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Impact of Certain Plant Oils and Extracts against *Etiella zinckenlla* (Treit.) in the Field and Study the Extending Effect on *Callosobruchus maculatus* in the Store in Cowpea Crop

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ABSTRACT

Two Field experiments were conducted during 2020 and 2021 summer seasons at the Plant Protection Research Station at Qaha, Qalubiya Governorate, to study the effect of Cinnamon Oil, Lupine oil, (ethyl alcohol, acetone and petroleum ether) extracts from Cinnamon and Lupine plants and Pasha (chemical insecticides) for control the Lima Bean Pod Borer, *Etiella zinckenella* (Treit.). The concentrations of plant oils and extracts (v/w%) used in this investigation were 2, 1 and 0.5% and were used at the recommended concentrations for Pasha.

Cinnamon Oil, Lupine oil, petroleum ether extract from the Cinnamon plant and ethyl alcohol extract from Lupine plant (2%) showed maxima reductions in the larval population and Cinnamon Oil and Lupine oil (2%) after the first and second sprays during 2020 and 2021 summer seasons on cowpea green and dry pods, respectively.

Ethyl alcohol extract from the Cinnamon plant (2%) recorded the highest percentage of total protein in cowpea grains (15.51 and 16.75% during the two summer seasons, respectively). Also, the highest yield (green and dry pods) was obtained after treatment by Cinnamon oil (2%) (1775 and 1000 kg/fed.) and (1880 and 1100 kg/fed.) in 2020 and 2021 summer seasons, respectively.

Cinnamon Oil and ethyl alcohol extract from Cinnamon plant (2%) used in the field resulted in the highest protection from pests during the storage. Reduction in progeny was 99.16 and 97.97 for Cinnamon Oil and ethyl alcohol extract from Cinnamon plant (2%) in seasons 2020 and 2021, respectively. Hence the efficiency of oils and plant extracts in controlling insects leads to a reduction in the damage caused by insect pests in the field and store.

INTRODUCTION

Cowpea, *Vigna unguiculata* (L.), (Fabaceae) is a legume widely adapted and grown throughout the world (Bittenbender 1990 and Xiong *et al.*, 2016). The origin of this product is Africa (Coulibaly *et al.*, 2009). In recent years, it has become an important crop in many countries of tropical Africa, Asia and South America (Mahalakshmi *et al.*, 2007).

World cowpea production was estimated at 12.27 million tons from 70.70 million hectares in 1992 (FAO, 1993).

One of the main reasons for the low cowpea yield is the attack by many insect pests at various stages of the crop. Pod borer (*Etiella zinckenella*), is one of the most common and destructive insects, usually attacks the late cowpea plantation causing serious crop damage, since the larvae feed on seeds only and destroy whole pods resulting in considerable losses of yield (Abdou and Abdalla, 2006).

The aim of this study is to show estimate the efficiency of some natural materials on the pod borer, *Etiella zinckenlla* in the field and on *Callosobruchus maculatus* in the store.

MATERIALS AND METHODS

Two field experiments were conducted at the Plant Protection Research Station at Qaha, Qalubiya Governorate. The experiments were conducted to study the effect of some plant oils and extracts from some plants on the infestation rate by Lima Bean Pod Borer in cowpea plants. The experimental area (about 880 m^2) was divided into 80 plots (of 11 m^2 each). Sowing of cowpea grains (Kareem 7 variety) was done on April, 1st in two summer successive seasons of 2020 and 2021, to evaluate the efficiency of 2 plant oils and 6 plant extracts from two plants species and one chemical insecticide, those were:

- Cinnamon Oil (*Cinnamomum verum*; Fam: Lauraceae) and Lupine oil (*Lupinus albus* L.; Fam: Fabaceae) were bought from El-Captain Company ″CAP PHARM″.
- The plant powder (Cinnamon plant and Lupine plant) was weighed and soaked in Petroleum ether, Acetone and Ethyl alcohol. The extracts were filtered through Whatman No.4 filter paper. The solvent was removed by vacuum in a rotary evaporator separately at 40^{o}C and the residue was dissolved in the least amount of solvent and used as a starting stock solution. Further dilutions in the distilled water were used to prepare suitable concentrations used in treatments (Warthen *et al.*, 1984).

  The concentrations of plant oils and plant extracts used in this investigation were 2, 1 and 0.5% (v/w%).

- Pasha (Emamectin benzoate) 1.9% EC was used at 125cm/100 L water and was bought from El-Helb Pesticides and Chemicals Company.
- Control.

The experimental plots were arranged in a randomized complete block design and each treatment was represented by three plots. All the normal agricultural practices were followed except for the pesticide treatment. A sampling of cowpea pods started 56 days after sowing. Weekly samples (10pods/plot) were randomly picked from each plot, placed in a paper bag and transferred to the laboratory for inspection to count the number of *Etiella zinckenella* larvae. Two sprays with each material were applied on June, 19th and July, 3rd in seasons 2020 and 2021, respectively, by using a 20 L. knapsack sprayer with one nozzle. The final yield of each treatment was weighted in two seasons.

