

Terpenoids crude extract of *Caparis spinosa* affecting some biological aspects of housefly, *Musca domestica* L. (Diptera : Muscidae)

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Abstract

Terpenoids of *Caparis spinosa* was tested against *Musca domestica* ; study results revealed that crude terpenoids extracts of leaves and fruits significantly affected some aspects of housefly .

Egg production was dropped from about 1147 egg / female to 498 and 515 eggs/female when the insect reared on diets treated with leaves and fruits terpenoids respectively . at concentration of 20 mg / ml .

Cumulative mortality of immature stages reached 72 % and 67 % at the same concentration , developmental period was extended to 17 and 15.2 days when treated with both extracts , compared with control (11 days).Pupal wt. also, reduced significantly and reached 0.16 (gm / 30 pupa) and 0.18 (gm / 30 pupa) compared with 0.89 gm / 30 pupa of control treatment .

Introduction

Terpenoids are enormous range of plant substance . they are all based on the isoprene molecule (Harborn , 1984) . they range from the essential oil compounds , the volatile mono and sesquiterpenes , dienes , involatile triterpenoids , and sterols carotenoid pigments . All of these compounds are of significance in either plant growth , metabolism or ecology .

Many studies indicated that terpenoids play an important role in insect plant interaction . Stipanovic (1983) found that maiximilin - C caused a high mortality rate of 1st larval instar of *Homeosoma electellum* . Beninger et. Al , (1993) found that epicaryotine (a terpenoid extracted from *Clerodendrum calamitoides*) reduced the growth , increasing mortality rate, prolonged the pupation time , and caused growth abnormalities of *Ostrinia nubilalis* . Al- Mansour (1997) found that terpenoids of *Ibicella lutea* affected egg hatchability and larval development of *Bemisia tabaci* .

Present study is an effort to test the bioactivity of extracted terpenoids from *Caparis spinosa* on some biological criteria of housefly , *Musca domestica*

Material and Methods

Adult houseflies were collected from the field , then kept in a rearing cage (40 x 20 x 20 cm) . The adults were supplied with artificial diet (Abdul fatah , 1989) , then kept in a constant temperature of 30 ± 1°C and 20 - 30 % relative humidity . Eggs were collected and transferred to a glass petridish (7.5 cm in diameter) supplied with larval food (Abdul fatah , 1989) . Sex separation was based on (Ponts , 1973) . Insect identification was confirmed by the Iraqi National history museum .

Terpenoid extraction from *C . spinosa* leaves and fruits was done according to Harborn (1984) . 2 gms. of dried terpenoids extract were

dissolved in 5 ml ether ,the volume was made up to 100 ml with distilled water ,from this stock solution 6 different concentrations were prepared (0.0 ,1.0 , 2.5 , 5 , 10 and 20 mg / ml) 60 ml of each were added to the larval diet instead of distilled water originally described .

The effect of terpenoids on egg hatchability was tested by using 100 eggs (12 hrs old) /10 replicates each .Sprayed with a laboratory sprayer . The treated eggs were kept at incubator with temperature of 30 ± 1°C and 50 - 70 % R.H .Mortality of the eggs was recorded after 24 hrs. and continued till hatching was completed .

Larval : Pupal developmental time and mortality rate were tested by using 100 newly emerged , 1st instar larvae (12 hrs. old) /10 replicates, all mortality rates were corrected according to Abbott formula (Abbott, 1925) .

Study finding clearly indicted that *C. spinosa* terpenoids adversely affected biological criteria of housefly tested . More studies needed to identify the compound (s) responsible for these effects in order to use such compound (s) as botanical insecticide .

Egg production was tested by using 100 newly emerged larvae / 10 replicates each . Treated with each concentration . The emerged adults were sexually separated before mating .The experiments were carried out as following :

10 Untreated	x	10 untreated	(control)
10 Treated	x	10 treated	
10 Treated	x	10 untreated	
10 Untreated	x	10 treated	

Egg deposition and vitality were followed . Statistical analysis of the data was based on completely randomized design with confidence limits of 95 % (Snedecor and Cockran , 1976) .

