

Effect of infrared Radiation on two stored product insects and barley grain Germination on grain

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Abstract:

This study handles the effect of the infrared radiation (IR) from a red incandescent bulb at three exposure distances [6 , 8.5 , 10 cm] and five exposure periods [2,3,4,5,6 and minutes]at the larval , pupal and adult stages of confused flour beetle *Tribolium confusum* and rusted flour beetle *Tribolium castanum* in addition to the effect of the IR on germinations grain and barley . The effect of IR on each insect species increases with the decrease of the exposure distance and increases as well with the increase of The exposure period. The 6cm exposure distance at 6 exposure periods kills all the stage of the two species. Exposure distances and periods show significant difference on percentage and speed of grain germination of wheat and barley.

Keyword :spots , infrared , environmentl .

Zoology Classification : QL 461- 599.82

Introduction:

The use of the physical agents for controlling insects likely outdates other means of control. Undoubtedly the material and natural forces of the universe are recognized and employed against insect pests long before the turn to chemicals . But the scientific use of the physical agents are comparatively recently developed recent physical procedures are considered one of the necessary components of pest management strategies of the control stored product insects (1). Recently (IR) has developed considerably as a result of the increased emphasis on space application . The use of (IR) is among the more promising new methods of controlling insect pests of cereal during storage. The possibility of using IR temperature radiation for IR control was first suggested by (2)

IR have been used. For heating insects to the death point The usual method of producing IR is by means of the red incandescent bulbs that are widely used as heat lamps. In some commercial applications for heating grain to kill insect. The loose grain has been carried on belt conveyor between banks of infrared lamps both above and below the belt. Al-Iraq 1993

Many investigators such as (3)(4) (5) (6) (7) (8)(9)(15)

Controlled stored product insects by using (IR) to increase the temperature of the stored commodity. The present study is conducted to determine the effectiveness of (IR) on larval pupal and adult stages of the confused flour beetle *Tribolium confusum*

and rusted flour beetle *T. castanum* and also on the percentage and speed of germination of wheat and , flour barley seeds.

materials and methods:-

In this study ared incandescent lamp (100 watt turysten lamp) was used as a source of(IR). Three distance levels (6,8.5 and 10 cm) and 5periods (2,3,4,5,6) minutes of expasureto IR were applied to samples representing each of larval (4th instar larva) pupa and adult stage of each of confused flour beetle and rvsted flour beetle intensity was controlled by converted the distance between the lamp and the sample. The dosage was controlled by converted altering the periods tim time which the samples werex posed .

All treatments were replicated 5 times in adition to the control . At the treatment time each sample (20 individuals) was spread on petiry dish (6 cm in diameter) placed over black rubber plate of 5mm in thickness. The temperature correlated to each treatment was estimated as shown in table 1 Mortality percentage was estimated 24 hours after treatment

Table 1 : Temperature from ared incandescent lamp (100 watt) at Different exposure distances and exposure periods.

Exposure	Exposure period Cominute					coutrol*
	1	2	3	4	5	
Distance(cm.)						
6	34	48.7	59.5	62.0	37.5	50.0
8.5	29.5	39.5	48.2	54.5	59.2	50.0
11	24.0	39.0	44.5	49.0	55.7	50.0

(*)Laboratorytory temperature

The effect of IR on the percentage and speed of germination of wheat and barley grains was also couducted by the same way except using grains instead of insects.The exposed grains (20 grains in each petri – dish) were treated with 6% sodium hypo chloride for two minutes to prevent grainmold iness during germination. Five replicates were used for eachtreatment inaddition to the control.Germination of grains were conducted according to the method recommended by international seed testing association (10).The complete randomized design (C.R.D) was used and the data was analysed according to (11).

Results and discussion:-

The data in table 2 show that the mortality of larva of each of confused flour beetle and beetle and rusted flour beetle increased significantly with decrease of exposure distance and increase of the exposure time. All larvae of confused flour beetle were killed at 6 minutes exposure at all exposure distances while 100% kills at 6 and 8.5cm. distances and 75% kill at 11cm. distance for the larva of rusted flour beetle. The mortality percentage is very low at 2 minute exposure period at the three distances for the both species. The data in table 2 reveals that the exposure of the pupa to IR gives 100% at 6 minutes period at all exposure distances for each of confused flour beetle and rusted flour beetle. However 2 minute exposure did not have effects at all exposure distance except at 6 cm. distance gives 10% kill of larva of confused flour beetle. The statistical analyses of the data show that there are significant differences between treatments. The mortality percentage of the adult of each species exposed to IR is shown in table 2. It is 100% kill at 6 minutes exposure period at all exposure distances while nothing killed at 2 minutes exposure at all exposure distances. The statistical analysis of the data shows that there are insignificant differences between the two insects whereas the exposure periods and exposure distances show significant differences. Reviewing the obtained results in the three previous tables it can be seen that the effect of IR varies according to the insects species, insect stage, exposure period and exposure distance. It is found that confused flour beetle is more affected by IR than the rusted flour beetle. This is in accordance with (12). The effect of IR on each insect increases with increase of exposure period and exposure distance.