Inspections of plants were carried out before spraying and after 1, 3, 5, 7 and 14 days after spraying to evaluate the efficacy of treatments on reduction rates of the pest population.

The reduction percentage of the population (% mortality) has been calculated according to the equation of Henderson and Tilton (1955) formula as follows:

% Reduction of counts = 100 [1-(Cb / Ca X Ta / Tb)]

Where:
Cb = count of insects in control before application
Ca = count of insects in control after the application
Ta = counts of insects in treatment before application
Tb = counts of insects in treatment after the application

Determination of Protein Content:

Total N in cowpea grains was estimated according to Bremner and Mulvaney (1982). The crude protein content was obtained by multiplying the N content by the factor of 6.25.

Statistical Analysis:

Statistical analysis was performed using SAS computer program and LSD (Least significant difference) was calculated to find out the rate of significance between treatments of oils and extracts after treatments, considering; plant protection and productivity against *E. zinckenella* on cowpea (SAS Institute, 2003).

Grain Storage:

The grains were stored after harvest, were taken from each treatment 30 gm and divided into 3 replicates. The experiment was kept aside for another 30, 45 and 60 days for the emergence of the progeny. The number of adults that emerged from each replicate was counted. The percentage of reduction percentage in adults' emergence was calculated according to the following formula:

$$\%\text{Reduction} = \frac{\text{no. of emerged adults in control} - \text{no. of emerged adults in treatment}}{\text{no. of emerged adults in control}} \times 100$$

RESULTS AND DISCUSSION

Efficacies of Different Compounds in Reducing the Population Density of The Lima Bean Pod Borer, *Etiella zinckenella* during 2020 and 2021 Summer Seasons in Cowpea Green Pods:

Data on the effect of different compounds on the larval population of lima bean pod borer presented in Tables (1 and 2) indicated that all treatments were significantly superior to the control.

Cinnamon Oil 2%, Lupine oil 2%, petroleum ether extract from Cinnamon plant 2% and ethyl alcohol extract from Lupine plant 2% showed maxima reductions in counts of *E. zinckenella* larval counts ((96.4 & 100), (97.1 & 100), (97.3 & 100), (96.4 & 100)) and ((95.5 & 99.9), (97.9 & 100), (96.9 & 99.9) and (95.5 & 99.9)), respectively in larval population. The reduction in larval counts was, significantly, superior to the remaining treatments. The differences between 2% treatments after the first and second spray during 2020 and 2021 summer seasons were nonsignificant.

Table 1: Efficacies of different compounds (at 3 rates of each) in reducing the population density of *E. zinckenella* during 2020 season on cowpea green pods.

Conc. %	first spray				second spray			
	Days after spray			Mean Red.	Days after spray			Mean Red.
	3	7	14		3	7	14	
Cinnamon Oil								
2	100	97.6	91.6	96.4^{a}	100	100	100	100^{a}
1	78	95.6	86.9	86.8^{cd}	68.6	100	100	89.5^{c}
0.5	100	86.3	44.7	77^{g}	58.9	81.1	100	80^{f}
Lupine oil								
2	95.4	98.1	97.8	97.1^{a}	100	100	100	100^{a}
1	85.8	91.4	89.8	89^{b}	82.5	100	100	94.2^{b}
0.5	78	86.7	86.9	83.9^{e}	47.6	100	100	82.5^{e}
ethyl alcohol extract from Cinnamon plant								
2	82.9	86.3	89.2	86.1^{d}	60.7	100	100	86.9^{d}
1	75.6	70.6	85.5	77.2^{g}	47.6	100	100	82.5^{e}
0.5	38.6	61.6	74	58.1^{l}	34.5	71.2	71.7	59.2^{l}
acetone extract from Cinnamon plant								
2	86.4	100	77.2	87.9^{cb}	77.6	100	100	92.5^{b}
1	71.6	100	30.3	67.3^{j}	51.5	100	87.4	79.6^{f}
0.5	50.8	100	34.3	61.7^{k}	41.8	85.4	83.8	70.3^{h}
petroleum ether extract from Cinnamon plant								
2	95.3	98.1	98.6	97.3^{a}	100	100	100	100^{a}
1	62.1	94.9	69.9	75.6^{gh}	58.1	100	77.4	78.5^{fg}
0.5	29.9	92.7	18.7	47.1^{n}	43.9	67.1	83.8	65^{i}
ethyl alcohol extract from Lupine plant								
2	100	97.6	91.6	96.4^{a}	100	100	100	100^{a}
1	51.9	78.9	87.5	72.8^{i}	56.4	74.4	100	76.9^{g}
0.5	45.2	55.9	71	57.3^{l}	21.4	77	77.4	58.6^{l}
acetone extract from Lupine plant								
2	43.1	79.7	81.9	68.2^{j}	12.7	100	100	70.9^{h}
1	31.8	66.7	72.1	56.9^{l}	27.3	100	62.3	63.2^{j}
0.5	30.8	66.6	67	54.8^{m}	30.2	89.8	54.8	58.2^{l}
petroleum ether extract from Lupine plant								
2	55.8	82.2	88	75.3^{h}	34.5	100	100	78.2^{fg}
1	31.8	72.6	81	61.8^{k}	40.1	67.1	100	69.1^{h}
0.5	24.7	69.7	78.5	57.7^{l}	41.8	64.2	77.4	61.1^{k}
pasha								
0.125	100	100	50.7	83.6^{e}	100	100	77.4	92.5^{b}
LSD				1.64				2.46

