surinamensis* , this might be due to containing many components of Alkaloids , this was confirmed by [12, 36] , who indicated that it contains semi alkaloide Such as harm line , harmine , peg amine ,and vasicim , when performing chemical analysis on plants . Which might be the main cause of insect mortalities.

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