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Effect of some botanical materials on certain biological aspects of the house fly, *Musca domestica* L.

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Abstract

The effects of *Lantana camara* (leaves), *Pelargonium zonale* (leaves), *Cupressus macrocarpa* (leaves), *Cyperus rotundus* (whole plant) and *Acacia nilotica* (seeds) powders on some biological aspects of house fly, *M. domestica* L. were tested. The effects of three lethal concentrations LC_{25}, LC_{50} and LC_{75} on the larval duration, pupation percent, pupal weight, pupal duration, adult emergence percent, sex ratio, adult longevity, and fecundity were determined. The induced malformed larvae, pupae and adults were recorded and photographed. The powders of the five plants were found to have promising effects in controlling this insect.

Keywords: *Musca domestica*; *Lantana camara*; *Pelargonium zonale*; *Cupressus macrocarpa*; *Cyperus rotundus*; *Acacia nilotica*; Biological studies.

Introduction

The house fly, *Musca domestica* L., is a serious pest to livestock and a public health pest that acts as a transmitter of many human and animal diseases (**Emerson *et al*., 1999; Douglass and Jesse, 2002; Mian *et al*., 2002**).

House fly has been successfully controlled by the application of various insecticides, but reports of insecticide resistance in this insect have been amply found (**Kaufman *et al*., 2001; Shono and Scott, 2004**). For this reason, alternative house fly control strategies, including the use of botanical insecticides have been studied **(Wang-Jian *et al*., 2005; Ghoneim *et al*., 2007; Pavela, 2008; Sripongpun, 2008; Tarelli *et al*., 2009)**.

Plants and plant products are recently considered alternatives to conventional insect-control agents as they constitute a rich source of bioactive chemicals, against number of species including specific target insects, and are often biodegradable to non-toxic products **(Hashem and Youssef, 1991)**.

The successful use of plant products in the control of certain insect species depends on contained substances that inhibit the developmental process of those insects **(Kristensen and Jespersen, 2003)**. From these points of view, the aim of this research was to study the effect of some plant materials on the house fly population and the possibility of using these materials as larvicides for controlling the insect by treating insect's breeding places.

Material and methods

Insect rearing

Musca domestica L. colony was obtained from the Medical Insect Research Center, Dokki, Giza. The adults were allowed free access to sugar and cotton pads soaked in milk powder dissolved in water (10% w/v). Larvae were reared according to the method described by **Pavela (2008)** and **Huang *et al*. (2008)** on a mixture of sterilized bran (38 g), milk powder (2 g) and water (60 ml), and maintained at 27±2°C and 70±5% relative humidity (RH).

Tested plants

The sublethal concentrations (LC_{25}, LC_{50} and LC_{75}) of leave's powder of *L. camara*, *P. zonale* and *C. macrocarpa;* whole plant powder of *C. rotundus*, and seed's powder of *A. nilotica* were determined in previous work (**Elbermawy *et al.*, 2011)**.

Biological studies

The experiments were carried out on the 2nd instar larvae (3- days old). The larval media were treated with LC_{25}, LC_{50} and LC_{75} of each tested plant. The treated media was divided in 250 ml beakers each received 50g of media. Normal larvae were transferred from rearing media to each beaker (25 larvae). Control experiments were done as above but without any treatment. This procedure was repeated 4 times. All tests were carried out at laboratory conditions mentioned above.

Larvae were examined daily to estimate larval duration which was calculated as the intervals between the commencement of 1st instar larvae and that of pupation. It was calculated for each larva and then the mean value was taken. Mortality was recorded daily until pupation.

The resultant pupae were counted and weighed to determine the percent of pupation and the mean pupal weight. Observations were carried out daily to record pupal duration. The reduction in pupal weight and adult emergence was calculated according to **Khazanie (1979).** Percentage of total pupae developed to adults was estimated according to **Sripongpun (2008)** and the emergence of successfully metamorphosed adults was estimated in percentage according to **Jimenez Peydro *et al.* (1995)**.

The emerged males and females adults were transferred daily to oviposition cages, containing sugar and cotton pads served for feeding and oviposition, the cotton pads were renewed daily. Mean longevity for each sex was calculated according to **Fletcher *et al.* (1990)**.The total number of eggs was recorded and the number of eggs laid per female (fecundity) was calculated. Percent fecundity was determined according to **Crystal (1964)**. The oviposition deterrent index was calculated according to **Lundgren (1975)**. The eggs were moved to Petri dishes containing filter paper moisten by water. Control and treated eggs were incubated under the same laboratory conditions. One day later, the emerged larvae were counted and the percent of egg hatch was determined. The sterility was calculated according to **Toppozada *et al.* (1966)**. Any morphogenetic abnormalities that might occur in all developmental stages were recorded and photographed.

Results

Larval duration:

Results in Table 1 revealed that the larval duration of the control larvae of *M. domestica* was 6.31±0.98 days. A significant prolongation in the larval duration of the treated larvae was observed in larvae treated with LC_{25} of *C. macrocarpa*. Also, a highly significant prolongation in the larval duration was observed in larvae treated with LC_{25}, LC_{50} and LC_{75} of *L. camara*, *P. zonale* and *C. rotundus* and LC_{50} of *C. macrocarpa*. On the contrary, LC_{50} of *A. nilotica* caused a highly significant reduction in the average larval period compared to controls. On the other hand, there was insignificant effect on the larval duration after treatment with LC_{25} of *A. nilotica* and LC_{75} of *C. macrocarpa* as compared with controls.

