



## OVICIDAL ACTIVITY AND LATENT ADVERSE EFFECT OF *Syzygium aromaticum* AND *Pinus brutia* OILS AGAINST *Pectinophora gossypiella* (SAUNDERS) (LEPIDOPTERA: GELECHIIDAE)

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### AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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### ABSTRACT

The present study was undertaken to investigate the impacts of the two essential oils; *Syzygium aromaticum* (Clove) and *Pinus brutia* (Turpentine) against 1-3 days old eggs of pink bollworm *Pectinophora gossypiella*; the toxicity and the adverse impact of these products on some biological and physical characters were studied under laboratory conditions at  $25 \pm 1$  °C and  $65 \pm 5\%$  R.H.

The obtained results revealed that the eggs of *P. gossypiella* pest were highly susceptible to Pinus than Syzygium. The  $LC_{50}$  value were 9.38% ppm when PBW eggs treated with Turpentine oil, while it increased to 11.57% when 1-3 days old eggs of *P. gossypiella* dipping with Syzygium. Some biological aspect studies show a prolongation in larval and pupal stages developments resulted from treated 1-3 day old eggs by *S. aromaticum* and *P. brutia*. It estimated by 9.0 and 20.0 days/ larvae, respectively for larvae and 9.3 and 10.2 days/ pupae. . The life cycle were significant affected, as it was elongated to 34.1 and 36.9, respectively, compared with 26.2 days in control.

In contrast, in adult stage, the results indicated that the percentage of adult emergence was highly decreased to 56.0 and 61.0% emerged from eggs treated with  $LC_{50}$  of Syzygium and Turpentine, respectively, compared with (94.00%) control, with high reduction in total eggs laid, percentage of hatchability. The average number of eggs deposited by females were 107 and 97 eggs laid at 11.1 and 7.6 days oviposition/ female, resulted from Syzygium and Turpentine, respectively compared with 226.0 eggs/ female in control deposited at 11.6 days.

The physical result indicated that latent adverse effect in biochemical larvae resulted from eggs treated with two essential oil Syzygium and Turpentine. It caused high decreased in total protein to 15.0 and 8.6 (total protein (mg/g.b.wt.), respectively compared with 17.0 mg/g.b.wt. /larvae in control, with decreased the Phenoloxidase, to 14.8 and 13.5 (O.D. units/g.b.wt), respectively, compared with 26.0 Phenoloxidase (O.D. units/g.b.wt) in control. In contrast, increased in free-amino acid to 137.3 and 298.0 ( $\mu$ g D, L- alanine/g.b.wt) respectively, compared with 118.0 in control, also, the total lipid increased to 27.9 and 22.0 (mg/g.b.wt.), respectively, compared with 16.9 (mg/g.b.wt.) in control..

**Keywords:** *P. gossypiella*; *Syzygium* and *Pinus brutia*; biological and physical.

## 1. INTRODUCTION

The pink bollworm, *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae) larvae is considered to be one of the most injurious cotton pest, because it is difficult to control with insecticides. On contrary, the eggs considerable easy to control with insecticides, because are laid on the sutures or under the bracteoles at the base of the boll, particularly on bolls up to 14 days old. Upon hatching destructive larvae can penetrate feeds on flowers making rosetted bloom, later it enters bolls within 20–30 min to 2 hr. [1]. It feeds on seeds therein, which results in malformation, rotting, premature or partial boll opening, and great loss as in both quality and quantity and reduction of cotton yield [2].

Wide used of several chemical pesticides sprays have been applied, it had created some problems in natural fields; such as pest resistance and toxicity against beneficial predator or parasite and honey bees, in additional high effect on environmental pollution and high input costs, health risks and the presence of pesticide residues in plants at the end resistant pest.

New, essential natural oils are being tried as potential candidates for pest and disease management. Because, it products play an increasingly prominent role as alternatives to synthetic for used to control some insect pests due to the increasing injurious on environmental pollution, negative effects on non-target organisms and health hazards, [3].

Several essential oils of botanical origin have been reported for their repellent, toxic and developmental inhibitory activities.

