Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.4, No.4, 2014

Fumigant Toxicity of *Ricinuscommunis* L.Oilon Adults and Larva of Some Stored Product Insects

Ubaid Jenan
Babylon University, Iraq,Collageof ScienceFor Women
E-mail of corresponding author:jenanubaid@yahoo.com*

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In this study fumigant toxicity of castor oil on adults and larva of two stored product insects*Triboliumconfusum*and *Trogonellagranarium* was investigated.Three concentrations were prepared 2%,5% and10% respectively by using acetone,statistical analysis showed thathightest mortality for adults of *T.confusum* were 23.333% and 26.666% at 2% and 10% of castor oil and all three concentrations significantly caused high mortality but 10% of castor oil killed 100% of khaprabeetles.Results also showed that 5% and 10%concentrations of castor oil were the most effective on first , second and third larval instars of *T.confusum*, as they caused 60% and 66.6% mortality for the first larval instar, 50% and 63.3% mortality for second larval instar and, 33.3% and 40% for third larval instar at 5% and 10% concentration respectively compared with 0% at control treatment,in addition the three concentrations of castor oil affected first ,second and third larval instars of *T. granarium* significantly ,the percentage of mortality was 86.6%, 90.0% and 93.3% for the first laval instar compared with 40.0% at control treatment, 70.0%,70.0% and 80.0% for second larval instars compared with 20% at control treatment,and 40.0%, 63.3% and 80.0% for third larval instar compared with 20.0% at control treatment, at 2%,5% and 10% concentrations respectively.In summary, results indicated that these essential oils have good fumigant toxicity on stored-product pests.
Keywords:essentialoiles,castoroil,stored product insects.

1.Introduction

The confused flour beetles *Triboliumconfusum* (coleoptera:Tenebrionidae)andkhapra beetles *Trogonellagranarium*(coleopteran:Bruchidae)arethe mostwidespreadand destructive stored_productpests throught the world ,beetles and larvae feed on avery wide variety of dry vegetables substances (Rees,2004).The application of various synthetic insecticides over the years has lead to a number of problems including the development ofresistance in stored products are generally preffered because of their innate biodegradability and less harmful compounds affecting non_ target organisms (Prabakar and Jabanesan,2004) ,all these caused encouraged researchers tobenefit from natural materials as safe replacements to control stored product pests. The bioactivity of essential oiles is directly relayed to its chemical composition (Angioni etal,2006) ,they possess acute contact and fumigant tocxicity toinsects(Abdelgaleil etal,2009). .*Ricinuscommunis* (L.) (Euphorbiaceae) is wide spraed in many parts of the world (Weiss,2000) contains ricin which one of the most toxic materials which could be essily extracted from different parts of the plant (Ogunniyi,2006).There are many studies has been found to experience the activity of this material on the serious insects pests .Aouintyetal(2006) have proved hight activity of the aqueous extraction of*Ricinuscommunis* leaves on four species of mosquitos ,Obeng-Ofori and Freeman (2000) found that ground leaves,water or acetone extracts and essential oil of *R. communis* were acutely toxic to *Sitophilusoryzae* and *Triboliumcastaneum*.Castor oil alsoproduced hight mortality on adults of scale insect *Parlatoriablanchardi*on date palm (Naser etal,2008).In addition,many studies reported the effectiveness of castor oil in protecting stored grains against different insect pests, Pierrard(1986)used oils of groundnut , castor , coconut , palm kernel , corn cotton , babassu , mustard , olive , seasome , sunflower and rice , in that study castor oil at 8 ml/kg provided complete control against *Callosobrochus maculates*,Lal and Raj(2012) used neem oil, eucalyptus, sunflower oil and castor oil in protecting pigeon pea against the pulse beetles and they found that castor oil was recorded in terms of reduction inweight loss of the grains , as it gave 100% control..

And because of the little studies that respect with the activity of material found in*Ricinuscommunis* in Iraq ,so this research have been designed to experience the activity of castor oil in controlling the larvae and adults of confused floor and khapra beetles.

2.MaterialsAnd Methods

2.1 Insect rearing

Triboliumconfusum and*Trogonellagranarium* were reared in glass containers (20 cm length,12 cm width and 8 cm hight) covered by a fine mesh cloth for ventilation,containing wheat flour mixed with yeast (10:1) (w:w) respectively.The culture were maintained in a dark incubator at 27±1ºC and 65±5% relative humidity(Abbassand Javad,2012).Four larval instars and adults were used to investigatethe effect of castor oil on these two pests.