Pupation percent, pupal weight and pupal duration:

Results shown in Table 2 revealed that a significant reduction of pupation percent was induced by using LC_{25} of *P. zonale* and LC_{50} of *L. camara*. Also, a highly significant decrease in the pupation percent was observed in treatments with LC_{75} of *L. camara*, LC_{50} and LC_{75} of *P. zonale*, all LC's of *C. rotundus* and *C. macrocarpa* and *A. nilotica*. The percent pupation was decreased as the concentration of plant powder increased.

Larvae of *M. domestica* raised on tested plant materials diets recorded a highly significant lower pupal average weight

and the average pupal weights dropped with increased concentration and the effect of plant materials is rated as follows: *P. zonale* > *C. rotundus* > *A. nilotica* > *C. macrocarpa* > *L. camara*. Also, a highly significant prolongation in the pupal duration was observed in all tested concentration of all plant materials (Table 2).

Table 1: Effect of the tested plant materials on the larval duration of *M. domestica* treated as 2nd larval instar, at 27 ºC.

Treatment		Larval duration (days)			Change %	*t*-Test	
		Min.	Max.	Mean ± SD		*P*-value	Significance level(1)
Control		5	8	6.31±0.98	-	-	-
L. camara	LC_{25}	5	10	7.41±1.30	17.37	0.000	**
	LC_{50}	6	10	7.47±1.48	18.44	0.000	**
	LC_{75}	6	9	7.09±1.02	12.43	0.000	**
P. zonale	LC_{25}	7	10	8.41±0.79	33.34	0.000	**
	LC_{50}	8	10	9.44±0.62	49.69	0.000	**
	LC_{75}	8	10	9.22±0.55	46.20	0.000	**
C. rotundus	LC_{25}	6	10	7.45±1.14	18.09	0.000	**
	LC_{50}	6	9	7.11±0.87	12.65	0.000	**
	LC_{75}	6	8	7.05±0.62	11.80	0.000	**
C. macrocarpa	LC_{25}	5	8	6.67±0.81	5.66	0.016	*
	LC_{50}	6	8	6.78±0.59	7.46	0.001	**
	LC_{75}	6	8	6.57±0.73	4.11	0.099	ns
A. nilotica	LC_{25}	6	8	6.10±0.38	-3.32	0.074	ns
	LC_{50}	5	7	5.07±0.30	-19.69	0.000	**

(1) Significance level: n.s. (insignificant), * (significant), ** (highly significant) as compared with control.

Table 2: Effect of the tested plant materials on pupation percent, pupal weight and pupal duration of *M. domestica* treated as 2nd larval instar, at 27 ºC.

Treatment		% Pupation	% Inhibition in pupation	Pupal weight (mg) (Mean± SD)	% Reduction in pupal weight	Pupal duration (days) (Mean±SD)	% Change in pupal duration
Control		97±3.83	0.00	19.66±2.34		4.51±1.14	
L. camara	LC_{25}	79±16.77^{ns}	15.56	18.53±5.70**	5.74	7.08±1.66**	57.23
	LC_{50}	74±12.44*	20.71	18.19±4.64**	7.48	7.50±1.65**	66.48
	LC_{75}	64±5.66**	31.02	17.30±3.84**	12.02	7.08±1.53**	57.19
P. zonale	LC_{25}	80±9.80*	14.53	9.98±3.65**	49.26	6.49±1.30**	44.13
	LC_{50}	63±9.45**	32.05	9.51±2.83**	51.64	6.93±1.67**	53.73
	LC_{75}	49±8.25**	46.48	7.51±2.00**	61.80	6.40±1.68**	42.06
C. rotundus	LC_{25}	71±6.83**	23.80	10.90±2.49**	44.55	5.87±1.20**	30.37
	LC_{50}	65±3.83**	29.99	9.91±2.75**	49.60	6.12±1.25**	35.86
	LC_{75}	37±2.00**	58.86	8.38±1.74**	57.38	6.61±1.72**	46.79
C. macrocarpa	LC_{25}	66±6.93**	28.96	16.59±3.38**	15.61	5.91±1.21**	31.16
	LC_{50}	59±6.83**	36.18	14.61±3.27**	25.69	6.13±1.33**	36.11
	LC_{75}	51±12.38**	44.42	11.82±3.31**	39.86	5.94±1.45**	31.95
A. nilotica	LC_{25}	80±6.53**	14.53	12.96±3.51**	34.07	5.34±1.00**	18.59
	LC_{50}	75±5.03**	19.68	10.30±2.69**	47.60	5.95±1.33**	32.07

(1) Significance level: n.s. (insignificant), * (significant), ** (highly significant) as compared with control.

