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THE USE OF NATURAL PESTICIDE AND ITS COMBINED ACTION WITH GAMMA RADIATION AS TRADITIONAL PROTECTANTS OF STORED COWPEA AGAINST CALLOSOBRUCHUS MACULATUS (F.)

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ABSTRACT: Plant powders (garlic, onion and both of them) either alone or in combination with radiation (20 and 40 Gy) were used in order to suppress the attack of pulse beetle Callosobruchus maculatus (L.) in cowpea seeds. Results show that tested materials had a toxic effect against insect. It appears that adult mortality was affected by both dosages of irradiation and period of exposure. Treatment of irradiated adults with LC_{10}, LC_{25}, and LC_{50}, of plant powders produced higher percent mortality than either treatment given alone. Garlic powder was significantly effective at 40 Gy with LC_{10}, LC_{25}, and LC_{50} after 72 hr., treatment at the other exposure time (24 and 48 hr.) caused slight percent mortality. The lowest concentration LC_{10} in this study were effective in reducing oviposition while did not cause egg mortality. The combined effect of plant powders and radiation caused highly significant inhibition in eggs number except in the case of onion powder with 20 Gy. The LC_{10} of garlic powder caused higher percentage reduction of progeny than onion or the mixed of both powders, this effect was more pronounced with radiation even the using of the dose 40 Gy.

INTRODUCTION

The pulse beetle *Callosobruchus maculatus* (F.), is among the most destructive insects of stored pulses in Egypt and all over the world. Infestation begins in the field and continues in stored seeds causing considerable damage (Huignard, 1979). In order to avoid the high costs and hazards of the chemical control of insects, a cheap and safe alternative is needed. Mixing

of plant parts and vegetable oil are widely practiced in Asia and Africa (Morallo-Rejesus et al., 1990). Also the use of locally available plant materials to limit insects in stored stuff is common in traditional farm storage in developing countries (Weaver et al., 1994). This treatment is convenient and inexpensive method to protect stored seeds from insect infestation. In several African countries, the use of plants as pest control agent in store is very common (Sighamany et al., 1986; Ismail et al., 1995; El-Degwi and El-Orabi, 1996; El-Degwi, 1997; Ezz El-Din et al., 1998; El-Degwi and Rizk, 2001 and El-Degwi et al., 2001).

The study was carried to test toxicity of garlic cloves powder, onion bulbs and the combined effect with irradiation against C. maculatus.

MATERIALS and METHODS

C. maculatus. Was drown from cultures reared in Insect and Pest Control Lab., (NCRRT). Adults were reared on cowpea Vigna unguiclata in an incubator maintained at 30±2°C and 70% ± 5% R.H. All experiments were performed at these conditions.

Newly emerged adults were isolated from the standard culture and introduced to (9 cm diameter) petri dishes lined with filter paper containing different concentrations (0.0313, 0.0625, 0.125, 0.250, 0.500, 1.00 and 1.500 gm) of each garlic (Allium sativum) and onion (Allium cepa) poders, garlic cloves and onion bulbs were dried in shade and ground to fine powder in an electric mill, and kept in clean dried bottles. Each concentration was replicated five times. Five replicates were left untreated to serve as a control. Mortality was recorded daily after 24, 48 and 72 hr. Data were corrected by Abbottís formula (Abbott, 1925). The corrected mortality was plotted on logarithmic probability paper (Finney, 1971). LC_{10}, LC_{25}, and LC_{50} were calculated at 72 hr.

Irradiation of newly emerged adults was carried out through the model 220 Gamma Cell Irradiation Unit (^{60}Co Source installed in NCRRT with a dose rate 2.1 rad/sec.), only two dose levels of gamma irradiation were chosen, 20 and 40 Gy to study combined effect of gamma radiation and

powders on mortality and some biological aspects. Irradiated newly emerged adults were introduced to petri dishes containing concentrations of LC_{10}, (0.039, 0.015 gm), LC_{25}, (0.15, 0.15 gm) and LC_{50} (1.00, 2.5 gm) of each garlic and onion. Mortality percentage was recorded after 24, 48 and 72 hr. in all treatments.

The biology of C. maculatus was studied at each separate LC_{10}, plant powder and then with mixed two LC_{10}, of powders. Plant powders were mixed thoroughly with 25 gm seeds at (0.039 gm) of garlic and (0.015 gm) of onion (w/w) in small jar. Three replicates for each concentration, mixed concentrations and untreated seeds were used. Ten irradiated newly emerged pairs of adults were released in each jar. The number of eggs on infested seeds were recorded. The infested seeds were incubated till the emergence of offsprings which were counted.

