Hordeum vulgare

Aymen W. Al-Fadili

Nawal S. Mehdi

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Bio-Activity of Some Oil extracts on Khapra Beetle Trogoderma gronarium Everst (Cloptera:Dermastidae) larvae on Barley seeds Hordeum vulgare

Aymen W. Al-Fadili¹ and Nawal S. Mehdi² Ministry of Agriculture, Mesopotamia State Company for Seeds Department of Biology, College of Educates for Pure Science (Ibn- AL Haitham), University of Baghdad

Abstract:

The effect of some plant olis on Trogoderma granarium larvae was investigated in the laboratory at 27 ± 2 C° and 70% Relative humidity on barley grains 10 grams of barley were treated with five different concentration of plant oils (Eugenia caryophyllata, Osimum basilicum,Piper nigrum, and Azadirachta indica). The results showed that the rate of mortality was reached 99.96% and 93.33% when grain treated with 12.5% of A.indica and P.nigrum respectively. Also the results indicated that using 12.5% of O.basilicum and A indica reduce the germination of barley grains after treating with plant olis up to 26.66%. So it can be considred that these plant oils an environmentily safe and cheap inproteting the darley grains from infestation by T.granarium and used an alternative to chemical insecticides. **Key words:** Plant oils, Insecticides, Khapra, Trogoderma granarium.

Introduction:

Togoderma granarium (Everests) (Khapra beetle) is one of the most destructive pests for stored products, Its known as pests of stored wheat where it may causes post-harvest losses up to 30% (Honey et al., 2017).

Khapra beetle usually causes quantitative and qualitative losses for stored grains. It has a unique ability to tolerate starvation for more than three years and survive on a very low moisture content food and its ability to develop resistance against certain insecticides makes it the most destructive and dispersal pest of stored gains (Myers, 2012).

Larval feeding ways of khabra beetle move in and out through the grains which reduce seeding germination due to qualitative losses. When larvae feeds and consumes whole seeds leaving only shells behind, larvae and its skin can be noticed around the edges of grain bags makes is unsuitable for consumers (Parashar, 2006).

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Singh et al. (2017) reported that damage in stored grain caused by Khapra can be sever with weight losses of between 5-30 and in some cases may reached 73% therefore this grain will be unfit for consuming or markotable. Using synthetic insecticides intensively for controlling of stored pests has resulted in many problems including environment contamination, insecticide resistance, pesticides residues in food and lethal effects on non target living organisms (Gharson, 2015).Controlling and protecting grains by using botanical pesticides is a very promising issue (Behal, 1998). Since its much safer than synthetic insecticides, they do not pose any effect on the environment furthermore, plant origin insecticides are cheap and available (Arda and Selim, 2013).

The objective of our study was to evaluate the effects of some plants oils against T. granarium larvae and germination and weight losses of barley grains.

Materials and Methods:

<u>1- Insects Culture:-</u>

Culture of Khapra beetles maintained under controlled conditions of 27 \pm 2 C^o and 70 % RH in 5L plastic containers covered with a moslin cloth, tightend with rubber band to avoid the escape of insects. The culture were allowed to grow in natural environment as in traditional food medium (Barley), newly emerged 2nd instar larvae of T. granarium were tested in the experiments. (Sagheer, et al., 2013).

2- Plant oils:-

Four commercially available oils were tested in our study which are :-Eugenia caryophyllata, Osimum basilicum, piper nigrum, Azadirachta indica. (Table 1) These oils were tested on 2^{nd} instar khapra beetle larvae.

<u> 3- Bioassay:-</u>

Stock solution of 20% of plant oil were prepared, various concentration (5, 7.5, 10, 12.5%) of each were prepared by using acetone (as a diluting solvent), two ml of each concentration were applied to 10 gm of sterilized barley grains in a disposable jars, three repilcats of each treaments were made. Ten 2^{nd} instar khapra beetle larvae were transferred to each jar, the control treatement was carried out by using aceton only and replicated three times too.

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The treatment jars were covered with mosiln cloth held with rubber band, then it incubated in an electrical incubator at 27 ± 2 C^o and 70% R.H. the number of dead larvae in each jar was counted every day and the percentage of mortality and emergence were recorded (Kestenholz et al., 2007).