Percent adult emergence and adult longevity:

Results shown in Table 3, revealed a reduction in the percent of total pupae developed to adults. All the tested plant powders induced reduction in the percent of adult emerged from treated larvae. Changes in the sex ratios of emerged adults tended towards favoring males. The longevity of adults in both male and female flies was highly significantly decreased in all treatments comparing with the control.

Reproductive potential:

The treatment of *M. domestica* larvae with LC_{25} of *L. camara* caused a significant decrease in the number of eggs deposited per resulting female. Also, all LC's of *P. zonale*, *C. rotundus*, *A. nilotica* and *C. macrocarpa*, LC_{50} and LC_{75} of *L. camara* caused a highly significant decrease in fecundity of adult females. The tested plant powders showed a highly significant decrease in the egg hatching percent (Table 4).

Table 3: Effect of the tested plant materials on the adult emergence percent, sex ratio and adult longevity of *M. domestica* treated as 2nd larval instar, at 27 ºC.

Treatment		% of total pupae developed to adults	% Adult emergence	% Inhibition in adult emergence	Sex ratio		Adults longevity (days) (Mean±SD)	
					♂	♀	♂	♀
Control		100.00	97	0.00	49.48	50.52	16.52±1.15	18.10±1.31
L. camara	LC_{25}	86.08	68	29.90	50.00	50.00	11.44±0.93**	13.65±1.54**
	LC_{50}	62.16	46	52.58	54.35	45.65	8.32±1.65**	10.90±1.97**
	LC_{75}	40.63	26	73.20	57.69	42.31	7.13±0.92**	8.45±1.44**
P. zonale	LC_{25}	83.75	68	30.93	59.70	40.30	9.23±1.62**	9.63±1.39**
	LC_{50}	85.71	50	44.33	46.30	53.70	8.12±0.73**	9.66±1.70**
	LC_{75}	53.06	27	73.20	57.69	42.31	7.87±0.35**	8.55±1.04**
C. rotundus	LC_{25}	95.77	68	29.90	54.41	45.59	6.67±0.84**	8.03±0.80**
	LC_{50}	76.92	50	48.45	52.00	48.00	6.46±1.33**	8.00±0.98**
	LC_{75}	72.97	27	72.16	51.85	48.15	5.07±0.92**	6.62±0.51**
C. macrocarpa	LC_{25}	100.00	66	31.96	48.48	51.52	11.06±1.63**	12.65±1.12**
	LC_{50}	86.44	51	47.42	58.82	41.18	10.63±1.10**	11.19±0.87**
	LC_{75}	54.90	28	71.13	60.71	39.29	7.29±0.99**	8.18±0.87**
A. nilotica	LC_{25}	87.50	70	27.84	65.71	34.29	7.61±1.34**	8.25±0.85**
	LC_{50}	70.67	53	45.36	66.04	33.96	6.37±0.81**	8.06±0.87**

(1) Significance level: n.s. (insignificant), * (significant), ** (highly significant) as compared with control.

Table 4: Effect of the tested plant materials on Fecundity, Fecundity percent, % ODI, Hatchability and Sterility percent of *M. domestica* treated as 2nd larval instar, at 27 ºC.

Treatment		Fecundity (no. eggs/female)	% Fecundity	% ODI	Egg hatchability (% egg hatching)	% Sterility
Control		191.35±18.55	100.00	0.00	95.69±0.47	0.00
L. camara	LC_{25}	164.53±18.28*	85.99	7.53	89.64±2.14**	19.44
	LC_{50}	88.81±11.96**	46.41	36.60	89.29±3.93**	56.69
	LC_{75}	50.04±6.45**	26.15	58.54	75.77±5.89**	79.29
P. zonale	LC_{25}	133.36±14.56**	69.70	17.86	84.69±4.78**	38.31
	LC_{50}	131.13±19.09**	68.53	18.67	82.36±3.33**	41.01
	LC_{75}	63.58±7.36**	33.22	50.12	67.26±5.0**	76.64
C. rotundus	LC_{25}	52.37±6.49**	27.37	57.02	84.23±5.09**	75.91
	LC_{50}	50.44±6.60**	26.36	58.28	81.46±2.41**	77.56
	LC_{75}	25.03±3.10**	13.08	76.87	67.89±5.72**	90.72
C. macrocarpa	LC_{25}	92.89±16.18**	48.54	34.64	90.06±2.74**	54.31
	LC_{50}	50.76±4.52**	26.53	58.07	79.21±5.09**	78.04
	LC_{75}	46.22±15.96**	24.15	61.09	65.78±2.82**	83.40
A. nilotica	LC_{25}	73.22±3.25**	38.26	44.65	76.95±7.26**	69.23
	LC_{50}	29.76±7.48**	15.56	73.08	76.81±8.68**	87.51

(1) Significance level: n.s. (insignificant), * (significant), ** (highly significant) as compared with control.

Morphogenetic effects:

In the present study, the application of all LC's of *L. camara*, *P. zonale*, *C. rotundus*, *C. macrocarpa and A. nilotica* against *M. domestica* induced different morphological abnormalities. Considerable number of larvae, pupae and adults showed obvious malformations after the treatment of 2nd instar larvae with plant powders. Malformations include complete darkened larvae, curved larvae, irregular-shaped larvae, swelling larvae, larvae with patches of cuticle melanization, larval-pupal intermediates, compressed and shrinkage pupae, dry and darkened pupae, C-shaped pupa, peanut shaped pupa, and small sized pupae. Many adults could not emerge completely and remained concealed in the puparia. Other adults with defective wings, and deformed abdomen were also observed (Plates 1 - 3).

