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Effect of the alcoholic extract of the seeds of the *Sesbania sesban* plant and Applaud's growth regulator in the complete phase control of the red flour beetle *Tribolium castaneum* (Coleoptera: Tenebrionidae)

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Abstract

The study dealt with the effect of the alcoholic extract of *Sesbania sesban* seeds and the growth regulator Applaud in controlling the full phase of the red flour beetle *Tribolium castaneum,* as the concentrations used for the alcoholic extract of Sesbania seeds were 0.5, 1.0, 1.5, 2.0%, and the lowest killing rate was 6.6% at a concentration of 0.5% And after 48 hours of treatment, while the highest killing rate reached 93.5% at a concentration of 2.0% after 48 hours of treatment compared with the control sample in which no killing rate occurred. As for the effect of the growth regulator in controlling the red flour beetle, the concentrations were 1000, 2000, 4000, 6000 ppm with the lowest killing rate of 0.0. % at a concentration of 1000 ppm after 48 hours of treatment, while the highest killing rate was 86.3% at a concentration of 6000 ppm after 48 hours of treatment compared to the control sample in which no killing rate occurred.

Introduction:

The red flour beetle *T. castaneum* is one of the widespread pests worldwide, and it is a serious pest of food stored in stores and warehouses, as it feeds on many types of food, but it is more important as food for flour and grain products, in addition to being a pest of other stored products such as beans, peas, dried fruits, powdered milk and mixtures Prepared cakes, spices, drugs, chocolate, cocoa, oilseeds, dried flowers, herbs and others [1]. The plant *S. sesban* belongs to the leguminous family Fabaceae. It is a tree that reaches a height of 2 meters and bears feathery leaves with thin oblong leaflets with yellow flowers. The fruit is a long narrow pod that carries within it a quantity of seeds. It grows well in soil with little water and nutrients and bears a high degree of salinity It multiplies by seeds, grows and blooms at the end of spring or during summer and does not tolerate low temperatures or frost [2].

Insect growth regulators (IGRs), or so-called third generation pesticides, are among the chemicals commonly used in pest control, and they are compounds that interfere with the natural mechanism of growth, development and reproduction in insects. The field of insects, after it proved its high efficiency in combating insect pests, and because of its high specialization, as it is considered somewhat safe for most of the non-targeted neighborhoods.

Also, the emergence of resistance as a result of its use is a rare thing. These substances include groups of chemicals of different chemical nature and similar in terms of their effect, as they occur through a physiology that affects metamorphosis and reproduction in insects, and among these groups are hormonal analogues such as Juvenil Hormone Analogs and Non-steroidal molting hormone analogues. Steroidal ecdysteroid agonst as well as chitin synthesis inhibitors [3].

Materials and methods:

Insect breeding laboratory:

The insect was obtained from infested flour and grains taken from commercial stores in Samarra district in Salah al-Din governorate. A clean glass bottle of 800 ml capacity was prepared and 250 g of crushed wheat grains were placed in each bottle. Whole insects were added to it. The bottles containing the colonies are in the incubator at a temperature of 30 ± 2 °C and a relative humidity of 65 ± 5% [4, 5].

Study experiences:

1- Effect of *S. sesban* seed extract in controlling the whole phase of flour beetle. *T.castaneum*

The concentrations prepared from sesame seed extract (0.5, 1, 1.5, 2%) were placed in clean and sterilized well-sprayed plastic bottles, and each concentration was a bottle. The dishes containing whole insects were sprayed with 10 whole insects per plate, as 6 sprays were applied to each plate. After 10 cm, these plates were incubated at 30 ± 2 °C. Follow-up was carried out and the dishes were examined after 24 and 48 hours of treatment. As for the control treatment, insects were treated with distilled water only [6].

2- Effect of Applaud growth regulator in controlling the full phase of flour beetle. *T.castaneum*

The growth regulator Applaud (the active substance Buprofezin) was obtained. Four different concentrations of the Match Growth Regulator were prepared, namely (1000, 2000, 4000, 6000) ppm, as the concentrations were prepared by dilution method according to the recommendations written on the box by the producing company. The results were followed up. 24 and 48 hours after treatment [3,7].