Percentage reduction in adult emergence were estimated by the following formula

$$\% \text{ reduction in emergence} = \frac{y - x}{y} \times 100$$

Where

y = Number of adults in control

x = Number of adults emerged in treatment.

Data were transformed to acsine units and subjected to analysis of variance to find the significance of each main factor (Snedecor and Cochran, 1967).

RESULTS AND DISCUSSION

Results in Table (1) show that garlic powder had toxic effect against C. maculatus infesting cowpea seeds. Garlic powder at 1.5 gm concentration were found to be the most efficient in increasing the percentage of mortality being (53.9, 89.8 and 91.8%) after 24, 48 and 72 hr., respectively. The lowest percent mortality was recorded at 0.0313 gm. (9.6, 34.8 and 47.0%) after 24, 48 and 72hr. respectively. We noticed that the percentage of mortality increased significantly as the concentration and time increased.

The adult percentage mortality (Table 2) showed notable differences (from zero activity to 89.8%). Seeds treated with onion powder cause appreciable adult mortality being 18.6, 30.6 and 57.2% after 24, 48 and 72 hr., respectively at 0.0313 mg concentration. On the other hand, the concentration 1.5 gm showed (42.6, 85.7 and 89.8%) after 24, 48 and 72 hr., respectively. It is very important to note that percentage of mortality is concentration and time depended.

The combined effect of gamma radiation and plant powders were presented in Table (3). Results indicated that the percent mortality of irradiated adults at the dosage of 40 Gy were higher after 72 hr than 24 hr or 48 hr. Meanwhile, 20Gy caused slight less degrees of mortality, which increased after 72 hr. Treatment of irradiated adults with LC_{10}, LC_{25}, and LC_{50} of garlic or onion produced higher percent mortality than either treatment given alone.

Garlic powder was significantly effective against the irradiated adults at 40 Gy, with LC_{10}, LC_{25} and LC_{50} (48.3, 56.7 and 86.7%) after 72 hr. Data show that the onion powder produced (40.0, 41.7 and 65.0%) mortality on the 72 hr. exposure. In all cases mortality in irradiated adults was less than 50% at the end of experiment. While combination of 20 Gy of gamma radiation and LC_{10} or LC_{25} or LC_{50} onion powder caused a slight percent mortality (33.3, 40.0 and 58.3%) after 72 hr. However, percent mortality were 43.3, 48.3 and 85.0% for treatments with garlic powder, respectivelly. Treatment at the other exposure time caused a slight percent mortality increased with the increase of radiation dosages and powder concentration. These results are in line with the results of several workers. Deb-Kirtaniya et al. (1980) found that oil obtained from garlic cloves exhibited toxicity to third instar larvae of *Euoroctis sp.* And one day old larvae of *Culex sp.* In addition an aqueous solution of the crude juice of garlic was highly potent as a contact toxicant. Risha et al. (1993a) mentioned that on treated faba been seeds with essential oils the percentage mortality of *C. chinensis* affected significantly as the concentration increased.

Mohamed and Abdel-Alim (1994) stated that the mean mortality percentage of *Sitophilus granarius* at higher dosages of different plant oils were higher after 14 days than 3 or 7 days. El-Degwi and El-Orabi (1996) reported that soybean powder was more effective in inducing the highest percentage of mortality especially at 12% ratio against *C. maculatus*. Ezz El-Din et al. (1998) studied the efficiency of *Artimiza harba* oil against *C. maculatus* and *C. chinensis* and found that the high concentration (1000 ppm.) of oil caused high percentage of mortality after 4 days.

Ryan and Byrne (1988) found that LC_{50} value of linalool for adult of red flour beetles *Tribolium castaneum* is $2.5X10^2$ ppm. Sharaby (1988) stated that the LC_{50} value of guava and eucolyptus leaves admixed with rice against *Sitophilus oryza* were. 2.551 grm and 4.140 grm leave/100 grm. El-Degwi et al. (2001) evaluated black pepper powder for protecting cowpea seeds against *C. maculatus* they mentioned that the LC_{50} value was 0.022 mg. The percentage of mortality was directly proportional to the concentration and time. The effectiveness of plant powder was increased with the increasing of the radiation dose. Also El-Degwi (2001) reported that the combination of 4% soyabean powder and radiation increased mortality percentage of *C. maculatus* reared on different hosts than separate treatment.