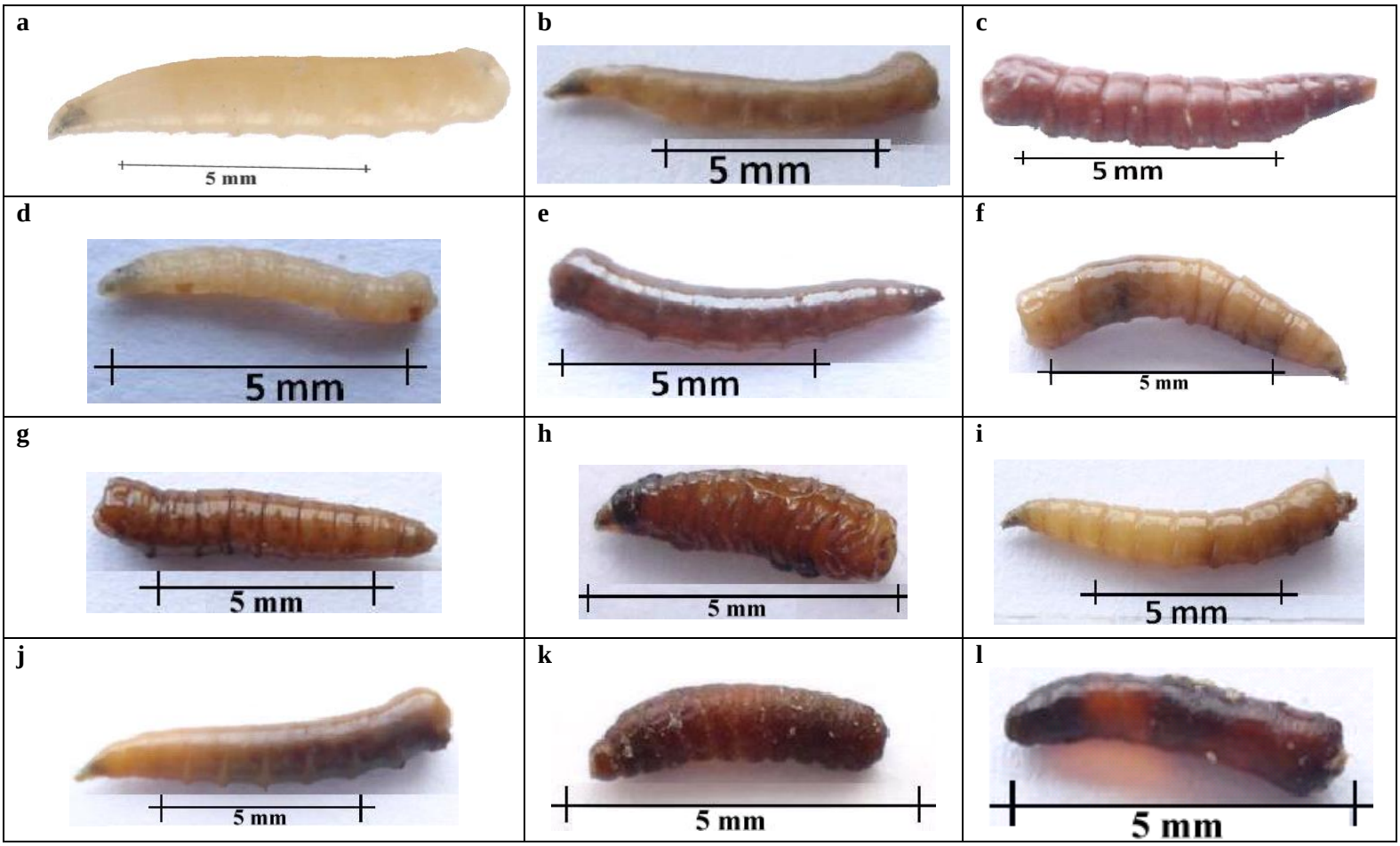

Plate 1: Normal and treated larvae of *M. domestica*: a, normal larva; b & c, *P. zonale* treated; d & e, *C. rotundus* treated; f-h, *C. macrocarpa* treated and i-l, *A. nilotica* treated.