Results and Discussion:

1- Effect of S. sesban seed extract in controlling the whole phase of flour beetle. T.castaneum

The results in Figure (1) showed a significant effect of the alcoholic extract of the seeds of S. sesban plant on the percentage of killing of the whole phase of the flour beetle, as the highest killing rate reached 93.5% at a concentration of 2% after 48 hours of treatment, while the lowest killing rate was 0.0% at 0.5% concentration after 24 hours of treatment, as for the control treatment, it had no effect on the rate of killing, and we conclude from this that the increase in concentration is proportional to directly with the increase in the killing rate, and these results are consistent with [6], which showed that the killing rate increases with increasing concentration, as the killing rate at a concentration (0.1%) was zero after 24 hours of incubation, while the killing rate at a concentration of (1.5%) reached (80%) in At the same time, in 48 hours, the killing rate reached at a concentration of (1.0%) (10%) and reached (100%) at a concentration of (1.5%), and at the same time the same was true in maize and

bulgur, compared to the control sample in which no killing rate occurred during 24 hours and 48 hours of incubation, and it also agrees with [8] which indicated that the alcoholic extract of eucalyptus leaves had a high inhibitory activity against the insect under study, and this effect is due to the content of eucalyptus leaves of fixed and volatile oils that have a killer effect on the insect after shock events The insect's nervous system paralyzes it and then causes its death. Continuous exposure to plant extracts leads to the accumulation of toxic substances for these extracts in the insect's gut, leading to damage to the enzymes responsible for removing toxicity known as (MFO) (Mixed Function Oxidase).

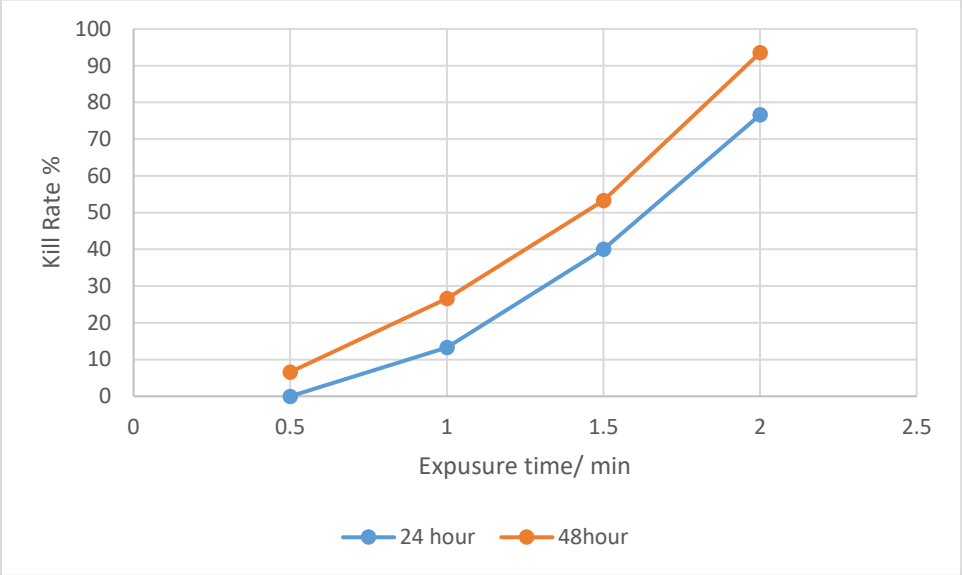

Figure 1. Effect of *S. sesban* seed extract on controlling the whole phase of the red flour beetle *T.castaneum*

2- Effect of Applaud growth regulator in controlling the full phase of flour beetle. *T.castaneum*

The results in Figure (2) showed a significant effect of the growth regulator on the percentage of killing of the full phase of the flour beetle, as the highest killing rate was 88.3% at a concentration of 6000 ppm after 48 hours of treatment, while the lowest killing rate was 0.0% at a concentration of 1000 ppm after 24 hours. From the treatment, as for the control treatment, it had no effect on the killing rate, and we conclude from this that the increase in concentration is directly proportional to the increase in the killing rate. These results are consistent with [9] who indicated that the concentration of chitin formation inhibitor Applaud is directly proportional to the average lifespan of adults and inversely to the number of eggs laid, as the average age of the adults decreased, where the lowest average age was 33.21 days for the adults treated with a concentration of 2000 ppm, while it reached 25.37 days in the control treatment, and the number of eggs laid down was the lowest rate. It is 66.46 eggs/female at a concentration of 2000 ppm.