2.2 Preparation of concentrations of castor oil

Castor oil was obtained from local markets ,three concentrations were prepared 2%,5% and 10%respectively,by

using acetone (Fouad,2013).

2.3 Fumigant bioassay of insects

To determine fumigant toxicity of castor oil ,petridishes were used each containing 10 adults or larvae (of aech instar).Filter paper whatman°1(9 cm diameter)were prepared by adding 2ml of each concentration then fiter papers were fixed to the surface of petridishescover,Treated insects were transferred to untreated petridishes after 24 hr.Tree replicates were run for each concentration and for control group ,mortality was determined after 48hrs after exposure .When no signs of leg or antennal movement were observed,insects were considered dead (Mahmoudvand etal,2011).

2.4 Statistical analysis

The mortality counts were corrected by using Abbott formula (Abbott,1925).All data were analyzed by using Analysis of variance (ANOVA) and Least significant differences (LSD).

3.Results

3.1 Fumigant bioassay on adult beetles

Figure(1) and(2) show mortality trends for*T.confusum* and *T.granarium* adults at different concentrations of castor oil.Results indicated that all concentratios of castor oil affected adults of the two insects ,statistical analysis showed that the hightest mortality for adults of*T.confusum* were 23.333% and 26.666% at 2% and 10% of castor oil(Table 1).Table(2) showed mortality of *T. granarium* adults exposed to different concentrations of castor oil,statistical analysis showed that all three concentrations significantly caused high mortality but 10% of castor oil killed 100% of khapra beetles

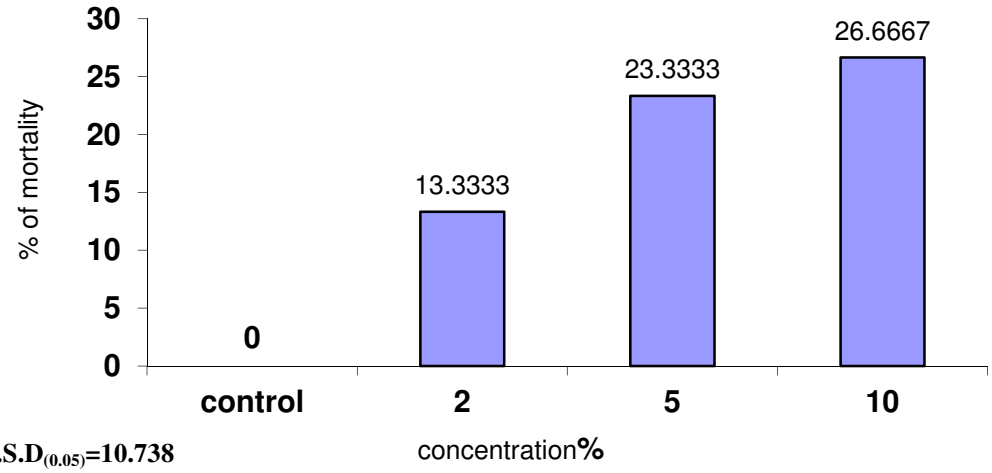
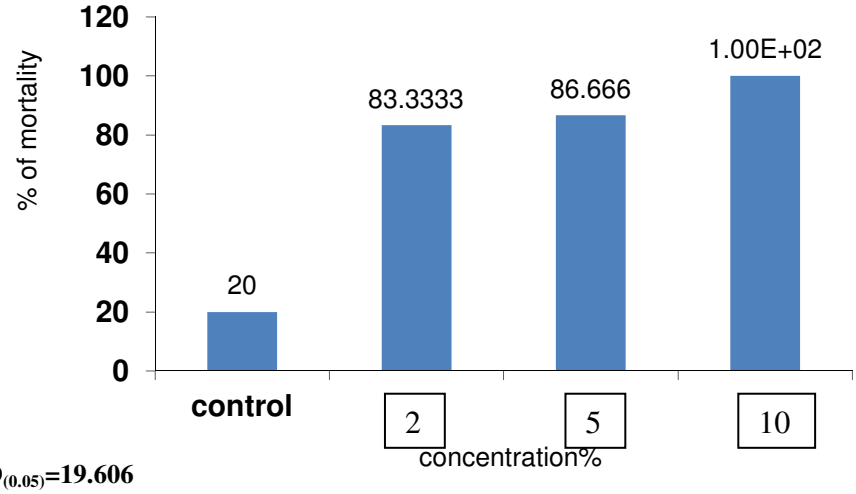