Results and Discussion

Study results indicated clearly that terpenoids extracts of both leaves and fruits of *C. spinosa* , significantly affected the developmental

period of immature stages, survival rate, and pupal weight of housefly *M. domestica* (Table 1, Fig. 1) . Egg mortality rate reached 28.2 % and 27.2 % due to the effect of leaves and fruits terpenoid extracts at concentration of 20 mg/ml respectively . A direct correlation was found between egg mortality rate and extract concentration . While larval-pupal developmental period was increased from about 11 days to 17 and 15.2 days respectively at the same concentration . An inverse correlation was found between terpenoid extract and pupal wt . Pupal wt. reduced from about 0.89 (gm / 30 pupa) to 0.16 (gm / 30 pupa) and 0.18 (gm / 30 pupa) when treated with terpenoid extract of both leaves and fruits respectively at concentrations of 20 mg/ml (Table 1) . Cumulative mortality of immature stages reached 72 % and 62 % when treated with leaves and fruits terpenoid extracts (Fig. 1) . The obtained data revealed a direct correlation between mortality rate of immature stages and extract concentration of both leaves and fruits

Egg production was also significantly affected by terpenoid extract application (Table 2) . The obtained data revealed that egg production dropped from about 1147 498 and 555 egg when treated with leaves and fruits extract respectively at concentration of 20 mg / ml .

Female egg deposition behavior was affected by terpenoid extract (Fig 2) . Egg deposition was dropped from about 230 eggs in control treatment to zero and 110 eggs over sites treated with leaves and fruits terpenoid extracts respectively . Also , the data showed an inverse correlation between egg deposition and extract concentration .

In this respect Stjepanovic (1983) found that maximilin (C₁₅ terpenoid compound) caused a high mortality rate of the 1st larval instar of *Homocidus elevatus* when treated with concentration of 1.0 - 10.0 % . While , Brattestam (1983) mentioned that all higher plants contain terpenoids , which are toxic to phytophagous insects .

Beninger et al. (1993) found that epicaryotin which is extracted from *Clerodendron columbinus* reduced the growth , increased mortality rate , pupation time , and cause developmental abnormalities of *Ostrinia nubilalis* . While , Al Mansour (1991) found that terpenoids extracted from *Ibiscus hana* leaves affects egg hatchability and the growth of nymphs of whitefly *Bemisia tabaci* . Al Salmi (1998) found that adult mortality rate of *Sitotrophia granarum* reached 90% when treated with terpenoid extract of *Convolvulus arvensis* and *Ipomea circa* , while nymphal mortality rate reached 74% and 71% when treated with terpenoids of *C. arvensis* and *I. Circa* respectively . Also his data showed an increase in the developmental period of treated nymphs

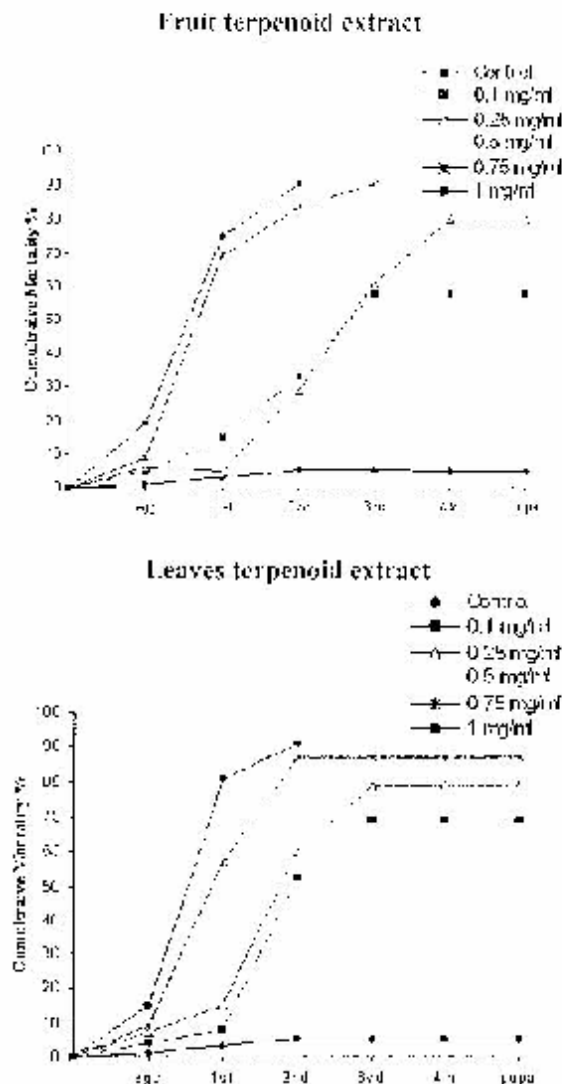


Figure (1): Cumulative mortality of immature stages treated with leaves and fruits terpenoid extracts