Data presented in Table (4) shows that LC_{10} of garlic or onion or mixed of both reduced egg laying. The mean number of eggs laid was reduced to 249.0, 276.7 and 361.6 eggs, respectively compared with 414.3 eggs laid in untreated control. This finding proved that the tested powders had affected the oviposition activity of female adults. While, garlic powder showed significant effect on oviposition it wasn't efficient on hatching. It is clear that the lowest concentration of plant powders failed to prevent egg hatchability.

Data in Table (4) also showed that irradiation alone reduced the number of eggs to 176.0 and 114.3 eggs at 20 and 40 Gy, respectively compared with 10243 for the untreated control. The combined effect of plant powders and gamma radiation caused highly significant inhibition in eggs number,

except in the case of onion powder with 20 Gy (143.7 eggs). The least number was (37.7 eggs) obtained at 40 Gy with garlic powder (Table 4). Also, the combined effect of 40 Gy gamma radiation and LC_{10} plant powder caused considerable reduction in egg hatchability as compared to the effect of radiation alone, where it was 58.4, 57.3 and 59.9%, respectively , compared with 87.2 % for the untreated. However, the treatment of irradiated adults at 20 Gy by LC_{10} of onion powder did not cause appreciable reduction in eggs hatchability (87.0 %). The above results indicate that the percentage of hatching was decreased in comparison to the control and as the irradiation dosage increased.

The results obtained for adult emergence of all treatments were significantly different from the controls Table (5). The average number of adults emerged from the control and irradiated adults at 20 and 40 Gy, were 331.3, 143.0 and 40.7 adults, respectively. The variance indicates that the number of progeny was affected by applying garlic powder (157.8 adults). This means that garlic powder has effect against internal stages of *C. maculatus* under the conditions of these tests. This effect was much more pronounced with the irradiated adults. The LC_{10} of garlic powder caused higher percentage reduction of progeny (52.62%) than onion (42.36%) or the mixed of both powders (37.63%). The analysis of variance indicated that the number of progeny affected by the combination of plant powders and radiation even the using of the dose 40 Gy. Abdel-Kareem (1980) found that neem powder protect *Vigna radiata* seeds against *C. chinensis* by reducing the hatchability of eggs.

El-Sayed and Abdel Razik (1987) and Mahgoub and Zewar (1989) applied some citrus oils (lemon, grapefruit, orang and sweet orange) to the surface of cowpea seeds, reduction in oviposition, decrease in hatchability and lack of progeny of *C. maculatus* indicated that such oils are effective in controlling this insect. Risha et al. (1993a) mentioned that the soybean oil caused a high percentage of reduction in progeny of *C. chinensis*. The same authors (1993b) studied the efficiency of 7 essential oils against the same

insect and found that lemon and eucalyptus oils had some effect on oviposition. Abbass (1993) found that all plant products had diversified effect on the fecundity. Ismail et al. (1995) found that the percentage of hatched eggs of *C. quadrimaculatus* decreased significantly when mung bean seeds were treated with different plant powders. El-Degwi and El-Orabi (1996) showed that seed powders of lupine, soybean, fenugreek and kidney bean were effective in reducing the number of eggs and adults emerged from host seeds. El-Degwi and Rizk (2001) stated that the effects of black pepper, garlic and onion powders were concentration dependent. All tested materials decreased the number of deposited eggs and reduced the percentage of hatched eggs, black pepper caused the highest reduction in progeny. Also, El-Degwi (2001) studied the efficiency of soybean and lupine at ratio of 4% w/w in combined with radiation on protecting some pulses against *C. maculatus* and found that combination of plant powders and gamma radiation have caused highly significant decrease in eggs number and was highly effective decreasing the adult emergence.

In general, this study proved that garlic powder had toxicity to the adults, the magnitude of this effect was more pronounced with radiation. The reason for this may be due to that irradiation may alter somatic tissue to extent either decreasing or increasing the efficiency of cells which can detoxify insecticides. And also showed effect on oviposition and reduced progeny of *C. maculatus*,. this means that the garlic powder has effect against internal stages of insect.

The protective action of vegetable materials as ovicides is caused by physical properties rather than specific chemical action (Messina and Renwick, 1983 and Mahgoub and Zewar, 1989).

The fact that the action of the combination of radiation and plant powders against stored product insects suggests this method of control in stores. These treatments are nontoxic, simple and inexpensive for these reasons they are the most suitable for the consumers or farmers.