From theses essential natural oil products; Oil of clove, also known as clove oil, is an essential oil extracted from the clove plant, *Syzygium aromaticum* (Clove) belongs to the Myrtaceae family which considers as an important medicinal plant with wide range of biological activities such as anti-bacterial or anti-oxidant activities [4,5]. The essential oils obtained from some other aromatic plants showed toxic effects on many insects [6,7].

*Pinus brutia*, common name; Turpentine oil, Family: Pinacea: the essential oils obtained by steam distillation from plant naturally grown. Analysis of turpentines showed that alpha- and beta-pinene are the only major components in essential oil [8].

Under the laboratory condition, many researchers used mineral and natural oils products as an insecticide for some pests; against eggs and newly hatched larvae of the *P. gossypiella* or *Earias insulana* and *Spodoptera littoralis* in laboratory and

field experiments [9,10] mentioned that jojoba oil proved efficiency against the 2<sup>nd</sup> and 4<sup>th</sup> instars larvae of *S. littoralis* after 24 hrs of treatment.

In additionally; many studies on plant essential oils (Eo) were screen for their effects on some metabolic, physiological and behavioral functions of some insects. They also have fumigant high toxicity and repellent activity against a variety of Lepidoptera insects [11].

The effect of oils on their relation sheep between some biological aspects and physiology of digestive were studied by many authors' [12, 13, 14, 10, 15] Also, the inhibition of carbohydrates hydrolyzing enzymes, free amino acid, total protein and lipids and subsequently their latent effects on the insect growth and biology high affected [16, 17].

The experiment amid to knowledge of information the toxicity and adverse effects of natural oil products on some biological aspects and physiology of digestive effect on *P. gossypiella*.

## 2. MATERIAL AND METHODS

### 2.1 Insect Used

The target insect: eggs (1-3 day old) of pink bollworm, *P. gossypiella* used in this experiments was obtained from the laboratory colony of Bollworm Department, Plant Protection Research Institute; Agriculture Research Center. This work was carried out under the controlled conditions; 25±1°C and relative humidity 65±5% R.H. It reared on semi-artificial diet for several generations described by Amer [18].

### 2.2 Oil used for the Investigated

Family: Myrtaceae  
English name: Clove oil  
Scientific name: *Syzygium aromaticum*

Clove oil is a mixture of different compounds, with the three main active ingredients: being eugenol, eugenyl acetate and caryophyllene.

Analysis of *Syzygium aromaticum* found the 23 constituents, with eugenol (76.8 %), followed by β-caryophyllene (17.4 %), α-humulene (2.1 %), and eugenyl acetate (1.2 %) as the main components. [19] reported eugenol (89.6 %), β-caryophyllene (8.6 %) and eugenol acetate (1.7 %) Jirovetz et al. [20].

- Family: Pinacea: 2  
English name: Turpentine oil

Scientific name: *Pinus brutia* Ten.

Analysis of turpentines showed that alpha- and beta-pinene are the only major components in essential oil (turpentine) and it major was determined. Gas chromatography-mass spectroscopy analysis [6].

## 2.3 Procedure

### 2.3.1 Prepared syzygium and turpentine oils concentrations

To study the ovicidal activity of *Syzygium* and Turpentine oils against 1-3 days egg of *P. gossypiella*, Serial concentrations in water were prepared. Five concentrations (25, 12.5, 6.25, 3.125 and 1.562%) for **Syzygium and Turpentine oils** were freshly prepared for the stock solution of each compound (100 ml liter water).

### 2.3.1 Ovicidal effect of the tested Turpentine and Syzygium oils on the eggs

Dipping technique was used as a method of application in the present work. The eggs age of *P. gossypiella* used from 1- 3 days old , treatment of eggs was done by dipping a piece of paper containing eggs on the different concentrations of each essential oil. Three replicates from eggs were used, each replicate (100 eggs on paper) was dipped in each concentration of each oil. After that the papers were left until dried. In additional; other three replicates of 1-3 old day egg were dipped in water and left as control. Then, the treated and control eggs were kept in an incubator under constant conditions  $25\pm 1^{\circ}\text{C}$  and  $75\pm 5\%$  R.H. The eggs were observed daily until hatching, the percentages of hatchability were estimated after 4-7 days for each treatment. Data were corrected and  $LC_{50s}$  of *Syzygium* and Turpentine were calculated according to [21] by using proban software.