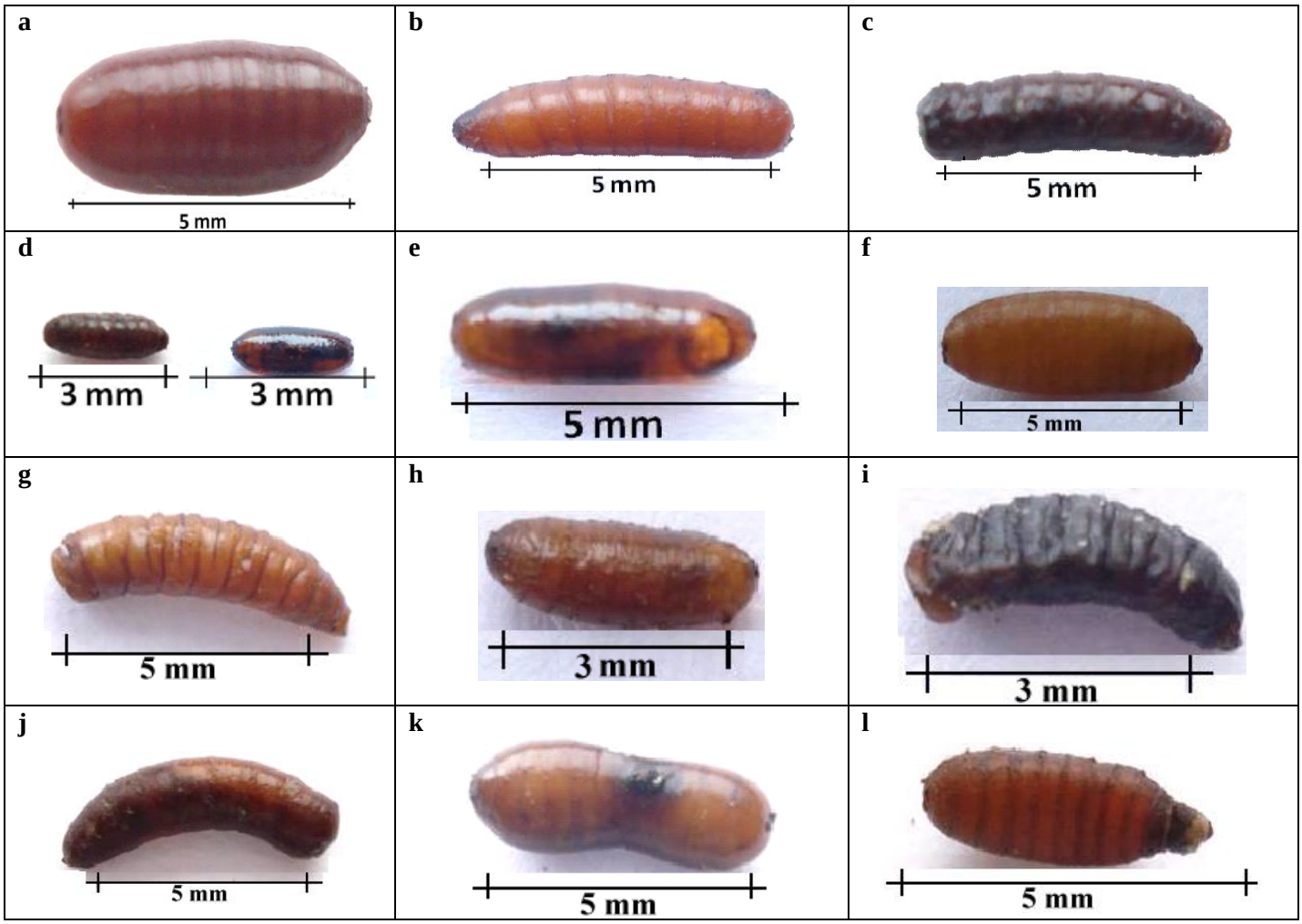

Plate 2: Normal and treated pupae of *M. domestica*: a, normal pupa; b, *L. camara* treated; c, *P. zonale* treated; d-f, *C. rotundus* treated; g-i, *C. macrocarpa* treated and j-l, *A. nilotica* treated.

