Volume 2, Issue 6, June - 2024
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

A PRACTICAL STUDY OF THE CAMOUFLAGE OF THE SOUTHERN COWPEA BEETLE CALLOSOBRUCHUS MACULATUS F.

(Coleoptera: Chrysomelidae)

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Abstract
The study aimed to test the possibility of camouflaging the southern cowpea beetle to lay its eggs on rhyolite rocks mixed with red cowpea seeds, where it was found that the insect laid its eggs on the seeds in addition to the rocks with which they were mixed. A significant decrease in the rate of the number of eggs laid, as it was found a decrease The rates of the number of eggs laid when the ratio of rocks to seeds was increased reached (66.33, 45.66, 25.33) eggs\20gm while the seeds were mixed with rocks in ratios of (1:1), (2:1), (3:1) respectively, compared to the control that It reached (92.33) eggs, which in turn affected the percentage decrease in the first generation individuals, which amounted to (37.99, 63.31, 84.72)%.

Introduction

Agricultural production is considered a fundamental pillar in the economy of most countries in the world, and attention to it is classified among the priorities of development programmers. Every citizen is directly or indirectly linked to the mechanism of agricultural production, and the continuous increase in the population makes it necessary to use all available resources to produce food. Some processes are post-harvest is of great importance to achieve this goal [1]. Legumes especially cowpea L. are infected *Vigna unguiculata* is associated with many field and warehouse pests that cause major economic losses. One of these pests is the southern cowpea beetle *Callosobruchus maculatus* F. It is one of the main most dangerous and widespread warehouse insects as it infects legumes in the field and moves to the warehouse increasing the damage to the seeds reducing their economic value and affecting the proportions of germination [2]. The southern cowpea beetle has more than one generation per year, with the number of its generations reaching 6-7 generations per year. Thus, the infestation is repeated and the damage intensifies. The percentage of seed losses caused by this insect is estimated at 62% [3]. As a result of the damage and losses caused by this insect, many researchers have directed their research to study its resistance using chemical, physical and biological methods. Given the environmental pollution caused by the use of chemical pesticides, the emergence of resistance in some insects, and their high costs, this has increased attempts to search for alternative methods, including the use of materials that have a negative impact on pests, are safe for humans, animals, and play a major role in maintaining environmental balance [4], [5].], [6], [7], [8], [9], [10], [17] and [18]. Due to the importance of this insect in Iraq, our study was conducted for the purpose of studying the efficiency

Volume 2, Issue 6, June - 2024
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of rhyolite rocks in protecting cowpea seeds, which are used as seeds, from infection by the southern cowpea beetle without using toxic pesticides.

Materials and methods

1.Collecting plant samples and classifying them

Samples of red cowpea seeds *Vigna unguiculata* L. were collected from local markets in Kirkuk city for the period from mid-December 2013 until the end. The samples were transported to the laboratory in sterile polyethylene bags whose weights ranged between 250 - 050 gm. The seeds were stored at -20°C for 24 hours for disposal. From any of the insect roles that may be present on or inside the seeds [8]. The seeds were diagnosed by the General Authority for Seed Inspection and Certification in Abu Ghraib as *Vigna unguiculata* L.

2. insects diagnosing, Collecting and raising

The southern cowpea beetle *Callosobruchus maculatus* was obtained from infected red cowpea seeds from the markets in Kirkuk city for the period from December 3, 2013 to January 3, 2014. Adults were later identified in the natural history museum at the university of Baghdad. The insect was raised in laboratories of the college of education for Pure Sciences at Kirkuk University, where the infected seeds were placed in glass bottles with a capacity of 800 ml and 200 gm per bottle, and their nozzles were sealed with a mulch cloth, and they were placed in the incubator at a temperature of 30 C + 2, and the relative humidity was set at 70 + 5% using a humidity and temperature test device[11] used the grain moisture content meter by taking a sample weighing 500 gm and placing it in the device, the moisture percentage of the grains was read, as the moisture percentage of the cowpea seeds ranged from 12-13%, the insect farms were maintained for the purpose of reproduction. This is done by taking newly emerged insects from the pupal stage to create other farms and then conducting experiments on them.