Table2:- Mortality percentage of the larvae, pupae and adults of confused flour beetle and rusted flour beetle 24 hours after exposure

Exposure Distance cm.		% Mortality																		
		Exposure period(min).																		
		1			2			3			4			5			control			
L	P	A	L	P	A	L	P	A	L	P	A	L	P	A	L	P	A			
6	C.F.B.	0e	10g	0i	88ab	87b	90b	100a	94ab	100a	100	100a	100a	100a	100a	100a	100a	0e	0h	0i
6	K.B.	0e	0h	0i	18d	80b	66b	91ab	90ab	100a	96ab	100a	100a	100a	100a	100a	100a	0e	0h	0i
8.5	C.F.B.	0e	0h	0i	57e	9g	17gh	88ab	79c	54e	100a	92b	75c	100a	100a	100a	100a	0e	0h	0i
8.5	K.B.	0e	0h	0i	14d	2h	10h	70c	70dc	32f	84b	86bc	54e	100a	100a	100a	100a	0e	0h	0i
11	C.F.B.	0e	0h	0i	18d	0h	0i	52c	5g	7hi	75b	55e	65d	100a	100a	100a	100a	0e	0h	0i
11	K.B.	0e	0h	0i	10d	0h	0i	50e	5oh	7hi	75c	30f	20g	75be	100a	100a	100a	0e	0h	0i

C.F.B.. –Confused flour beetle, K.B. – khapra beetle.

L = Larva

P = Pupa

A = Adult

Values followed by the same letter do not differ significantly at P < 0.05 using Duncan's multiple range test.

As shown in table 3 the germination percentage of the wheat grains is not affected with IR at all treatment while that of barley grains is affected slightly at 8.5 and 11cm Exposure distances at exposure periods whereas it is reduced somewhat at 6 exposure distances (96,81,78,74,71%) at 2,3,4,5,6 and minutes exposure periods respectively .

Overall the germination percentage of each of wheat and barley grains is more than the lower level of the germination of the certified seeds which is 80% (13).

Statistical analysis of the data show that the exposure periods and exposure distances show insignificant difference on the germination percentage of each of wheat and barley grains while the difference in germination percentage between wheat and barley is significant

The data in table 3 also indicate that the speed of germination is slightly affected with the exposure to IR and this effect is significant .

The speed of germination ranges between 29.3- 40.5 and 26.5 – 39.6 seedling wheat and barley grains respectively.

Table3:- percentage and speed of germination for wheat and barley seeds After 42 hours of Exposure.

Exposure Distance	Cm	% germination Exposure period(min).						speed of germination seeding / day Exposure period (min.)					
		2	3	4	5	6	control	2	3	4	5	6	control
6	W.	98	100	98	100	96	100	38.1	39.4	38.5	39.5	27.3	39.6
	B.	96	81	76	74	71	98	37.5	30.8	30.7	27.5	25.5	37.7
8.5	W.	100	100	100	100	100	100	38.8	39.1	35.7	36.1	36.4	39.6
	B.												
11	W.	94	92	98	87	87	98	34.3	32.3	29.0	31.3	29.8	37.7
	W.	100	100	100	100	100	100	37.0	39.6	38.3	38.0	35.1	39
		95	89	90	89	89	98	35.5	39.6	36.5	36.3	36.4	37.7

W: wheat . B. Barley.

There are no significant difference at $p \geq 0.05$

From this study it can be stated that death as a result of exposure to IR is due to the increase of the internal body temperature. This is in accordance with (3) .

The exposure period at 6 minutes at 8.5 cm. exposure distance is sufficient to kill all stages of confused flour beetle and rusted flour beetle without effect on speed and percent germination of wheat and barley grains.

The temperature from IR at this treatment is 58.2°C.

This result agrees with (5) (12) and (14) which indicates that insects in grain can be controlled by rising grain temperature to 65°C for 40 sec – 6°C for 30min . and 55°C for 30min . by infrared heaters respectively.

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تأثير الأشعة تحت الحمراء على حشرتين مخزنتين وعلى انبات

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الخلاصة

شملت الدراسة تأثير ثلاثة مسافات (6,11,805,6سم) وست فترات تعريض (2,3,4,5,6 دقيقة) للأشعة تحت الحمراء على يرقات عذارى و بالغات كل من خنفساء الطحين المتشابهه *Tribolium confusum* وخنفساء الصدئيه الحمراء *Tribolium castanum* بالإضافة الى دراسة تأثير الأشعة على نسبة وسرعة انبات حبوب الحنطة والشعير ووضحت النتائج بان تأثير الأشعة تحت الحمراء على كلا الحشرتين يزداد بتقليل مسافة التعريض وبزيادة فترة التعريض ولاحظنا بان نسبة الموت كانت 100% لجميع الاطوار ولكلا الحشرتين عند مسافة تعريض 6سم ولفترة 6 دقائق وان نسبة الانبات وسرعته بالنسبة لحبوب الحنطة والشعير تأثر معنويا عند تعريضها للأشعة .

الكلمات المفتاحية : بقع ، الأشعة تحت الحمراء ، جيلوجيا البيئة .

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