Table (1): Effect of different concentrations of garlic on percentage mortality of adult *Callosobruchus maculatus*

Conc.	24 hours		48 hours		72 hours	
	% mortality	% Corrected mortality	% mortality	% Corrected mortality	% mortality	% Corrected mortality
0.000	13.3	0.00	18.3	0.00	18.3	0.00
.0313	21.6	9.60	46.7	34.8	56.7	47.0
.0625	35.0	25.0	55.0	44.9	63.3	55.1
0.125	38.3	28.8	65.0	57.2	71.6	65.4
0.250	41.7	32.8	71.7	65.4	81.7	77.6
0.500	46.7	38.5	80.0	75.5	83.3	79.6
1.000	53.3	46.1	85.0	81.6	86.7	83.7
1.500	60.0	53.9	91.7	89.8	93.3	91.8

Table (2):Effect of different concentrations of onion on percentage mortality of adult *Callosobruchus maculatus*

Conc.	24 hours		48 hours		72 hours	
	% mortality	% Corrected mortality	% mortality	% Corrected mortality	% mortality	% Corrected mortality
0.000	10.0	0.00	18.3	0.00	18.3	0.00
.0313	26.7	18.6	43.3	30.6	65.0	57.2
.0625	28.3	20.3	51.7	40.9	66.7	59.2
0.125	30.0	22.2	56.7	47.0	71.7	65.4
0.250	31.7	24.1	65.0	57.2	73.3	67.3
0.500	33.3	25.9	76.7	71.5	83.3	79.6
1.000	38.3	31.4	80.0	75.5	85.0	81.6
1.500	48.3	42.6	88.3	85.7	91.7	89.8

Table (3): Effect of (garlic-onion) in combined with gamma radiation on percentage mortality of adult *Callosobruchus maculatus*

Treatment	20 Gy						40 Gy					
	24 hrs		48 hrs		72 hrs		24 hrs		48 hrs		72 hrs	
	% Corrected mortality		% Corrected mortality		% Corrected mortality		% Corrected mortality		% Corrected mortality		% Corrected mortality	
	Onion	Garlic	Onion	Garlic	Onion	Garlic	Onion	Garlic	Onion	Garlic	Onion	Garlic
0.0	2.5	11.7	8.3	26.7	31.7	41.7	8.3	20.0	31.7	31.7	35.0	45
LC_{10}	15	13.3	28.3	30.0	33.3	43.3	18.3	18.3	33.3	33.3	40	48.3
LC_{25}	20	20	31.7	35	40	48.3	21.7	25.0	35.0	36.7	41.7	56.7
LC_{50}	21.7	25	33.3	55	58.3	85	31.7	28.3	36.7	56.7	65.0	86.7
L.S.D.	1.2154	1.917	2.306	2.718	2.491	2.306	1.719	2.431	2.105	2.369	1.719	4.515

Table (4):Effect of LC_{10} of garlic, onion, gamma radiation and their combined effect on fecundity and hatchability of eggs laid by *C. maculatus*.

Treatment	Plant powders (LC_{10})			Combined effect (LC_{10} + Gy)					
				20 Gy			40 Gy		
	Total No. of eggs	No. of eggs per female ± SD	% Hatchability	Total No. of eggs	No. of eggs per female ± SD	% Hatchability	Total No. of eggs	No. of eggs per female ± SD	% Hatchability
Control	1243	414.3±29.901	94.4	528	176.0±11.06	92.1	343	114.3±5.507	87.2
Garlic	747	249.0±23.302	83.6	383	127.6±10.974	67.2	113	37.7±5.897	58.4
Onion	830	276.7±12.197	90.8	431	143.7±5.487	87.0	286	95.4±14.495	57.3
Garlic + Onion	1085	361.6±9.351	82.5	340	113.3±9.339	77.4	202	67.3±8.412	59.9
LS.D. 0.05%		46.59			-			21.166	

Table (5):Effect of LC_{10} of garlic, onion, gamma radiation and their combined effect on adult progeny of *C. maculatus*.