Table 2: Efficacies of different compounds at different application concentrations in reducing the population density of *E. zinckenella* during 2021 season on cowpea green pods.

Conc. %	first spray				second spray			
	Days after spray			Mean	Days after spray			Mean
	3	7	14	Red.	3	7	14	Red.
Cinnamon Oil								
2	96.4	100	90.2	95.5^{a}	100	99.8	100	99.9^{a}
1	88	93.8	76.9	86.2^{d}	78.6	100	100	92.9^{e}
0.5	100	76.3	54.3	76.9^{f}	57.6	100	100	85.9^{gh}
Lupine oil								
2	97.8	100	95.8	97.9^{a}	100	100	99.9	100^{a}
1	80.8	95.8	90.8	89.1^{b}	88.5	100	100	96.2^{c}
0.5	88	83.7	76.9	82.9^{e}	48.6	100	100	82.9^{i}
ethyl alcohol extract from Cinnamon plant								
2	72.9	96.3	89.7	86.3^{bcd}	63.7	100	100	87.9^{g}
1	65.6	75.6	88.5	76.6^{fg}	53.2	100	100	84.4^{h}
0.5	48.6	63.7	84	65.4^{ij}	47.6	100	63.9	70.5^{m}
acetone extract from Cinnamon plant								
2	76.8	100	87.2	88^{bc}	69.9	100	100	90^{f}
1	61.5	100	40.8	67.4^{i}	57.6	100	85.4	81^{ij}
0.5	55.8	96.5	44.5	65.6^{ij}	41.8	100	83.8	75.2^{kl}
petroleum ether extract from Cinnamon plant								
2	98.4	100	92.3	96.9^{a}	100	99.8	100	99.9^{a}
1	58.4	92.9	70.5	73.9^{h}	68.1	100	67.4	78.5^{j}
0.5	29.9	92.7	18.7	47.1^{l}	54.5	100	79.4	78^{jk}
ethyl alcohol extract from Lupine plant								
2	96.4	100	90.2	95.5^{a}	99.8	100	100	99.9^{a}
1	62.3	88.9	77.5	76.2^{fg}	54.8	99.9	100	84.9^{h}
0.5	55.8	65.9	70.8	64.2^{j}	34.5	97.6	78.4	70.2^{m}
acetone extract from Lupine plant								
2	63.5	69.3	83.2	72^{h}	22.7	100	99.9	74.2^{l}
1	51.8	76.7	52.4	60.3^{k}	37.3	100	52.3	63.2^{o}
0.5	43.8	62.6	72.5	59.6^{k}	50.2	94.6	54.8	66.5^{n}
petroleum ether extract from Lupine plant								
2	65.8	85.1	84	78.3^{f}	62.5	97.8	95.9	85.4^{gh}
1	51.8	62.4	84.8	66.3^{ij}	67.3	92.6	97.4	85.8^{gh}
0.5	37.9	66.9	88.5	64.4^{j}	61.8	89.7	73.4	75^{kl}
pasha								
0.125	100	98.6	60.9	86.5^{cd}	100	96.5	85.4	94^{d}
LSD				2.87				3.28

Efficacies of different compounds in reducing the population density of *E. zinckenella* during 2020 and 2021 summer successive seasons on cowpea dry pods:

Data on the effect of different compounds on the larval population of *E. zinckenella* infestation presented in Tables (3 and 4) indicated that all treatments were, significantly, superior to the control.

Cinnamon Oil 2% and Lupine oil 2% showed maxima reductions in larval counts ((75 & 85.9), (76.6 & 86.4)) and ((75.3 & 85), (78.4 & 85.3))% in the larval population, indicating, significantly, superior effects than the remaining treatments and there were no

significant differences between the 2% treatments after the first and second spray during 2020 and 2021 summer seasons on cowpea dry pods, respectively.