3. Rocks preparing

500 gm of rhyolite rocks pig. (1) which are used in ornamental fish ponds, were purchased with a red color similar to the red cowpea color seeds from an exhibition that sells ornamental fish and their supplies. It was brought to the insect laboratory in the college of science and diagnosed by professor Dr. Sabah Ahmed Ismail a lecturer in the college of science / Kirkuk university / department of geology. It was washed with distilled water and sterilized in an autoclave at 121°C and an atmospheric pressure of 15 psi for 15 min.

Fig (1): Rhyolite rocks before spawning

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Testing the effectiveness of rhyolite rocks on immature stages and the emergence of the southern cowpea beetle

20 gm of red cowpea seeds were mixed with 60, 40, and 20 gm of rhyolite rocks in ratios of (1:1), (2:1) and (3:1) by placing the seeds with the rocks inside sterile glass bottles shaking them for 5 minutes, and leaving them for ranged between 20-24 hours to ensure the process of adhesion of the smell and some parts of the seeds to the rocks. The comparison treatment consisted of seeds only. All the seeds and rocks were transferred to 800 ml glass bottles. Five pairs of insects (5 ♂ + 5 ♀) were introduced into each bottle, with three replicates. The nozzles were sealed with a milling cloth and placed in the incubator at a temperature of 30°C + 2. The relative humidity was set to 70 + 5%. They were left to females lay eggs pig. (2). The insects were isolated after their death. The percentage of productivity and decline in individuals of the first generation [12] was calculated according to the following equations:

$$\text{Productivity percentage} = \frac{\text{Number of insects emerging}}{\text{Number of eggs laid}} \times 100$$

$$\text{Percentage decline in members of the first generation} = \frac{\text{Number of reports in the comparison} - \text{the number of reports in the transaction}}{\text{Number of adults in comparison}} \times 100$$

Pig (2): Eggs laying on rhyolite rocks

Statistical analysis

The study experiments were designed using a completely randomized design (C.R.D.), and the arithmetic means of the coefficients were compared using duncan's multiple range test with a probability level of 0.05, and the results were analyzed using the SAS version 6 program (13).

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Results and discussion

The effect of mixing seeds with rhyolite rocks on the average number of eggs laid and the number of emerging insects of the southern cowpea weevil, *Callosobruchus maculatus*

The results of Table 1 showed that mixing seeds with rhyolite rocks caused a significant decrease in the average number of eggs laid, as significant differences were found between the rates of the number of eggs laid when the ratio of rocks to seeds was increased, as it reached (66.33, 45.66, 25.33) eggs when mixed in ratios (3:1) , (2:1), (1:1) respectively compared to the control, which had (92.33) eggs. It was found that the southern cowpea weevil laid its eggs on the seeds in addition to the rocks that were mixed with them. This can be attributed to laying its eggs on the rocks because they are of a color matching the selected seeds (red cowpea seeds) as they tend to lay their eggs on soft, colored and bright seeds. Which is consistent with what was mentioned (14) with its ability to evaluate the color, texture, size of seeds, it was found that it prefers large, smooth seeds with bright colors which also mentioned by (15) that it prefers soft, well-filled seeds over rough ones.

Table (1) The effect of mixing seeds with rhyolite rocks on the average number of eggs laid and the number of emerging insects of the southern cowpea weevil, *Callosobruchus maculatus*

Percentage decline in first generation individuals	Percentage of productivity	Number of insects emerging	Average number of eggs laid	Stones / Seeds 20 gr
37.99 D	71.33 C	47.33 E	66.33 A	1:1
63.31 C	61.32 D	28 F	45.66 B	2:1
84.72 a	46.03 F	11.66 G	25.33 C	3:1
	83.27 G	76.33 H	91.66 D	Control

***Similar letters in the same column mean that there are no significant differences between them at a significance level of 0.05**

It also found that this insect lays its eggs based on seed coat stimuli without being able to directly evaluate the quality of the suitability of the cotyledon for the growth of its larvae, and this is consistent with what was mentioned (16). This affected the number of emerging insects, which amounted to (47.33, 28, 11.66) emerging for each of the ratios (3:1), (2:1), (1:1), respectively, compared to the control sample, which amounted to 76.33 emerging insects, which was not mixed with rocks. Which consequently led to a decrease in the percentages of productivity, which amounted to (71.33, 61.32, 46.03) compared to the control, which amounted to (83.27), which in turn affected the percentage decrease of members of the first generation, which amounted to (37.99, 63.31, 84.72).

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