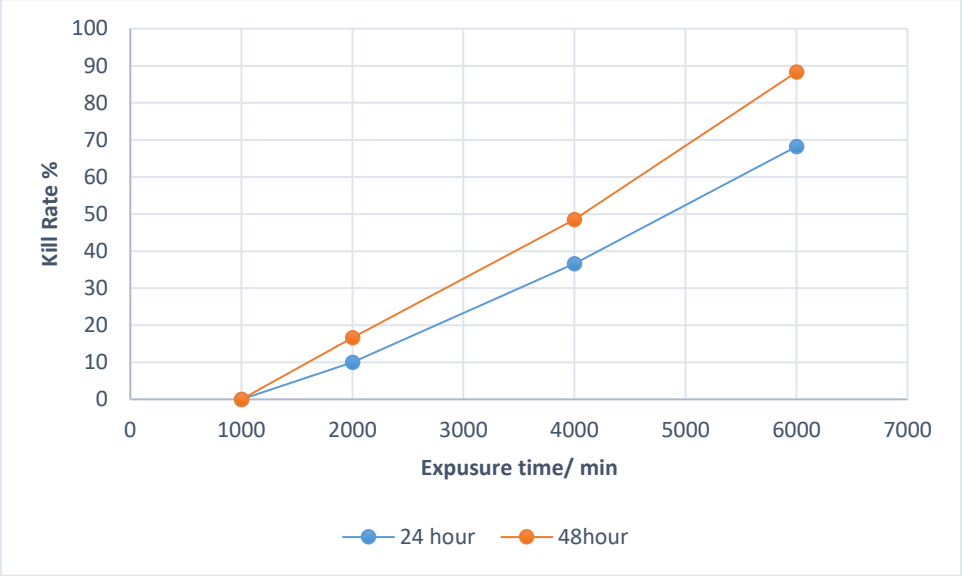

Figure 2. The effect of the growth regulator Applaud in controlling the full phase of flour beetle. *T.castaneum*

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تأثير المستخلص الكحولي لبذور نبات السيسبان *Sesbania sesban* ومنظم النمو Applaud في السيطرة على الطور الكامل لخنفساء الطحين الحمراء *Tribolium castaneum* (Coleoptera:Tenebrionidae)

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الخلاصة:

تناولت الدراسة تأثير المستخلص الكحولي لبذور السيسبان *Sesbania sesban* ومنظم النمو Applaud في السيطرة على الطور الكامل لخنفساء الطحين الحمراء *Tribolium castaneum*، حيث كانت التراكيز المستخدمة للمستخلص الكحولي لبذور السيسبان 0.5 ، 1.0 ، 1.5 ، 2.0٪ ، وبلغت اقل نسبة قتل 6.6٪ بتركيز 0.5٪ وبعد 48 ساعة من المعاملة ، بينما بلغت أعلى نسبة قتل 93.5٪ بتركيز 2.0٪ بعد 48 ساعة من المعاملة مقارنة بمعاملة السيطرة التي فيها. لم يحدث نسبة قتل. أما بالنسبة لتأثير منظم النمو في السيطرة على خنفساء الطحين الحمراء، اذ كانت التراكيز المستخدمة 1000، 2000، 4000، 6000 جزء في المليون، وبلغت اقل نسبة قتل 0.0. ٪ بتركيز 1000 جزء في المليون بعد 48 ساعة من العلاج، بينما كان أعلى نسبة قتل 86.3٪ بتركيز 6000 جزء في المليون بعد 48 ساعة من العلاج مقارنة بعينة التحكم التي لم يحدث فيها معدل قتل.