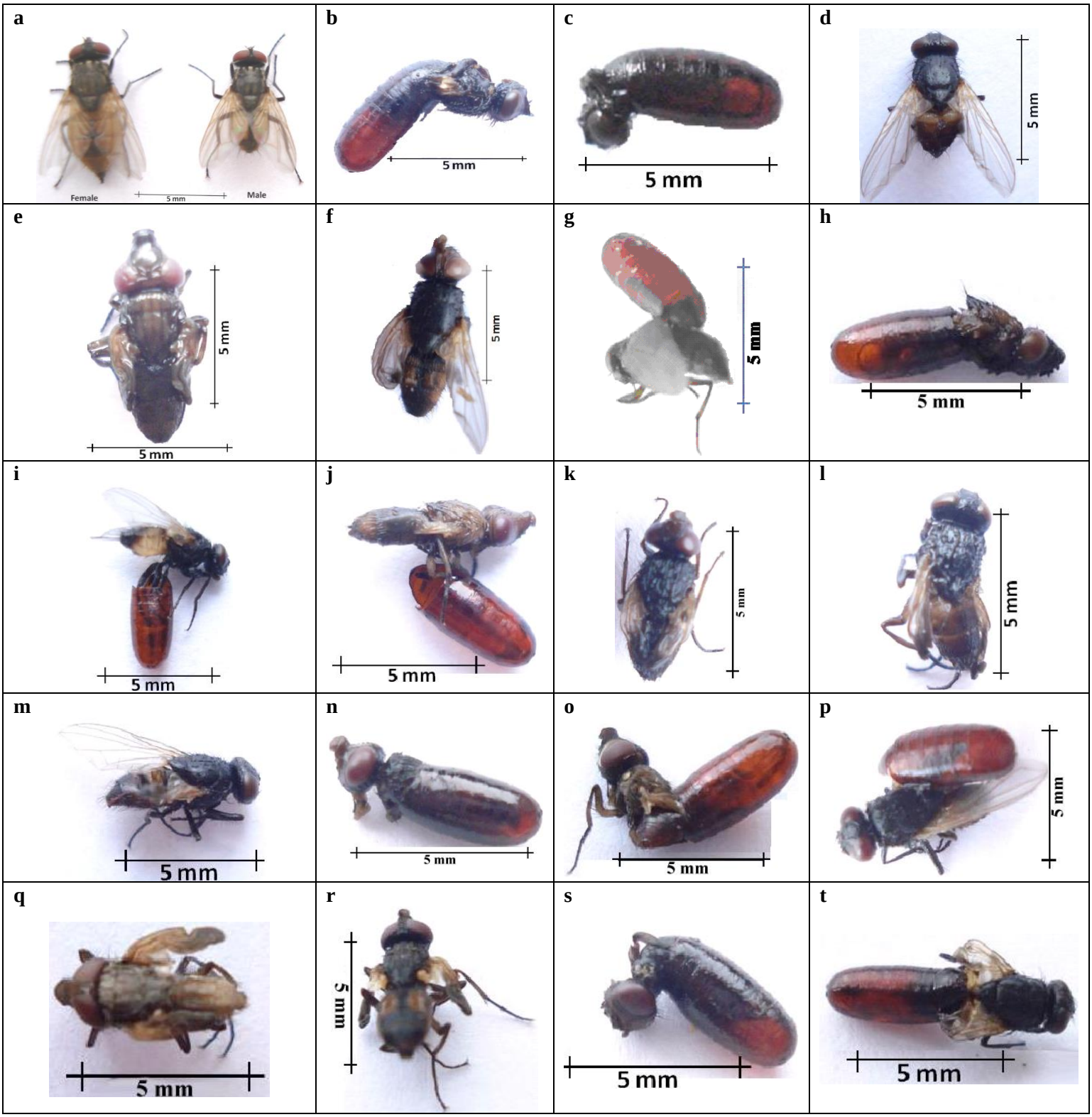

Plate 3: Normal and adults resulted from larvae treated with plant materials in *M. domestica*: a, normal adults; b-f, *L. camara* treated; g, *P. zonale* treated; h-m, *C. rotundus* treated; n-p, *C. macrocarpa* treated and q-t, *A. nilotica* treated.

Discussion

In the present study, prolongation of the larval duration with tested plants was similar to that reported in *M. domestica* by **Gad-Allah (1991)** using *Melia azedarach* and *Venca rosea*, **Ande (2001)** using *Peganum harmala, Acalypha. indica and Calotropis gigantic*, **Assar (2002 and 2003)** using *Lupinus termis*, *Calotropis procera* and *Atriplex inflate* and **Bakr *et al.* (2003)** using *Artemisia monosperma*, *Conyza dioscoridis*, *Clerodedron inerme*, *Clocasia antiqorum*. Likewise, white and black mustard lengthened the duration of 2nd larval instars of *M. domestica* (**Abdel Kadder, 2005)**. Also, shortened larval period after *A. nilotica* treatment was in accordance with **Shaalan *et al.* (2005)** in *Aedes aegypti* larvae treated with *Callitris glaucophylla*. They stated that larvae observed to pupate faster as their environment increased in toxicity. This is clearly a self preservation mechanism since the pupal form is less susceptible to the environment.

The percent pupation was decreased as the concentration of plant powder increased. Similar observation was also reported, reduction of percentage of pupation by 91.57%, after treatment of 3rd larval instar of *Synthesiomyia nudiseta* with LC_{50} of *C. macrocarpa* oil **(Khalaf *et al.*, 2009)**. Similar effects of some botanical plant extracts have been reported *on M. domestica* by **Abou El Ela *et al.* (1995)**; **Ande (2001)**; **Assar (2002 and 2003)** and **Bakr *et al.* (2003).**

The decrease of pupal weight in the present study may be attributed to the decrease in total water content or decreased intensity of protein biosynthesis **(Abdel Aal, 1996)**. Also, it may be due to the lack of proper sclerotization of the newly formed puparium, or evaporation of body fluids leading to decreased pupal weight. The effect of the tested plant powders on the mean pupal weight of pupae treated as larvae agrees with the results obtained on *M. domestica* by **Kilani *et al.* (1991); Ande (2001)**; **Assar (2003)** and **Bakr *et al.* (2003).**

Prolongation in the pupal duration was observed in all tested concentration of all plant materials. Similar observation was also reported on *M. domestica* by **Assar (2003)** using *A. inflate*,and **Bakr *et al.* (2003)** using *Artemisia monosperma*, *Conyza dioscoridis*, *Eichhornia crassipes*, *Clerodedron inerme*, *Clocasia antiqorum*, and *Farestia aegyptia*. On the contrary, other studies reported that other plants reduced pupal duration **Bakr *et al.* (2003)** using *Zygophyllum coccineum* on *M domestica* and **Khater and Shalaby (2008)** using *Cyperus esculentus* on *C. pipiens*