These results were in agreement with Oparaeke *et al.* (2005), Shabana *et al*. (2019), Sabbour (2016) and Abd El-Rahman and Abdel-wahab (2020), their data indicated that the reduction in the population of *E. zinckenella* occurred due to the treatment by plant oils and plant extracts.

Table 3: Efficacies of different compounds in reducing the population density of *E. zinckenella* during 2020 season on cowpea dry pods.

Conc. %	first spray				second spray			
	Days after spray			Mean	Days after spray			Mean
	3	7	14	Red.	3	7	14	Red.
Cinnamon Oil								
2	65.3	81.8	77.9	75^{a}	57.6	100	100	85.9^{a}
1	35.7	38.9	30.7	35.1^{j}	25.7	100	100	75.2^{e}
0.5	6.4	12.8	26.1	15.1^{o}	36.3	58.5	65.7	53.5^{l}
Lupine oil								
2	86.1	91.6	52.1	76.6^{a}	59.1	100	100	86.4^{a}
1	77.3	35.1	21.6	44.7^{hl}	45.4	100	100	81.8^{c}
0.5	72.1	6	14.8	31^{k}	38.4	100	100	79.5^{d}
ethyl alcohol extract from Cinnamon plant								
2	45.4	46.7	38.4	43.5^{l}	52.3	61.1	85.3	66.2^{h}
1	48	42.3	17.9	36.1^{j}	42.7	65	78	61.9^{j}
0.5	29.8	15.4	48.7	31.3^{k}	14.1	58	38.3	36.8^{p}
acetone extract from Cinnamon plant								
2	72.8	60	82.1	71.6^{b}	36.3	100	100	78.8^{d}
1	35.2	27.7	77.7	46.9^{hi}	51.2	100	62.5	71.2^{g}
0.5	28.9	39.4	12.7	27^{m}	32.6	78	86.2	65.6^{h}
petroleum ether extract from Cinnamon plant								
2	53	76.8	32.5	54.1^{ef}	55.2	100	94.5	83.2^{b}
1	17.5	49	78	48.2^{g}	23.6	100	73.6	65.7^{h}
0.5	10.6	39.8	17.9	22.8^{n}	47.5	58	64.8	56.8^{k}
ethyl alcohol extract from Lupine plant								
2	69.8	60	67.2	65.7^{c}	47.9	66.1	100	71.3^{g}
1	54.7	52.7	52.3	53.2^{ef}	28.4	65	78	57.1^{k}
0.5	22.3	49.6	52.8	41.6^{i}	12.5	53.4	70.6	45.5^{n}
acetone extract from Lupine plant								
2	51.9	54.3	50.1	52.1^{f}	28.4	53.4	91.2	57.6^{k}
1	38.4	45	45.9	43.1^{i}	28.4	41.7	85.3	51.8^{m}
0.5	28	21.9	28.9	26.3^{m}	17.2	19.1	58.9	31.8^{q}
petroleum ether extract from Lupine plant								
2	64.9	54.2	48	55.7^{ef}	52.3	68.9	100	73.7^{f}
1	48	46.7	48.7	47.8^{gh}	34.1	58	100	64^{i}
0.5	40.6	25.7	23.4	29.9^{l}	32.6	28.7	100	53.7^{l}
pasha								
0.125	6.4	57	45	36.1^{j}	54.2	17.9	43.6	38.6^{o}
LSD				3.28				1.23

Table 4: Efficacies of different compounds in reducing the population density of *E. zinckenella* during 2021 season on cowpea dry pods.