### 2.3.2 Some biological aspects for immature and mature stages resulted from eggs treated

For some biological aspects studies; newly hatched larvae resulted from treated eggs with  $LC_{50}$  of *Syzygium* or Turpentine oils were transferred individually to the untreated diet by camel hair brush. Three replicates use each replicate 40 tubes, each tube (2 cm X 7.5 cm) containing 4 gm of diet were used [9].

The same was done with the newly hatched larvae resulted from untreated eggs. All tubes were capped with cotton, and kept in an incubator in laboratory at  $25 \pm 1^{\circ}\text{C}$  and 65-5% RH and inspected every two days until pupation. Pupae formed from each treatment were removed and placed in clean tubes till

adults' emergence. Some biological aspects larval, pupal stages and life cycle duration, percentage of adult emergence, malformation adults and sex ratio were estimated.

The newly emerged moths resulted from larvae hatched from eggs treated by  $LC_{50s}$  of *Syzygium* or Turpentine oils were sexed and transferred to chimney glass cage (five pairs /cage). Each treatment was replicated three times. The adults were fed on 20% sucrose solution. All cages kept under the previous conditions in an incubator in laboratory at  $25 \pm 1^{\circ}\text{C}$  and 65-5% RH. It were examined daily to record pre oviposition, oviposition and post oviposition times and the total numbers of eggs laid per day and percentage of hatchability. In additional; estimated the females and males longevity for each treatment

## 2.4 Statistical Analysis

All biological data obtained in the present studies were subjected to data analysis by standard errors and using statistically analyzed with one – way analysis of variance (ANOVA;  $P < 0.05$  %) [22] and Duncans multiple range test of means [23] were used.

## 2.5 Biochemical Assay

### 2.5.1 Preparation of samples for biochemical assay

Larvae samples (14 days old) of *P. gossypiella* resulted from eggs dipping in  $LC_{50}$  of *Syzygium* or Turpentine oils tested were collected to study the adverse impact of two tested natural oils on biochemical assay. At the same time, another sample were collected from control. These larvae samples were homogenized in distilled water using a Teflon homogenizer. it were centrifuge at 5000 r. p. min. at  $5^{\circ}\text{C}$  in refrigerated centrifuge, and kept in deep freezer at  $-20^{\circ}\text{C}$  till use for biochemical assays. All samples of larvae were analyzed bio-chemically in Physiological Dept. of plant Protection Researches Institute.

### 2.5.2 Technique of biochemical analysis

The colorimetric determination of total soluble protein, lipid and carbohydrate in total homogenate larvae was carried out, as described by Bradford [24]. Free amino acid and Phenol- oxidase activity was determined according to modification of [25].

## 3. RESULT AND DISCUSSION

The numbers of *P. gossypiella* larvae completed the embryogenesis for hatchability (egg completed

incubation to hatchability) were decreased with the increase the concentration from two oils.

The most efficacy of tested oils was recorded in case of Turpentine followed by Syzygium oil against *P. gossypiella* eggs. The number of hatchability were (17, 44, 63 and 84 eggs) in case of Turpentine and increased to (21, 46, 76 and 91 eggs) in case of Clove oil at (25, 12.5, 6.25 and 3.125 %) concentrations, respectively. The two natural products oils (Syzygium and Turpentine) showed ovicidal activity at the high concentrations applied (25 and 12.5).

Toxicity of two oils against the eggs of the pink bollworm from 1-3 days old.