The decrease in the percentage of adult emergence of *M. domestica* due to treatment with the tested plant materials was similar to the data reported previous by these plants on other dipteran species.
The total mean number of males and females of blowfly, *Chrysomya chloropyga* emerging from larvae feeding diet containing 5% of *L. camara* powder, were significantly less than those of the control **(Muse *et al.*, 2003).** High reduction in adult emergence was achieved by larval treatment with *C. macrocarpa* and *A. officinarum* volatile oils against *Synthesiomyia nudiseta* **(Khalaf *et al.*, 2009).**

Disturbance in sex ratio observed after treatment with botanical materials towards more males than females was similar to the data obtained by **Robert and Olson (1989)** they found a change in the sex ratio towards more males in *C. quinquefasciatus* after sub-lethal exposure propoxur and resmethrin. This is not always the case, since **Shaalan *et al.* (2005)** found a change in the sex ratio towards more females in *Aedes aegypti* after treatment with LC_{25} of *Callitris glaucophylla*. The shortened adult longevity was also shown in *M. domestica* treated with plant extracts tested by **Gad-Allah (1991)** and **Shoukry (1997)**. On the contrary, the longevity of adult *M. domestica* was not affected by *A. inflate* **(Assar, 2003)** and jojoba oil **(Amer *et al.*, 2004)**.

The accumulation of the plant powders in different developmental stages of *M. domestica* might be expected to decrease the longevity of adult flies, as reported in *S. littoralis* after the treatment with *Abrus precatorious* extract **(Dimetry and Abdallah, 1991).**

The results obtained by the current study indicated that treatment of *M. domestica* larvae with all tested plant powders with all concentrations caused decrease in egg production. Some explanations were introduced by different authors revealing the possible reasons for the reduction of insect fecundity and as a result increasing sterility following the treatment with botanicals insecticides: (i) the weakened physical stage of the treated insects **(Tripathi *et al.*, 2003)**; (ii) mild suppressing effect exerted by the oil on the insect's mating-decisive factor influencing the subsequent number of eggs laid by the insect **(Engelmann, 1970);** (iii) partial sterilization of females and/or males, or the inability of the sperms to be transferred to the females during copulation **(Ismail, 1980);** (iv) reduction in the number of normal sperms produced by male insect **(El-Meniawi *et al.*, 1999);** (v) a blockage in ovarian activity, as the tested botanical products may interfere with oogenesis which, in turn, results in a complete and irreversible sterility of insect female flies **(Di Ilio *et al.*, 1999**; **Khan *et al.*, 2007)** and (vi) a delay or reduction of ova giving some opportunities not for retention but for possible egg re-sorption within ovaries. Also, that delay could be due, in part, to a lower metabolic rate **(Taher and Cutkomp, 1983**; **Lucantoni *et al.*, 2006)**.

Moreover, some extracts from *C. rotundus* prevented the sexual maturity of *S. gregaria* **(Bakr *et al.*, 2008).** Also, **Saxena *et al.* (1992)** found that extract of *L. camara* induced oviposition deterrent effect. The extract also had conspicuous activity against the eggs of pulse beetle, *Callosobruchus chinensis* deposited on treated seeds, leading to a pronounced reduction in progeny. As discussed by **Weathersbee III and Tang (2002),** the disruption of reproductive capability could lead to substantial population decline over time. Furthermore, **Dhar *et al.* (1996)** revealed that exposure to neem extract suppressed rather than inhibited oviposition in mosquitoes. Disturbance in sex ratio observed after treatment with *A. nilotica* (ratio males : females was 2: 1) may be the reason for the low number of eggs deposited by females emerged from treated larvae as compared with females emerged from untreated larvae.

Reduction in the egg hatching percent by plant materials was similar to findings reported by many authors using different plant oils and extracts against *M. domestica*, in which the decrease of egg production accompanied with increasing sterility; among these are: *Matricaria chamomilla and Clerodendron inerme* **(Shoukry, 1997)** *Melia azedarach* extract **(Radwan, 2000)**, extracts from leaves and flowers of *Datura innoxia* **(Al-Zubaidi *et al.*, 2002)** and *A. inflate* **(Assar, 2003)**.

The morphological aberrations induced by plant powders were concentration dependant, in almost cases, the higher concentration the more morphogenetic aberrations. **Adamski *et al.* (2005)** observed that the degree of malformation was directly proportional to the concentration of pesticides. Our results made also clear co- relation with the recent findings reported from **Khalaf *et al.* (2009)** where the essential oil of *C. macrocarpa* had been reported to produced clear morphological abonrmalities in *S. nudiseta*. Some deformed larvae were pigmented and larval-pupal intermediate, the resultant some individuals showed C-shaped pupae, elongated pupae and balloon shaped pupae, most of the pupae failed to reach adults, however, some emerged adult have various degrees of morphological abnormalities. Topical application of the ethanolic extract from *C. rotundus* onto the penultimate instar nymphs of *S. gregaria* resulted in the formation of defected adults **(Bakr *et al.*, 2008).** Similar abnormalities were reported by **Hashem and Youssef (1991)**, they