<u>4- Grains weigt loss</u>

Barley grains weight losses were calculated after one week of the experiment by weighting the grains to evaluate the efficacy of plant olis in protecting it from the larval feeding.

5- Percentage of germination

Test the germination of treated barley grains with plant oils was carried out to ascertain the effect of these treatments, grains from each treatment were placed in petri-dish lined by wetted cotton after 1-2 days the germination percent was calculated (Gharsan, 2015).

<u>6- Statical analysis</u>

Data of the experiment were analyzed using analyses of variance (ANOVA), means of the three replicates of treatment were tested by duncans multiple range test (Duncan, 1955).

Results and Discussions

Larvicidal activity of Clove, Basil, Black pepper and neem oil were tested against 2^{nd} instar larvae of khapra beetle. Data in table (2) showed that 12.5% of above plant oils led to cumulative mortality percentges reached about 56.66, 99.96, 76.66 and 93.33 respectively, so neem oil showed the highest efficacy against khapra beetle larvae followed by black pepper oil and the lowest efficacy among these oils was clove oil (56.66%).

The highest mortality rate of the 2nd instar larvae of khapra beetle when treated by neem oil could because of its bioactivity which are included larvicidal and feeding inhibition and disruption a metamorphosis and death (Abdallah and Subramanian,2008). Schnieder et al (2017) revealed that treating pupae and adult of the sugarcan eborer Diatraea Saccharalis F. with concentration of commercial formulation of neem oil led to multiple abnormalities and concentrations-dependent effects on mortality, therefor, the neem oil provide to be efficient control agent for this insect.

The obtained results of treating by black pepper oil led to mortality percent up to 93.33% (table 2) agreed with Hussein et al. (2017) who mentioned that treating Tribolium castaneum Hbst. and Sitophilus orzae. L. larvae which are a serious stored grain pests with 10 % of this oil led to mortality precnages reached up to 87.7 and 100% respectively the mortality results due the presence of insecticidal activities of many compounds in this oil such as carvone, pinene, α - copaene and α - pipene.

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Table (2) shows too that treatment with baisl oil led to mortality and emergency percent about 76.66 and 16.66 respectively these percentages may be due to the insecticidal effect of the active organic compound in this oil such as Eugenal which might be had an insecticidal effect. This result agreed with Hikal et al. (2017) who mentioned that basil oil have an insecticidle and strong repellent effect on mosquitoes because of the presence of eugenal compound in basil oil and very toxic effect to the Bruchid zabrotes and some other pests because of the presence of linalool compound in this oil too.

Our results in table (2) showed that treating with 12.5 % percent of clove oil recorded mortality and emergency percent about 56.66 and 43.33% respectively, this results agreed with khalaf (2016) results who mentioned that 6% of glove oil led to 90% mortality rate of T.granarium beetle.

Prercentage germination and weight gains or loss were recorded in Table (3) after treatment of barley grain with 0.5-12.5% of plant oils, to study the effects of these oils on germination, the results showed that treating barley grains with 12.5% of basil oil or neem oil led to 26.66% of germination without any losing in grain weight, while treating by black pepper or Clove oil led to germination percent about 60 and 50 % respectively these results showed that plant oils has a big effectiveness on the grain germination and no effects on losing weight- our finding agreed with many researches which proved that plant oils were effective in protecting stored grain from stored pests such as T.granarium, Callosobruchus chinesis, C.maculatus and Tribolium castanem. (Khalaf, 2016; Gharsan, 2015; Devi, 2014; Mehdi, 2012; Maina et al., 2012; Mahdi, 2008). So that the studied oils have a very good potential struggle, toxic and lethal effects on T. granarium. and could use some of these oils to protect the stored grains.