The corresponding LC<sub>25</sub> & 50 values were 4.398 and 9.38% when *P. gossypiella* eggs dipped in Turpentine, respectively, and it increased to 6.041 and 11.572 when eggs dipped in **Syzygium** oil, respectively. the corresponding LC<sub>95</sub> values were 56.46 and 49.58%, when *P. gossypiella* eggs dipping in **Syzygium and Turpentine**, respectively.

Effect of two potential oils on different stages of pink bollworm resulted from eggs treated.

### 3.1 Incubation Period

Data presented in Table 3 recorded that the increase in the time required for completion of *P. gossypiella* embryogenesis for hatchability, it were 5.8 and 6.7 days/ egg when eggs dipping in LC<sub>50</sub> values for Syzygium and Turpentine, respectively, compared with 3.6 days in control.

### 3.2 Larval and Pupal Durations

According to the Data in Table 3 illustrated obvious increase in developmental larval times for two oils, as it recorded 19.0 days of resulted from treated eggs with LC<sub>50</sub> of Syzygium, while it increased to 20.0 days when treated with Turpentine oil, compared with 14.6 days in the untreated. In addition, the average of pupal duration increased to 9.3 and 10.2 days for the previous compounds compared to 7.3 days in control.

The obtained data presented in Table 3 indicate an increase in the times required for total immature stages, it reach to 28.2 and 30.2 days when different stages resulted from treated eggs with LC<sub>50</sub> of Syzygium and Turpentine oils, respectively, compared with 21.9 in the untreated check.

**Table 1. Effect of two potential oils on number hatchability of the pink bollworm eggs treated under laboratory conditions**

Tested eggs	Con.	Initial number of eggs	Time of hatchability				Total hatchability	%hatchability Reduction	
			4 (days)	5 (days)	6 (days)	7 (days)			
1-3 days	Clove	25	100	0	7	10	0	17	83
		12.5	100	0	15	20	9	44	56
		6.25	100	0	25	30	8	63	37
		3.125	100	11	39	34	0	84	16
	Turpentine	25	100	0	0	71	4	21	79
		12.5	100	5	13	18	10	46	54
		6.25	100	14	40	22	0	76	24
		3.125	100	30	44	17	0	91	9
Control	0.0	100	61	33	0	0	94	6.00	

**Table 2. Toxicological evaluation of Syzygium and Turpentine against eggs of pink bollworm under laboratory conditions**

Ages of eggs	Compounds used	Toxicity: 95% Confidence limits			
		LC <sub>25</sub> (%)	LC <sub>50</sub> (%)	LC <sub>95</sub> (%)	Slope± SE
		<i>P. gossypiella</i>			
1-3 days' old eggs	<b>Syzygium</b>	6.041	11.572	56.46	.2389
	<b>Turpentine</b>	4.398	9.38	49.58	2.04

**Table 3. immature stages deterrent effect of tested oils against pink bollworm under laboratory conditions**

Natural oil used	Conc. (%)	Duration immature stags ( days+ SE)			Total immature stage ( days+ SE)	Life cycle ( days+ SE)	
		Eggs	Larvae	Pupae			
<i>P. gossypiella</i>	Syzygium	11.572	<b>5.8±0.10<sup>b</sup></b>	19.0±1.2b	9..3±0.3a	28.3±0.8a	34.1±1.6
	Turpentine	9.38	<b>6.7±0.2a</b>	20.0±1.4a	10.2± 0.2a	30.2±1.3a	36.9±2.4
	Control	<b>0.0</b>	<b>3.6± 0.3c</b>	14.6± 0.7c	7.3± 0.5b	21.9± 1.4b	26.2± 1.5
<b>LSD</b>		<b>0.446</b>	3.419	1.120	2.683	2.636	
<b>F</b>		.152.6	8.450	21.141	31.522	60.923	
<b>P</b>		0.0001	0.0017	0.0019	0.0007	0.0001	

Values are mean ± SE of three replicates.