observed dark intersegmental pigments on the 3rd larvae of *M. domestica* and fully formed pupa but with a constricted puparium after treatment the 1st instar larvae with methanolic extraction of leaves and flowers of *M. azedarach***. Bakr *et al.* (2003)** found larval pupal intermediate as a result of treatment of *M. domestica* larvae with *A. monosperma*, *C. inerme* and *C. antiqorum*. **El-Domiaty *et al.* (2003)** found shrinkage of the pupae and folding of the wing of adults as a result of treatment of 3rd instar larvae of *M. domestica* with *P. nigra* volatile oil. **Sripongpun (2008)** observed small sized pupae (1 mm wide x 3 mm long) after treated *M. domestica* larvae with the extract of Chinese star anise fruits, while the size of the control ones was 2 mm wide x 5 mm long. In addition, the number of small pupae developed to adults was less than that of normal one.
Sometimes highly melanized pupae (pupa with darkened puparium) were noticed as a result of treatment. These abnormalities are similar to the effect of IGR's against *M. domestica* as pointed out by **Khalil *et al.* (2010)**. This indicates that plant powders have also IGR effect.

As a result of treatments, cuticle melanization in patches were observable in *M. domestica* larvae. This phenomenon was observed previously with **Shoukry (1996)** who studied the histopathological effects of Chamomile and Jasmine oils on the house fly larvae. Ultrastructure of muscles of the treated larvae showed that those compounds induced disorganization of light and dark bands of the muscles. This may be the possible explanation for the melanized patches of cuticle or may be due to the inhibition in melanin synthesis **(Gelbič and Němec, 2001)**. **El Hadek (2002)** stated that the malformation in pre-pupal stage, as it appeared as larval-pupal intermediate, may be due to the treated larvae were unable or failed to free themselves from their old cuticle.

In the present study, some of the pupae failed to reach adults. This result was observed previously (**Jahan *et al.*, 1990)**, as a number of adults failed to come out from the puparium. Similar results were obtained by **Naqvi *et al*. (2007)** using N-9 (extract from neem tree) against *M. domestica*. **Ande (2001)** stated that diet of housefly containing these plant materials no doubt contains desirable primary or secondary principles which may have developed from the interactions of the components of the diet. These principles elicit biological activities in respect of larval/pupal transformation and pupal eclosion hindrances.

Emerging of adults with malformed wings may be attributed to the failure of the wings to expand and flatten after adult emergence (**Saxena *et al.*, 1981**). **Aly *et al.* (2010)** attributed the adult malformation of *S. gregaria* to the intervening of *F. bruguieri* extracts with the hormonally controlled program of morphogenesis. This may be due to the modification of the ecdysteroid titer, which in turn leads to changes in lysosomal enzyme activity causing overt morphological abnormalities **(Josephrajkumar *et al.*, 1999)**.

Conclusion

The results of the present biological studies suggest that the application of plant materials prevented normal development of the different developmental stages of *M. domestica*. Thus, *L. camara*, *P. zonale*, *C. rotundus*, *C. macrocarpa* and *A. nilotica* were nearly comparable with the insect growth regulators (IGR's) in its effects. All are able to reduce larval and pupal weights, adult emergence and the number of laid eggs, shorten adult life span and resulted in larval-pupal intermediates (**Shaurub *et al.*, 1998** and **Naqvi *et al.*, 2007).** According to the current data, *L. camara*, *P. zonale*, *C. rotundus*, *C. macrocarpa* and *A. nilotica* powders are harmful to *M. domestica*, not only reducing longevity of adults but also decreasing their reproductive potential. In conclusion, *L. camara*, *P. zonale*, *C. rotundus*, *C. macrocarpa* and *A. nilotica* show effective IGR-like activities and exhibit great promise in suppressing populations of *M. domestica*.

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تأثير عدد من المواد النباتية على بعض النواحى البيولوجية للذبابة المنزلية، *مسكا دوميستكا* ل.

نبوى عبد الرحمن القطان، خلف الله صابر أحمد، سعدية محمد البرماوى، رباب مجدى عبد الجواد
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تم اختبار تاثير مطحون أوراق نباتات اللانتانا والبلارجونيوم والسرو الليمونى ومطحون نبات السعد ومطحون بذور السنط على النواحى البيولوجية للذبابة المنزلية *مسكا دوميستكا*. وقد تمت دراسة تأثير ثلاثة تركيزات مميتة (LC_{25}, LC_{50}, LC_{75}) على طول عمر اليرقات، نسبة التعذر، وزن العذارى، طول عمر العذارى، نسبة خروج الحشرات البالغة، نسبة الإناث للذكور، طول عمر الطور البالغ، نسبة الخصوبة. كما تمت دراسة وتصوير التشوهات الناتجة فى كل من اليرقات والعذارى والحشرات البالغة بعد المعاملة. وقد أثبتت الدراسة أن مطحون النباتات الخمسة له تأثير واضح على كل النواحى البيولوجية مما يضيف طريقة جديدة آمنة إلى طرق مقاومة هذة الحشرة.