Treatment	Plant powders (LC_{10})			Combined effect (LC_{10} + Gy)					
				20 Gy			40 Gy		
	No. of emerged adults	Av. No. of progeny ± SD	% Reduction	No. of emerged adults	Av. No. of progeny ± SD	% Reduction	No. of emerged adults	Av. No. of progeny ± SD	% Reduction
Control	994	331.3 ± 21.168	-	429	143.0 ± 13.895	-	121	40.7 ± 6.385	-
Garlic	472	157.8 ± 16.825	52.62	196	65.3 ± 11.259	23.1	59	19.6 ± 5.783	51.63
Onion	573	191.0 ± 29.206	42.36	212	70.7 ± 8.950	50.56	99	33.0 ± 3.785	18.85
Garlic + Onion	620	206.6 ± 17.246	37.63	181	60.3 ± 12.387	57.81	68	22.7 ± 1.452	44.26
LS.D. 0.05%		49.40			34.76			10.84	

REFERENCES

Abbass, M.H.(1993): Biological studies on *Bruchidius incarnatus* Schm. and possibility of its control by using certain plant powders and extracts. (M.Sc. Thesis, Fac. Sci., Cairo Univ.).

Abbott, W.s. (1925) : A methods of computing the effectiveness of an insecticide. (J. Econ. Entomol. 18 : 265-267).

Abdul-kareem, A. (1980): Neem as an antifeedant for certain phytophagous insects and bruchid on pulses. (Proc. 1St. Int. Neem Conf., Rohach Egern : 223-250).

Deb-kirtaniya, S.; M.T. Ghosh; S.A. Mitra; N. Adityachaudhury and A. Chatterjee, (1980): Extract of garlic as possible source of insecticides. (Indian J. Agric. Sci., 50 (6): 507-10).

El-degwi, M.s. (1997): Effect of some plant extracts as pakage protectants against infestation after irradiation of seeds. (Bull. ent. Soc. Egypt, Econ. Ser.24:40-45).

El-degwi, M.S. (2001): Efficiency of some plant powders in combined with radiation as seed protectants against infestation by pulse beetle *Callosobruchus maculatus* (F.). (J. Agric. Sci. Mansoura Univ., 26 (9): 5791-5799).

EL-Degwi, M.S. and M.N.El-oraBI (1996): Evaluation of some seed powders as protectants against the pulse beetle *Callosobruchus maculatus* (F.). (Bull. ent. Soc. Egypt, Econ. Ser., 75 :12-18).

El-degwi, M.S. and S.A. Rizk, (2001): Effectiveness of some plant material for controlling the pulse beetle *Callosobruchus maculatus* (F.) in stored cowpea. (Bull. Ent. Soc. Egypt, Econ. Ser., 28 In Press).

El-degwi, M.S ,S.A. Rizk and F.M. Amin, (2001): Toxicity and biochemical effects of radiation and *Piper nigrum* on the adults of pulse beetle *Callosobruchus maculatus* (F.). (Bull. Ent. Soc. Egypt, Econ. Ser., 28 In Press).

El-sayed, F.M.A. And M. Abdel-Razik, (1987): Effect of three plant oils protectants of three legumes against infestation by cowpea weevil. (Agri.Res. Rev.,65 (1):53-59).

Ezz-el-din, A.el-shazly; G.A. El-baroty and Y.M. Abo-dâiya, (1998): Influence of sheen, *Artimisia harba* essential oil on two bruchid beetles, *Callosobruchus maculatus* (F.) and *Callosobruchus chinensis* (L.) (Col: Bruchidae). (Bull. Ent. Soc. Egypt. Econ. Ser., 25: 137-145).

Finney, D.J. (1971): Probit analysis (3rd ed., Cambridge Univ. Press- London, 333 P).

Huignard, J. (1979): Les Bruches des haricots un danger capital pour les recoltes de legumineuses alimentairs. (Afr. Agrie., 52: 16-18).

Ismail, A.I.; M.A.gesraha and N.Y. Salem (1995): The use of some plant parts as protectants of mung bean against *Callosobruchus quadrimaculatus* Fab during storage. (Bull. Ent. Soc. Egypt Econ.Ser., 22: 37-44).

Mahgoub, S.M. and M.M.Zewar (1989): Studies on the efficiency of some oils as protectants against the cowpea weevil *Callosobruchus maculatus* (F.) and granary weevil *Sitophilus granarius* (L.) (Proc. 1 st. Int. Conf. Econ. Ent. (1): 427-438), (the Entomological Society of Egypt and the Academy of Scientific Research and Technology, Cairo, Egypt, 1990).

Messina, J. And JA.A. Renwick (1983): Effectiveness of oils in protecting stored cowpea from the cowpea weevil *Callosobruchus maculatus* (F.) (Coleoptera : Bruchidae). (J. Econ. Entomo., 76: 634-636).

Mohamed, S.F. and A. A.abdel-alim (1994): Comparative efficacy of some plant oils against *Sitophilus granarius* (L.) infesting wheat grain. (Bull. ent. Soc. Egypt. Econ. Ser., 21: 65-74).