Values within the same column having the same letters are not significant different (ANOVA, Duncan's Multiple range tests,  $P < 0.05$ )

**Table 4. Effect of tested two oils against pink bollworm malformed and mortality of different stages under laboratory conditions**

Compounds used	No. of initial used	Malformed of immature stags			% of emergenc e adults	Sex ration as female	
		% Accumulated Larvae mortality	Malformed % Larvae	% Total malformed and dead pupae			
<i>P. gossypiella</i>	Syzygium	140	31.4	12.5	19	61	0.4
	Turpentine	140	49.28	18.36	14	56	0.3
	Control	100	7	2	1	94	0.54

### 3.3 Life Cycle

Data in Table 3 proved that the life cycle time (= estimated from eggs to adult emergence) resulted from eggs treated with LC<sub>50</sub> of Syzygium and Turpentine oils. Significant affected were found between treated and untreated, as it was elongated to 34.1 and 36.9 days, respectively, compared with 26.2 days in control.

### 3.4 Effect of two Tested Oils on Mortality and Malformation of Pink Bollworm Resulted from Eggs Treated under Laboratory Conditions

Data in Table 4 clear that the two tested oils high increased the accumulated mortality and malformation of larval or pupal stage resulted from eggs treated with LC<sub>50</sub> under laboratory conditions than that of untreated. The percentage of accumulated larvae mortality after hatched from treated eggs until pupation formed were 31.4 and 49.28 % for Syzygium and Turpentine oils, respectively, compared with 7.0% in untreated. Malformed recorded 12.5 and 18.36 % for Syzygium and Turpentine, respectively, compared with 2.0% in untreated. The most morphological deformed was pupal-adult intermediate resulted or the adult not completed the emergence from pupae lead to dead the adult before emergence.

Also, the percentage of adult emergence was highly significantly affected by two oils, it decreased to 61.0 and 56.0% for adults resulted from eggs treated with LC<sub>50</sub> of Syzygium and Turpentine oils, respectively, compared with control (94.0%) Table, 4.

### 3.5 Sex Ratio

The sex ratio of *P. gossypiella* was 0.54 as female for untreated in Table 4. Sex ratio parameters were high differed according to treatment. It was 0.4 and 0.3 as female when resulted from eggs treated with Syzygium and Turpentine oils, respectively.

### 3.6 Ovipositional Period and Reproductive Potential

Statistical analysis of data summarized in Table 5 demonstrated that highly significant differences between pre- oviposition, oviposition period, reproductive and fertility for adults resulted from eggs treated with Syzygium and Turpentine, respectively comparative with control. The respective, average number of eggs deposited (fecundity) by females were 107 and 97 eggs laid at 11.1 and 7.6 days oviposition/ female resulted from Syzygium and Turpentine, respectively, compared with 226.0 eggs/ female in control deposited at 11.6 days. Hatchability percentages, also were high affected by the Syzygium

and Turpentine oils treatments. The results shows those post - oviposition periods were significantly influence from 0.7 to reached 3.2 days . respectively, compared with 2.1 days in control.

The longevity of adult female increased when resulted from Syzygium , longevities of females estimated by 18.4 days/ female, and the Longevities for males recorded 14.3 days. In contrary, longevity of adult female and male high decreased when resulted from egg treated with turpentine, it were 12.4 and 9.3 days for female and male, respectively, compared with 16.0 and 13.6 days in control Table,5.

This data in Table 5 indicated that latent toxic effect in biochemical parameters larvae resulted from eggs treated with previous two essential oil Syzygium and Turpentine. It caused high decreased in the level of total protein to 15.0 and 8.6 (total protein (mg/g.b.wt. /larvae resulted), respectively compared with 17.0 mg/g.b.wt. /larvae in control, with increased free-amino acid to 137.3 and 298.0 ( $\mu\text{g D, L- alanine/g.b.wt}$ ) respectively, compared with 118.0 ( $\mu\text{g D, L- alanine/g.b.wt}$ ) in control. In additional, the two essential oil Syzygium and Turpentine cussed high increased in total lipid, it was 27.9 and 22.0 mg/g.b.wt. /larvae resulted), respectively, compared with 16.9 mg/g.b.wt. /larvae in control. While, two essential oil Syzygium and Turpentine decreased the Phenoloxidase, it estimated by 14.8 and 13.5 (O.D. units/g.b.wt) respectively compared with 26.0 Phenoloxidase (O.D. units/g.b.wt) in control. Additionally, the present study clearly that the total protein and Phenoloxidase appeared as the most affected with high level of reduction with turpentine. These percentages were - 49.4 total protein (mg/g.b.wt. /larvae resulted) and - 48.1, respectively (Table, 6).