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Table (1): Plants used in the study

Plants name	Common name	Family	Part used
Eugenia	Clove	Myrtaceae	Floral buttons
caryphyllata			
Osimum	Basil	Labiate	Leaves
basilicum			
Piper nigrum	Black pepper	Piperaceae	Seeds
Azadirachta	Neem	Meliaceae	Fruits
indica			

Table (2): Insecticidal action of plant oils against T.granarium

Plant oil	Concentration	Cumulative	Emergence % ±
	(%)	mortality % \pm	S.D*.
		S.D.	
Clove	5	20.00 ± 10.0	80.00 ± 10.0
	7.5	26.66 ± 5.77	73 ± 5.77
	10	40.00 ± 10.00	60.00 ± 10.00
	12.5	56.66 ± 11.54	43.33 ± 11.54
Basil	5	33.33 ± 15.27	66.66 ± 15.27
	7.5	40.00 ± 17.32	60.00 ± 17.32
	10	50.00 ± 26.45	36 ± 20.81
	12.5	76.66 ± 32.14	16.66 ± 20.81
Black pepper	5	53.33 ± 15.27	46.66 ± 15.27
	7.5	63.33 ± 11.54	36.66 ± 11.54
	10	80.00 ± 10.00	20.00 ± 10.00
	12.5	93.33 ± 11.54	6.66 ± 11.54
Neem	5	59.67 ± 3.58	40.33 ± 10.52
	7.5	40.00 ± 10.88	60.00 ± 10.73
	10	59.33 ± 10.52	40.33 ± 10.52
	12.5	99.96 ± 0.57	0.33 ± 0.55

*SD: Standard Deviasion

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Table (3): Germenation (%) and weight gain or loss of barley grain due to treating with plant oils.

Plant oil	Concentration	% Germenation	Weight gain or
	(%)		loss (g.)
Clove	5	63.33	0.271
	7.5	60	0.321
	10	73.33	0.391
	12.5	50	0.468
Basil	5	63.33	0.495
	7.5	73.33	0.465
	10	80	0.601
	12.5	26.66	0.951
Black pepper	5	100	0.628
	7.5	100	0.695
	10	100	0.748
	12.5	60	1.598
Neem	5	60	0.451
	7.5	66.66	0.541
	10	63.33	0.528
	12.5	26.66	0.637
Control	0.00	100	-0.135

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الفعالية الحيوية لبعض الزيوت النباتية ضد يرقات حشرة الخابرا Trogoderma gronarium Everts (Coleoptera:Dermastidae) على نبات Hordeum vulgare الشعير

الخلاصت

دُرس تأثير بعض الزيوت النباتية في يرقات حشرة الخابرا Trogoderma gronarium تحت خُرس تأثير بعض الزيوت النباتية في يرقات حشرة الخابرا عرامات من حبوب الشعير بخمسة تحت ظروف المختبر، والتي تصيب حبوب الشعير تم معاملة 10 غرامات من حبوب الشعير مسين المعير تم معاملة 10 غرامات من حبوب الشعير مسين المعير بخمسة Csimum والريحان Eugenia caruophyllata والنيم Azadirachia indica.

أظهرت النتائج أن معدل هلاك اليرقات وصل إلى 99.96% و 93.33% عند تغذيتها على حبوب معاملة بتركيز 12.5% من كل من نبات النيم و الفلفل الأسود وعلى التوالي. وأوضحت النتائج أيضاً بأن تركيز 12.5% من زيت نبات الريحان والنيم يخفض معذل إنبات بذور الشعير بنسبة أيضاً بأن تركيز زيوت هذه النباتات يمكن اعتبارها ملائمة في حماية بذور الشعير من الإصابة بحشرة الخابرا، فضلاً عن كونها صديقة للبيئة ورخيصة الثمن و يمكن اعتمادها كبدائل عن المبيدات الميرينية وصلية بين وي هذه النبات بنور الشعير بنسبة وليضاً بأن تركيز 12.5% من زيت نبات الريحان والنيم يخفض معذل إنبات بذور الشعير بنسبة المضاً بأن تركيز مات المعير من الإصابة ولي معاملة من زيت هذه النباتات ومكن اعتبارها ملائمة في حماية بنور الشعير من الإصابة الميرة الخابرا، فضلاً عن كونها صديقة للبيئة ورخيصة الثمن و يمكن اعتمادها كبدائل عن المبيدات الكيميائية.

الكلمات المفتاحية: زيوت نباتية، يرقات، Trogoderma gronarium، الخابرا، الشعير.