Conc. %	first spray				second spray			
	Days after spray			Mean Red.	Days after spray			Mean Red.
	3	7	14		3	7	14	
Cinnamon Oil								
2	69.3	81.8	74.9	75.3^{a}	58.6	99.8	96.7	85^{a}
1	38.7	32.9	40.7	37.4^{j}	35.7	100	98.7	78.1^{e}
0.5	8.4	17.8	32.1	19.4^{o}	46.3	48.5	68.7	54.5^{k}
Lupine oil								
2	84.1	88.9	62.1	78.4^{a}	60.3	100	95.5	85.3^{a}
1	73.3	45.1	25.6	48^{f}	47.4	100	94.6	80.7^{c}
0.5	78.1	8	15.8	34^{k}	48.4	98.7	100	82.4^{b}
ethyl alcohol extract from Cinnamon plant								
2	46.9	56.7	33.4	45. 7^{gh}	62.3	51.1	88.3	67.2^{gh}
1	44	32.3	27.9	34.7^{k}	52.7	55	80	62.6^{i}
0.5	27.9	18.4	43.7	30^{l}	24.1	60	28.3	37.5^{n}
acetone extract from Cinnamon plant								
2	82.8	59.6	72.1	71.5^{b}	39.3	99.3	100	79.5^{d}
1	55.2	17.9	67.7	46.9^{fg}	55.2	98.4	72.5	75.3^{f}
0.5	18.9	30	32.7	27.2^{m}	42.6	75	88.2	68.6^{gh}
petroleum ether extract from Cinnamon plant								
2	55	68.9	40.6	54.8^{e}	47.4	100	94.6	80.7^{c}
1	12.6	52.1	80.2	48.3^{f}	25.6	98.6	76.6	66.9^{h}
0.5	12.5	29.8	22.8	21.7^{n}	57.5	48	68.8	58.1^{j}
ethyl alcohol extract from Lupine plant								
2	73.4	62.5	70.5	68.8^{c}	44.9	64.1	99.7	69.6^{gh}
1	54.7	62.7	42.3	53.2^{e}	38.4	55	80.5	58^{j}
0.5	18.9	55.3	56.8	43. 7^{h}	22.5	43.4	75.6	47.2^{m}
acetone extract from Lupine plant								
2	55.5	58.3	49.8	54.5^{e}	30.6	43.4	94.2	56.1^{k}
1	40.8	48.7	46.9	45.5^{gh}	31.3	38.9	82.3	50.8^{l}
0.5	26.9	19.3	30.6	25.6^{m}	18.2	29.1	48.9	32.1^{o}
petroleum ether extract from Lupine plant								
2	60.9	64.2	50.8	58.6^{d}	56.3	78.9	95.9	77^{ef}
1	44.3	36.7	56.7	45.9^{gh}	37.1	55.6	98.6	63.9^{i}
0.5	37.9	28.7	25.4	30. 7^{l}	36.6	30.2	97.8	54.9^{k}
pasha								
0.125	12.3	54	55	40.4^{i}	44.2	24.9	47.6	38.9^{n}
LSD				2.05				2.46

Effect of Different Treatments on Cowpea Grains Protein in Summer Seasons 2020 and 2021:

Results tabulated in Table (5) indicated that the total protein in cowpea grains increased with all treatments compared with the control in summer seasons 2020 and 2021. Ethyl alcohol extract from Cinnamon plant (2%) recorded the highest percentage of total protein in cowpea grains during summer seasons 2020 and 2021, being (15.51 and 16.75%), respectively, compared with the control (7.87 and 8.06%), respectively.

Table 5: Effect of different treatments on cowpea grains protein in 2020 and 2021 summer seasons:

Conc. %	Protein %	
	2020	**2021**
Cinnamon Oil		
2	10.88	11.75
1	8.91	8.87
0.5	8.71	8.71
Lupine oil		
2	14.1	15.41
1	10.06	10.89
0.5	8.71	9.91
ethyl alcohol extract from Cinnamon plant		
2	15.51	16.75
1	11.75	12.81
0.5	10.44	11.75
acetone extract from Cinnamon plant		
2	14.36	15.44
1	11.31	12.81
0.5	10.39	11.39
petroleum ether extract from Cinnamon plant		
2	15.41	15.81
1	12.81	14.41
0.5	11.37	11.37
ethyl alcohol extract from Lupine plant		
2	13.72	14.36
1	12.54	12.54
0.5	11.89	10.89
acetone extract from Lupine plant		
2	13.72	13.72
1	12.54	12.41
0.5	11.89	11.49
petroleum ether extract from Lupine plant		
2	14.87	15.36
1	10.09	10.72
0.5	8.71	9.54
pasha		
0.125	13.49	12.89
control		
	7.87	8.06

Effect of Different Treatments on The Yield (kg/fed.) in Cowpea:

Results given in Table (6) indicated that the yield, significantly, increased with all treatments compared with the control in the two summer seasons. That the highest yield (green and dry pods) was obtained after treatment by cinnamon oil (2%) (1775 & 1000 kg/fed.) and (1880 & 1100 kg/fed.) indicating (43.7 & 63.8%) and (51.6 & 77.3%) increase than control (1000 & 362 kg/fed.) and (900 & 250 kg/fed.) in summer seasons 2020 and 2021, respectively.

It could be generally concluded that application of the treated compounds every two weeks during podding and maturation stage of cowpea plants was necessary for controlling *E. Zinckenella* populations. Also, treatments caused yield increases. These

results agreed with Dhaka *et al.* (2011), Mohamed *et al.* (2015), Shaalan (2016) and Abd El-Rahman and Abdel-wahab (2020).