#### 4. DISCUSSION

The results of these experiments indicate that the two natural oils are high ovicidal activity toxic. The data recorded that eggs high susceptibility to Turpentine than Syzygium: the  $LC_{50}$  for Syzygium and Turpentine were 11.572 and 9.38, respectively. In additional; promising as a prolonged the incubation period of eggs. It significant difference in times require for completed the embryogenesis to hatchability (TH). At the same time, it cussed reduction in hatchability eggs. The results are in congruence with those of [8, 17, 26 and 27] they

studied that the toxicity of essential oil Syzygium and others oils against, *Tribolium castaneum*, *Aedes aegypti* and other Lepidoptera insects also, [14] they recorded that the clove oil was high toxicity and repellency against *Rhyzopertha dominica*, *Sitophilus oryzae* and *T. castaneum*. [28]. [29,30] revealed that, the  $LC_{50}$  and  $LC_{90}$  values of pepper oil against 1st instars larvae of cotton leaf-worm recorded by 37.35 and 64.07 %. On the other hand, the newly hatched larvae of spiny bollworm after one day from treatment at concentration 70 % clear increased in percent larval mortality to 42 %. While the mortality decreased to 31 % at 60 % concentration. In case of spiny bollworm, pepper oil had the least effect of on the newly hatched larvae after one day of treatment. Also, Donald et al., (2008) recorded that, black pepper and red pepper are high toxicity and causing mortality of different insect species. [31]. [22] found that the combination of long pepper oil (*P. hispidinervum*) and clove (*Syzygium aromaticum*) oils in two concentrations with Xentari WG (Bta) a more toxic for *S. frugiperda*. Also, essential oil Clove (EOC) has recorded a larvicidal activity against field larva of *Ae. egypti* with  $LC_{50}$  of 92.56 and 62.3ppm in two different reports [8].

In additional; the present studies recorded that the two oils Syzygium and Turpentine cussed a significant prolonging of the time required for larvae development, which may be; due to, adverse effect as ante-feeding and repellent for larvae, it led to high effect on the metabolism and some biological parameter and Physical activity larvae; these appearance in latent effect on elongated development of pupae, life cycle for *P. gossypiella* among the Turpentine followed by Syzygium. It may be reflecting for their different chemical compositions in content the two essential oils. Thus a very careful study is needed to select the optimum combinations for further development. The results are in congruence with those of [13, 14, 20,32, 33] recorded that the ovicidal effect of essential oil Syzygium is probably the major factor in the suppression of eggs hatchability and the development of immature stages and adults resulted from treated eggs, also, 14. [10] recorded that the Syzygium oil were very toxicity and repellency against *Rhyzopertha dominica*, *Sitophilus oryzae* and *Tribolium castaneum*. Also, suggesting that the activity of clove oil was solely due to this major compound. Also, [23,24] they recorded that the Proclaim and mineral oil caused high effect on the metabolism of *P. gossypiella*, it lead to affect the growth, development for different stages of insect.

Table 5. Effect of two natural oils on fecundity and fertility of the pink bollworm adult resulted from eggs treated under laboratory conditions

Natural oil used		Ovipositional period (in days)			Longevity -(in days)		Total eggs laid	Fecundity % hatch
		Pre- oviposition	Oviposition	Post- oviposition	Female	Male		
<i>P. gossypiella</i>	Syzygium	3.9±0.10b	11.1±0.6b	3.2±0.1a	18.4±1.2a	14.3±0.7a	107.0±9.6	68
	Turpentine	4.1±0.3a	7.6±0.2c	0.7±0.3c	12.4±0.1c0	9.3±0.3b	97.0±8.1	77
	Control	2.3±0.10c	11.6±0.5a	2.1±0.1b	16.0±1.2b	13.6±0.5a	226.0±11.5	98
SLD		0.103	0.362	0.121	1.030	1.613	6.214	3.240
F		114	163	106	6.841	10.335	109.0	27.3
P		0.0001	0.0017	0.000	0.000	0.001	0.000	0.00

Values are mean ± SE of three replicates.

