

**STUDIES ON DIRHINUS GIFFARDII SILVESTRI  
(HYMENOPTERA: CHALCIDIDAE) AS PARASITOID OF  
BACTROCERA ZONATA (SAUNDERS) PUPAE (DIPTERA:  
TEPHRITIDAE) IN EGYPT.**

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**ABSTRACT:** *Dirhinus giffardii* Silvestri, is newly recorded chalcid in Egypt. The objective of the study is to report the first occurrence of the chalcid fly as pupal parasitoid of Peach fruit fly, *Bactrocera zonata* (Saunders) (Diptera: Tephritidae), which was recently recorded in Egypt.

**INTRODUCTION**

Fruit flies of family Tephritidae are considered as important pests, where their attacks for fruits, vegetables and nuts reduce yield and quality. Different species of this family have introduced into the Egyptian ecosystem. One of the most important attacks was the introduction of the Peach fruit fly (PFF), *Bactrocera zonata* (Saunders), which was recorded in Egypt (El-Minshawy, et al., 1999), all over the Indian sub-continent (Kapoor, 2005), Ceylon and Mauritius (Narayanan and Batra, 1960), Sri Lanka (Tsuruta and White, 2001), Reunion (White et al., 2001), Near east countries (Saudia Arabia, Israel, United Arabs Emirates, Oman, Iran and Yemen (Merz and Dawah, 2005)), North America (California)(Carey and Dowell, 1989). PFF has proved to be a destructive pest in every country where it has become established, where it infests different fruit and vegetable plant hosts belonging to different families (Narayanan and Batra, 1960, Syed et al., 1970, Kapoor and Agarwal, 1982 and White and Elson-Harris, 1992).

Family Chalcididae is cosmopolitan in distribution, but particularly diverse in low land tropical areas. The family presently comprises more than 1400 species in nearly 90 genera (Burks, 1960; Habu, 1960; Gauld and Bolton, 1988; Askew, 1994; and Pujade, 1994). Chalcididae species are strictly primary parasitoids of larvae or pupae of other insects, mostly Lepidoptera and Diptera (Clausen, 1940; Burks, 1960; Grissell and Schauff, 1990).

The aim of this paper was to report the first occurrence of *Dirhinus giffardii* Silvestri on pupae of *Bactrocera zonata* (Saunders) in Egypt.

### MATERIALS AND METHODS

Pupae of Peach fruit fly (PFF), *Bactrocera zonata* (Saunders), have been collected from horticultural orchards of Kalubia and Giza districts. In case of Giza district, the specimens were collected from Mansouria and Dokki while in Kalubia district, they have been collected from the 18<sup>th</sup> military factory gardens. The specimens were collected from peach, mango and guava orchards. During fruiting season, the soil under the fallen and infested fruits have been sampled and backed in plastic bags. The bags returned to the laboratory, examined and sifted for fruit flies pupae. The pupae kept in top perforated plastic vials (50 ml volume) in 25°C and 65% Rh incubator until the flies or the parasitoids were emerged. The emerged parasitoids have been kept in AGA solution (ethanol + Glycerin + Glacial acetic acid) for identification. To confirm the parasitization of the Peach fruit fly with that parasitoid, some of the emerged parasitoids have been kept alive and powered into round glass cage of 20 cm height and 10 cm diameter. The upper hole of the cage was sealed with organza fabric and the lower one closed with glass Petri dish. Droplets of honey were distributed on the top organza fabric. Water container was powered into the cage. After a week, a newly pupped pupae of peach fruit fly have powered into the glass Petri dish for 5-7 days. Later on, the pupae were replaced and kept in plastic vials in 25°C and 65% Rh incubator for parasitoid emergence.

### RESULTS AND DISCUSSION

Since the Peach fruit fly (PFF), *Bactrocera zonata* (Saunders), invaded the Egyptian ecosystem in early 90's of the last century (Abu-El-ela et al., 1997 and El-minshawy et al., 1999), it is started to be the most important factor controlling the horticulture and export in the country, and different methods of control have been conducted to reduce and eliminate its hazardous (Mohamed and El-Wakkad, 2003 and Shehata et al., 2006). Natural regulators such as parasitoids are agents responsible for reduction of fly population and started to be a promising tool for pest's control (Mason and Huber, 1993).

In late summer of 2004 and during the PFF survey studies in Kalubia and Giza districts have been progressed, 22 parasitoids have emerged from the collected pupae. By referring to the taxonomic keys (Schmitz,

1946; Burks, 1947; Masi, 1947; Boucek, 1951; Ferriere and Kerrich, 1958; Richards, 1977 and Borrer et al., 1989), it has been concluded that the parasitoid is *Dirhinus giffardii* Silvestri (Chalcididae: Hymenoptera) and by revising the recorded parasitoid species of fruit flies in Egypt (Sarhan, 1981), it has been recorded that it is a new record as pupal parasitoid of Peach fruit fly in Egypt.