Table (1): The effects of leaves and fruit terpenoids of *C. spinosa* on egg mortality, developmental period of immature stages, and pupal wt. (30 gm / pupal) of house fly, *M. domestica*.

Extract conc.	Leaves extract			Fruit extracts		
	Egg mortality (%)	Developmental period (days)	Pupal wt.	Egg mortality (%)	Developmental period (days)	Pupal wt.
0	16.6	13.8	0.872	16.8	11	0.888
1	18.4	12	0.639	18	11	0.706
2.5	19.8	17.2	0.575	19.4	12.4	0.640
5	22.4	13.4	0.342	21.2	13.2	0.387
10	24.2	15.5	0.206	24	14.8	0.261
20	28.2	17	0.164	27.2	15.4	0.281

Table (2): The effects of leaves and fruit terpenoids of *C. spinosa* on egg production of *M. domestica*.

Treatment / Mating Status	Leaves extract					Fruit extracts				
	1	2.5	5	10	20 mg/ml	1	2.5	5	10	20 mg/ml
Both treated	970	877	793	674	498	979	937	806	697	555
Untreated treated	978	875	816	705	538	987	902	835	736	567
treated untreated	989	961	862	759	621	1000	990	873	764	618
untreated (control)	1149	1145	1148	1143	1147	1137	1151	1135	1147	1144

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الخلاصة

لقد تم اختبار تربينات ثبات الكبر *Caparis spinosa* ضد الذبابة المنزلية *Musca domestica* L. أظهرت نتائج الدراسة أن مستخلص التربينات الخام للأوراق والثمار قد أثر معنوياً في بعض معايير الأداء الحياتي للذبابة المنزلية. فقد انخفض إنتاج البيض من 1147 بيضة / أنثى إلى 498 و 555 بيضة / أنثى عند تربية اليرقات على غذاء حلوي على مستخلصي تربينات الأوراق والثمار بتركيز 20 ملغم / مل على التوالي. كذلك ارتفعت الوفيات التراكمية للأولاد غير البالغة إلى 72% و 62%. وازدادت مدة نمو الأولاد غير البالغة إلى 17 أو 15.2 يوماً على التوالي مقارنة مع السيطرة التي وصلت إلى 11 يوماً. وقد تآثرت أوزان العذاري التي انخفضت إلى 0.16 و 0.18 غم / 30 عذراء عند معاملة اليرقات على غذاء حلوي على مستخلصي الأوراق والثمار على التوالي بتركيز 20 ملغم / مل. بينما أظهرت النتائج وجود فرق إحصائي معنوي في انخفاض مستوى الكوليسترول في مصمل الأشخاص القسوين يزاولون أعمال شاقة نسبة إلى الأشخاص الذين يزاولون أعمال يومية عادية وتم الاستنتاج من هذه الدراسة بأن قيمة الدهون في مصمل الأشخاص الأصحاء كانت أعلى عند مقارنتها مع كيم الدهون المسجلة في دراسات أخرى و يرجع السبب في ذلك إلى نمط الغذاء اليومي للناس في مدينة كركوك. حيث يعتمدون على نسبة عالية من الدهون والكربوهيدرات في غذائهم اليومي. إن هذه الدراسة أظهرت أيضاً بأن للعمر دوراً مهماً في زيادة نسبة الكوليسترول و الكليسيريدات الثلاثية كما لوحظ إن معدل الزيادة في الذكور أعلى من الإناث وإن نسبة الزيادة معنوية إحصائياً في نسبة الكليسيريدات الثلاثية في الفئات العمرية الثلاثة.