Values within the same column having the same letters are not significant different (ANOVA, Duncan's Multiple range tests,  $P < 0.05$ ).

Table 6. Biochemical parameters in larvae resulted from eggs treated with Syzygium and Turpentine

Biochemical aspects	Total protein (mg/g. b. w. t)		Free-amino acid (µg D,L-alanine/g. b. wt)		Total lipid (mg/g .b. wt)		Phenol oxidase (O.D. units/g. b. w)	decrease(-)
	Treatment	decrease (-) or increased(+)%	Treatment	Decrease (-) or increased(+)%	Treatment	increased( by times		
Syzygium	15.0±1.10 b	-11.76	137.3±10.99b	+	27.9±0.21 a	1.65	14.8±0.9 b	- 43.07
Turpentine	8.60±4.1 c	-49.4	298.0±13.2 a	+	22.0±16.25 b	1.302	13.5±4.9 b	- 48.1
Control	17. 0±0.28 a	0.0	118.0±2.3 c	0.0	16.9±0.5 c	00	26.0±3.2 a	0.0
LSD	0.133	...	7.421		2.531	..	1.404	..
P	0.001	---	0.0003		0.001	...	0.21	

Also, the results clear that the differences in relative performance of the two oils in the toxicity or adverse effect on mortality and malformed may be indicating likely differences in the nature of the chemicals responsible for the arrest we observed. In addition, the latent effect of two tested oils have an appeared on the adult performance and reproductive potential resulted from treatment of 1-3 day old eggs after dipping in LC<sub>50</sub> value of *Syzygium* and Turpentine. Generally, results indicated that all treatments decrease adult emergence, reduction in longevity and fecundity and eggs hatchability.

All these results agree with [7,25,9, 23] they revealed that the effects of mineral and natural oil against eggs and newly hatched larvae of Pink bollworm and cotton leaf-worm, it caused reduction in hatchability eggs with high mortality larvae after egg hatchability with increased in developmental stages. Also, [25] who found that the essential jojoba oil high toxicity and ant - feeding effect, it lead to development inhibitor. [8, 10,7,14, 27, 34,35] studied that the Larvicidal efficacies and chemical composition of essential oils of *Syzygium aromaticum* against mosquitoes. It high increased the time of developmental stages.

The present physical study for *P. gossypiella* clearly that; the protein, free amino acid and lipids are a very important in body insect for released the energy required to development the different stages.

These results are in congruence with those of [14, 15,25,28,11,24,29,34,35,36,37] they recorded that the inactivation of digestive enzymes with reduction in total protein or lipids results physical analyzed leading to poor nutrient utilization, development for different immature stages for insects , because all these are of vital importance to insects' growth, where they require for energy growth, longevity, and reproduction.

In addition, [6, 3,19,20,32,36,38,37,39] mentioned the combination of pepper oil, *Piper hispidinervum* and clove, *Syzygium aromaticum* essential oils considerable a more effective control of *S. frugiperda*. The both oil high effected on biological and reproductive parameters, in additional, changes in the levels of phenoloxidase and nitric oxide in the hemolymph of *S. frugiperda*.

## 5. CONCLUSION

The two essential oils of **Syzygium and Turpentine** can be involved in a promising alternative for the integrated management program in controlling the pest, to reduce the population of *P. gossypiella* in the

fields. Because it caused high reduction in hatchability of eggs with latent effect on different immature stages, with the adverse effects on decrease for the amount of eggs laid by females' resulted and high reduction of hatchability. In additional, it play very important role in change physical body insect for released the energy required to development growth, longevity, reproduction and fertility in all stages. It lead to reduction in population.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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