Table 6: Effect of different treatments on the yield (kg/fed.) of cowpea green and dry pods:

Conc. %	2020				2021			
	Green pods		Dry pods		Green pods		Dry pods	
	The yield (Kg/100 pods)	Rate of increase %	The yield (Kg/100 pods)	Rate of increase %	The yield (Kg/100 pods)	Rate of increase %	The yield (Kg/100 pods)	Rate of increase %
Cinnamon Oil								
2	1775^{a}	43.7	1000^{a}	63.8	1880^{a}	51.6	1100^{a}	77.3
1	1260^{q}	20.6	680^{c}	46.8	1460^{k}	38.4	587^{e}	57.4
0.5	1130^{t}	11.5	490^{k}	26.1	1350^{l}	33.3	389^{p}	35.7
Lupine oil								
2	1500^{g}	33.3	440^{o}	17.7	1650^{e}	45.5	350^{m}	28.6
1	1360^{l}	26.5	460^{m}	21.3	1210^{q}	25.6	370^{r}	32.4
0.5	1100^{v}	9.1	460^{m}	21.3	1000^{v}	10.0	340^{t}	26.5
ethyl alcohol extract from Cinnamon plant								
2	1490^{h}	32.9	580^{e}	37.6	1580^{f}	43.0	470^{k}	46.8
1	1274^{o}	21.5	520^{j}	30.4	1300^{m}	30.8	420^{n}	40.5
0.5	1030^{w}	2.9	407^{r}	11.1	980^{w}	8.2	300^{u}	16.7
acetone extract from Cinnamon plant								
2	1610^{d}	37.9	480^{l}	24.6	1740^{c}	48.3	380^{q}	34.2
1	1490^{h}	32.9	460^{m}	21.3	1560^{g}	42.3	350^{s}	28.6
0.5	1160^{s}	13.8	424^{q}	14.6	1100^{t}	18.2	400^{o}	37.5
petroleum ether extract from Cinnamon plant								
2	1770^{b}	43.5	550^{h}	34.2	1860^{b}	52.1	480^{j}	47.9
1	1600^{e}	37.5	490^{k}	26.1	1700^{d}	47.1	460^{l}	45.7
0.5	1122^{u}	10.9	448^{n}	19.2	1020^{u}	11.8	390^{p}	35.9
ethyl alcohol extract from Lupine plant								
2	1410^{j}	29.1	570^{f}	36.5	1480^{j}	39.2	500^{h}	50.0
1	1324^{m}	24.5	565^{g}	35.9	1225^{p}	26.5	550^{f}	54.5
0.5	1214^{r}	17.6	520^{j}	30.4	1120^{s}	19.6	487^{i}	48.7
acetone extract from Lupine plant								
2	1540^{f}	35.1	740^{b}	51.1	1650^{e}	45.5	660^{b}	62.1
1	1400^{k}	28.6	540^{i}	33.0	1530^{i}	41.2	655^{c}	61.8
0.5	1280^{n}	21.9	430^{p}	15.8	1250^{o}	28.0	380^{q}	34.2
petroleum ether extract from Lupine plant								
2	1760^{c}	43.2	595^{d}	39.2	1860^{b}	51.6	520^{g}	51.9
1	1272^{p}	21.4	540^{i}	33.0	1190^{r}	24.4	440^{m}	43.2
0.5	1130^{t}	11.5	488^{k}	25.8	1287^{n}	30.1	400^{o}	37.5
pasha								
0.125	1470^{i}	32.0	580^{e}	37.6	1540^{h}	41.6	600^{d}	58.3
control								
	1000^{x}		362^{s}		900^{x}		250^{v}	
LSD								
	1.64		2.46		2.0		3.3	

Effect of Different Treatments on The Infestation of Cowpea Beetle, *Callosobruchus maculatus* in Cowpea Stored Grain:

Concerning the effect of the prior field treatments on storability and cowpea beetle infestation after 60 days, Tables (7 and 8) demonstrate that all treatments gave considerable protection i.e., significant decreases in infestation by cowpea beetle compared with control. However, Cinnamon Oil (2%) and ethyl alcohol extract from Cinnamon plant (2%) used in the field gave the highest protection during storage. Reduction in progeny was 99.16 and 97.97% for Cinnamon Oil (2%) and ethyl alcohol extract from Cinnamon plant (2%) in summer seasons 2020 and 2021, respectively.

Post-harvest applications of plant oils and plant extracts protected grain yield in the store. These results agreed with Shabana *et al.* (2019).

Table 7: Effect of different treatments on infestation by the cowpea beetle *C. maculatus* in stored grains of cowpea in 2020 season.