Figure (1) mortality of *Triboliumconfusum* adults exposed to different concentratios of castor oil



Figure(2) mortality of *Trogonellagranarium* adults exposed to different cocentrations of castor oil cocentrations of castor oil

3.2 Fumigant Bioassay on larval Instars

Table(1) and table(2) showed mortality of different larval instars of *T.confusum* and *T. granarium* exposed to three concentrations of castor oil.Statistical analysis showed that 5% and 10%concentrations of castor oil were the most effective on first , second and third larval instars of *T.confusum*, as they caused 60% and 66.6% mortality for the first larval instar, 50% and 63.3% mortality for second larval instar and, 33.3% and 40% for third larval instar at 5% and 10% concentration respectively compared with 0% at control treatment table(1).In table(2) results showed that the threeconcentrations of castor oil affected first ,second and third larval instars of *T. granarium* significantly ,the percentage of mortality was 86.6%, 90.0% and 93.3% for the first laval instarcompared with 40.0% at control treatment, 70.0%,70.0% and 80.0% for second larval instars compared with 20% at control treatment,and 40.0%, 63.3% and 80.0% for third larval instar compared with 20.0% at control treatment, at 2%,5% and 10% concentrations respectively.

Table(1) Effect of different concentrations of castor oil on larval instars of *Tribolium confusum*

Larval instar	% of mortality			
	Concentration%			
	0	2	5	10
1st	0.0	23.3	60.0*	66.6*
2nd	0.0	23.3	50.0*	63.3*
3rd	0.0	23.3	33.3*	40.0*
4th	0.0	13.3	20.0	33.3*

$LSD_{(0.05)FORLARVALINSTAR=8.061}$
$LSD_{(0.05)FORCONCENTRATION=8.060}$
$LSD_{(0.05)FOR\ INTERFERANCE=16.123}$

Table(2) Effect of different concentrations of castor oil on larval instars of *Trogonella granarium*

Larval instar	% of mortality			
	Concentrations %			
	0	2	5	10
1st	40.0	86.6*	90.0*	93.3*
2nd	20.0	70.0*	70.0*	80.0*
3rd	20.0	40.0*	63.3*	80.0
4th	0.0	16.6	50.0*	76.6*

$LSD_{(0.05)FORLARVALINSTAR=7.279}$
$LSD_{(0.05)FORCONCENTRATION=7.296}$
$LSD_{(0.05)FORINTERFERANCE=14.559}$

4.Discussion

Natural compounds from plants could be efficient alternatives to conventional fumigants because of their low toxicity to mammals, fast degradability properties,and regional availability (Rajendran and Sriranjini, 2008),our results on fumigant toxicity ofcastor oil on adults and larval instars of *T.confusum* and *T. granarium*indicated that this oil had a good toxicity on these pests by fumigation.It was found that*T. granarium*adults and larval instars were more affected with all castor oil concentrations than those of*T.confusum*as the mortality of *T.confusum* adults were hightest only in 10% concentration while all concentrations caused significant mortalities in the adults of *T. granarium*,especially 10% which killed all the beetles ,on the other hand the highly toxic concentrations of castor oil on *T.confusum* larva were 5% and 10% while all concentrations were very toxic on larva of *T. granarium*,this indicated that khapra beetlesare more susceptible than confused beetlesand low concentrations are more effective on them ,this result is similar to those ofAggarwal etal(2001) which found thatadults of *T. castaneum* were the most highly tolerant to the vapor action of all the compounds tested ,the difference in theresponse of the insect species to the essential oils has been reported for stored product insects (Lee et al. 2003; Negahbanetal. 2007).

The high mortality in larva in this work was similar to that of Tounouetal(2011) which found high larval mortality in *Plutellaxylostella* by using castor oil.Castor oil and pure compounds of *R. communis*have been reported to exhibit high toxic effects in target animals (Olsnes, 2004).The insecticidal activity of plant materials derived from *R. cummunis*is attributed to its major components of protein ricin and alkaloid ricinine which are lethal at very low concentrations (Abbiw, 1990). Ali etal (2000) reported that oil of *R.communis* seeds contains phenolic materials which have toxic properties on insects through direct effect on nervous system ,digestive system and analytical enzymes.Ricin causes acute cell death by inactivation of ribosomal RNA, inhibiting protein synthesis (Roberts & Smith,2004;Utskarpen et al., 2006; Parikh et al., 2008)

.Results of this study clearly illustrated that insects varied in their susceptibility to different essential oils, which

probably refers to the insecticidal ability of their active constituents.

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