Morallo-rejesus, B.; A.H. Maini, K. Obsawa and I. Yamamoto (1990): Insecticidal action of several plants to *Callosobruchus chinensis* L. (bruchids and legumes: Economics and coevolation, 91-100).

Risha, E.M., M.Y.Hashem and M. Rabie (1993a): Efficiency of soybean oil as protectants for faba bean and cowpea stored against *Callosobruchus chinensis* L. (Bull. Ent. Soc. Egypt. Econ. Ser., 20: 151-159).

Risha, E.M., M.Y.Hashem and M.Rabie (1993b): Use of some essential oils as protectants against the pulse beetle *Callosobruchus chinensis* L. (Bull. ent. Soc. Egypt. Econ. Ser., 20 : 151-159).

Ryan, M.B. and O., Byrne (1988): Plant insect coevolution and inhibition of acetylcholinesterase. (J.Chem. Ecol., 14: 1965-1975).

Sharaby, A. (1988): Evaluation of some Myrataceae plant leaves as protectants against the infestation by *Sitophilus oryzae* L. and *Sitophilus granarius* L. (Insect Sci. Applic., 9(4): 465-468).

Sighamany, S.; I. Aness; T. Chadrakala And Z. Osmani (1986): Efficacy of certain indigenous plant products as grain protectants against *Sitophilus oryza*e (L.) and *Rhyzopertha dominica* (F.) (J. Stored Prod. Res., 22: 21-23).

Snedecore, G.W. and W.G. Cochran (1967): Statistical methods. (6th ed.) (Lowa State Unin. Press, Lowa, USA pp. 255-269).

Weaver, D.; V.D. Florence, C.P. Richari, And N. Leopole, (1994): Contact and funigant efficacy of powdered and intact *Ocinum canum sims* (Lumialas : Lamiaceae) against *Zobratus subfasciatus* (Boh.) adults (Coleoptera : Bruchidae). (J. Stored Prod. Res., 30(3): 243-252).

أستخدام المبيدات الطبيعية والتأثير المشترك مع أشعة جاما كحماية لحبوب اللوبيا المخزونة ضد خنفساء اللوبيا

سلوى عبده رزق – مى صلاح الدجوى – فاطمة الزهراء محمد أمين مجاهد

المركز القومى لبحوث وتكنولوجيا الاشعاع – هيئة الطاقة الذرية

تم دراسة تأثير التركيزات (٠,٠٣١٣ -٠,١٢٥ - ٠,٢٥٠ - ٠,٥٠٠ - ١,٠٠٠ - ١,٥٠ جرام) لكل من مسحوق الثوم والبصل على نسبة الموت لخنفساء اللوبيا وتم تحديد نسبة الموت خلال ٢٤, ٤٨، ٧٢ ساعة كما أجريت دراسة التأثير المشترك للتركيزات المميتة لنسبة ١٠, ٢٥, ٥٠ ٪. مع الاشعاع. ثم دراسة تأثير التركيز المميت لنسبة ١٠٪ لكل مسحوق على حده أو المخلوط منهما مع أشعة جاما على وضع البيض والخلفة الناتجية وقد أوضحت النتائج المتحصل عليها أن لهذه المساحيق تأثير سام على الحشرة حيث أن نسبة الموت زادت زيادة معنوية بزيادة كل من التركيز ومدة التعرض وكذلك جرعة الاشعاع. فالمعاملة المشتركة بالجرعة ٤٠ جراى والتركيز المميت لنسبة ٥٠٪ خلال فترة تعريض ٧٢ ساعة فى حالة مسحوق الثوم كان لها التأثير الاكبر عن المعاملة لكل منهما على حده وخلال فترات التعريض الاخرى وكان التركيز المميت لنسبة ١٠٪ المستخدم تأثيرا فى خفض عدد البيض ولكن دون التأثير على نسبة الفقس، كما كان لجرعات الاشعاع سواء بمفرده أو باللأشتراك مع المساحيق النباتية تأثيرا معنويا مرتفعا لخفض عدد البيض ماعدا فى حالة مسحوق البصل بالمشاركة مع الجرعة ٢٠ جراى وكان لمسحوق الثوم تأثيرا معنويا مرتفعا فى خفض عدد الخلفة سواء منفردا أو بالأشتراك مع جرعات الاشعاع وخاصة الجرعة ٤٠ جراى عنه فى حالة مسحوق البصل او المخلوط منهما.