Conc. %	No. of progeny after (days)			Mean No. of the Progeny after 60 days	Reduction in progeny %
	30	45	60		
Cinnamon Oil					
2	1	1	0	0.67	99.16
1	0	5	15	6.67	91.75
0.5	2	1	20	7.67	90.41
Lupine oil					
2	2	2	40	14.67	81.66
1	4	16	35	18.33	77.09
0.5	1	40	20	20.33	74.59
ethyl alcohol extract from Cinnamon plant					
2	0	2	0	0.67	99.16
1	2	6	20	9.333	88.34
0.5	0	10	40	16.67	79.16
acetone extract from Cinnamon plant					
2	2	4	10	5.333	93.34
1	1	1	20	7.333	90.84
0.5	1	4	25	10	87.5
petroleum ether extract from Cinnamon plant					
2	0	2	7	3	96.25
1	1	5	35	13.67	82.91
0.5	0	50	10	20	75
ethyl alcohol extract from Lupine plant					
2	0	5	10	5	93.75
1	0	4	15	6.333	91.75
0.5	4	12	30	15.33	80.84
acetone extract from Lupine plant					
2	0	6	15	7	91.5
1	3	8	15	8.67	89.16
0.5	2	5	35	14	82.5
petroleum ether extract from Lupine plant					
2	1	5	10	5.33	93.34
1	0	3	15	6	92.5
0.5	35	55	70	53.33	33.34
pasha					
0.125	40	50	70	53.33	33.34
Control	60	80	100	80	

Table 8: Effect of different treatments on infestation by the cowpea beetle *C. maculatus* in stored grains of cowpea in 2021 season.

Conc. %	No. of progeny after (days)			Mean No. of the Progeny after 60 days	Reduction in progeny %
	30	45	60		
Cinnamon Oil					
2	2	1	2	1.67	97.97
1	4	5	10	6.33	92.31
0.5	3	1	21	8.33	89.88
Lupine oil					
2	2	4	36	14	83
1	10	10	38	19.33	76.52
0.5	5	37	24	22	73.28
ethyl alcohol extract from Cinnamon plant					
2	0	1	4	1.67	97.97
1	1	5	6	4	95.14
0.5	6	8	18	10.67	87.04
acetone extract from Cinnamon plant					
2	0	0	11	3.67	95.54
1	2	5	12	6.33	92.31
0.5	0	6	15	7	91.5
petroleum ether extract from Cinnamon plant					
2	1	6	29	12	85.42
1	3	7	35	15	81.78
0.5	0	20	38	19.33	76.52
ethyl alcohol extract from Lupine plant					
2	1	3	10	4.67	94.33
1	0	4	12	5.33	93.53
0.5	7	17	33	19	76.92
acetone extract from Lupine plant					
2	3	6	12	7	91.5
1	5	10	20	11.67	85.83
0.5	4	15	20	13	84.21
petroleum ether extract from Lupine plant					
2	1	5	10	5.33	93.53
1	4	12	30	15.33	80.84
0.5	35	60	77	57.33	30.37
pasha					
0.125	48	60	77	61.67	25.09
Control	59	78	110	82.33	

Conclusion

The main target of this study was to produce a safe unharmful product free from pesticide residues and to preserve the health of humans, plants and the surrounding environment. Safe and natural substances hold promise in enhancing productivity and control of cowpea insect pests as compared with chemical insecticides which are hazardous.

REFERENCES

Abd El-Rahman Soheir F. and Eman I. Abdel-wahab (2020): Efficiency of Certain Bio-Insecticides for Reducing the Yield Losses due to the Bean Pod Borer, *Etiella zinckenella* (Treitschke) in Soybean Fields. *Journal of Plant Protection and Pathology, Mansoura Univ.*, (1):29 – 36.

Abdou Gehan Y., Abdalla E.F. (2006). Evaluation of some selected pesticides against the two pod borers *Helicoverpa armigera* and *Etiella zinckenella* populations infesting cowpea in the newly reclaimed regions, *Research Journal of Agriculture and Biological Sciences*, 2(6): 578-583.

Bittenbender, H..C. (1990): Handling and storage of cowpea (*Vigna unguiculata* (L.) Walp.) as a leaf vegetable. *Tropical Agriculture*, 69:197-200.

Bremner J.M., Mulvaney C.S. (1982): Total Nitrogen. In Page, A.L.; RH. Miller and D.R Keeney [Eds.] Methods of Soil Analysis, Part 2 *American Society of Agronomy Madison*, WI.W.S.A. 595-624.

Coulibaly O., Alene A.D., Manyong V., Sanogo D., Abdoulaye T., Chianu J., Fatokun C. *et al.* (2009): Situation and outlook for cowpea and soybean in sub-saharan Africa. II Project in West and East Africa.

Dhaka S.S., Singh G., Ali N., Mittal V., Singh D.V. (2011): Efficacy of novel insecticides against pod borer, *Etiella zinckenella* (Treitschke) in vegetable pea. *Crop Research. (Hisar)*, 42(1/2/3):331-335.

FAO (1993). Plant production and protection paper 56. Pesticide Residues in food. Rep. Joint meeting on pesticide residues held in Geneva, December 5 – 14, Rome, 4(4): 12-20.

Henderson C.F., Tilton E.W. (1955): Tests with acaricides against the brown wheat mite. *Journal of Economic Entomology*, 48: 157-161.

Mahalakshmi V., Ng. Q., Lowson M., Ortiz R. (2007). Cowpea [*Vigna unguiculata* (L.) Walp.] core collection defined by geographical, agronomical and botanical descriptors. Plant Genetic Resources: *Characterization and Utilization*, 5(3): 113–119.

Mohamed M. Sh.;M. A. H Abd El-Hady and W. A. El- Hadary (2015): Integrated control of *Etiella zinckenlla* infested cowpea in Upper Egypt and its effect on productivity. *Journal of Plant Protection and Pathology, Mansoura University*, 6 (7): 1077 – 1087.

Oparaeke A. M., M. C. Dike and C. I. Amatobi (2005): Evaluation of botanical mixtures for insect pests management on cowpea plants. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 106(1) 41–48.

Sabbour M. M. (2016): Observations of the effect of nano chitosan against the locust *Schistocerca gregaria* (Orthoptera: Acrididae). *Journal of nanoscience & nanoengineering*, 4:28-33.

SAS Institute (2003): SAS version 9.1. SAS Institute Inc, Cary, NC, USA.

Shaalan HS (2016): Effect of Planting Dates and Certain Insecticides on the Lima Bean Pod Borer, *Etiella zinckenella* (Treit.) (Lepidoptera: Pyralidae) and Productivity of Cowpea Plants in Qalyoubia Governorate. *Egyptian Academic Journal of Biological Sciences A.Entomology*, 9(1): 121– 128.

Shabana Abeer I., Ghada E. Abdalla, Farroh K.Y. (2019): Impact of Certain Safe Treatments on Growth, Productivity and Protection against some Insect Pests of Cowpea Grown under Thermal Stress Condition. *Journal of Plant Production, Mansoura University*, 10:193 – 203.

Warthen J.R., Stokes J.D., Jacobson M., Kozempel M.P. (1984): Estimation of Azadirachtin Content in Neem Extracts and Formulations. *Journal of Liquid Chromatography*, 7: 591–598.

Xiong H., Shi A., Mou B., Qin J., Motes D., Lu W., Ma J., Weng Y., Yang W. (2016): Genetic Diversity and Population Structure of Cowpea (Vigna unguiculata L. Walp). *PLOS ONE,* 11:1-15

ARABIC SUMMARY

تأثير بعض الزيوت النباتية والمستخلصات ضد حفار قرون اللوبيا فى الحقل وأمتداد تأثيرها على خنفساء اللوبيا فى المخزن فى محصول اللوبيا

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تم إجراء تجربتين حقليتين فى محطة بحوث وقاية النبات بقها (مركز البحوث الزراعية) - محافظة القليوبية خلال موسم الصيف لعام 2020- 2021 لدراسة التأثير لزيتى القرفة والترمس والمستخلصات بالمذيبات (الكحول الإثيلى والأسيتون والبتروليم إيثر لنباتى القرفة والترمس ومبيد الباشا ضد حفار قرون اللوبيا. التركيزات المستخدمة من الزيوت والمستخلصات النباتية هى 2 و1 و0.5 % (حجم /وزن) وإستخدم التركيز الموصى بيه للمبيد الباشا. أظهر زيتى القرفة والترمس ومستخلص الإيثر البترولي من نبات القرفة ومستخلص الكحول الإيثيلي من نبات الترمس بتركيز (2٪) إنخفاض ملحوظ في أعداد اليرقات على القرون الخضراء للوبيا وزيت القرفة وزيت الترمس بتركيز (2٪) على القرون الجافة للوبيا بعد الرش الأول والثاني خلال موسمى الصيف لعامى 2020 و2021 على التوالي. سجل مستخلص الكحول الإيثيلي من نبات القرفة بتركيز (2٪) أعلى نسبة من البروتين الكلي في حبوب اللوبيا (15.51 و 16.75٪ خلال موسمي الصيف على التوالي) ، كما تم الحصول على أعلى محصول من القرون الخضراء والجافة بعد المعاملة بواسطة زيت القرفة بتركيز (2٪) (1775 و 1000 كجم / فدان) و (1880 و 1100 كجم / فدان) موسمى 2020 و 2021 على التوالى.

أعطى زيت القرفة ومستخلص الكحول الإيثيلي من نبات القرفة بتركيز (2٪) المستخدم في الحقل أعلى حماية من الإصابة بخنفساء اللوبيا أثناء التخزين. كان الانخفاض في تعداد خنفساء اللوبيا 99.16 و97.97% لزيت القرفة ومستخلص الكحول الإيثيلي من نبات القرفة بتركيز (2٪) في موسمي 2020 و2021 على التوالي. ومن هنا فإن كفاءة الزيوت والمستخلصات النباتية في مكافحة الحشرات تؤدي إلى تقليل الأضرار التي تسببها الآفات الحشرية فى الحقل والمخزن.