According to Sarhan (1981), there were three pupal parasites emerged from Mediterranean fruit fly (Medfly), *Ceratitis capitata* (Weidemann), which were *Euchalcidia corybori* Hanna (Hymenoptera: Chalcididae), *Pachcrepoideus vindemmiae* (Rondani) (Hymenoptera: Pteromalidae) and *Spalangia gemina* Boucek (Hymenoptera: Pteromalidae). Previously there were two braconid larval parasites, *Diachasma tryoni* Cam. and *Opius humilis* Silvestri and the eulophid larval parasite *Tetrastichus giffardians* Silv., were imported from Hawaii and distributed in El-Kanater El-Khairia by Kamal (1951), but none of them could be recovered during Sarhan study.

#### **Taxonomic status and descriptive characters:**

Family Chalcididae is one of 20 families of the super family Chalcidioidea (Gibson, 1993) and currently it includes 87 genera and 1464 species placed in 5 subfamilies as follows: Haltichellinae (55/560), Dirhininae (3/65), Chalcidinae (25/767), Epitraninae (1/64), Smicroporphinae (1/6), and unplaced (2/2) (Gauld and Bolton, 1988; Boucek, 1988, 1992; Gibson, 1993 Askew, 1994, Pujade, 1994 and Hanson and Gauld, 1995). Genus *Dirhinus* consists of about 15 species in the Nero tropics region (Hanson and Gauld, 1995) and all of them are parasitoids in puparia of various Diptera.

Like other members of genus *Dirhinus*, *Dirhinus giffardii* Silvestri can be recognized by the antennae, which are inserted in a deep concavity formed by two frontal horn-like processes (Fig. 1a) as long as the scape of the antennae, moderately broad, incised at the apex, with the inner side some what surpassing the outer, the apex subacute (Fig. 1c ). The antennae are very compact club shape and they are brick-red except the club which is brown (Fig. 1 b). The head and thorax are blackish copper-green in color, while the abdomen is shining black. Wings are hyaline with brownish veins. Front wings with the stigmatic vein very short. First and second pairs of legs with coxae black, the rest brick-red, third pair with only the tarsus brick-red, the rest black. Femora of the posterior legs

as other chalcidids are greatly swollen and dentate beneath for almost the whole of the opposite side of the tibia (Fig. 1d). Pronotum covered with circular faveolae each with a short central seta. Mesonotum with the same sculpture as the pronotum. Propodium with the lateral submedian angles acute. Abdomen segments chitinized and compressed oval very acute posteriorly. The male's abdomen is slightly rounded than female's. The average length of the whole body is 4.2 mm, of the antennae is 1.8 mm, and of front wings is 2.75 mm.

#### **Distribution and hosts:**

As other Chalcidids *Dirhinus giffardii* Silvestri is a solitary primary endoparasitoid. It is idiobiont, oviposits into more or less fully grown hosts such as mature larvae or young pupae (Dresener, 1954 and Podoler and Mazor, 1981). Originally *Dirhinus giffardii* Silvestri has reared from *Ceratitis anonae* Graham in Nigeria and propagated on medfly, *Ceratitis capitata* (Weidemann) in Hawaii (Silvestri, 1914). Later, it has been recorded in different countries parasitizing different fruit fly hosts (Table 1), where it was recorded in Mexico (Lopez et al., 1999), India (Kapoor and Agarwal, 1982, Kapoor, 1993); Pakistan (Ahmad et al., 1975); Italy, Fiji (Narayanan and Chawla, 1962); France, Reunion, (Etienne, 1973). Tunisia, West Africa (Silvestri, 1914), and Cape Verde Islands (Fry, 1987). *Dirhinus giffardii* Silvestri is a generalist parasitoid known to attack a wide variety of other fruit-infesting Tephritids including, *Anastrepha oblique* (Macquart), *A. suspense* (Loew.), *A. ludens* (Loew), *Bactrocera caryeae* (Kapoor), *B. cucurbitae* (Coquillett), *B. demmerezi* (Bezzi), *B. dorsalis* (Hendel), *B. latifrons* (Hendel), *B. oleae* (Gmelin), *B. passiflora* (Froggatt), *B. tryoni* (Froggatt), *Ceratitis rosa* Karsch, *Dacus ciliatus* Loew, *D. correctus* (Bezzi), *D. frontalis* Becker, *Toxotrypana curvicauda* Gerstaecker and *Trirhithromyia cyanescens* (Bezzi). In addition to Family Tephritidae, *Dirhinus giffardii* Silvestri has been recorded parasitizing other hosts of Order Diptera in Family Glossinidae (*Glossina brevipalpis* Newst., *G. morsitans* Westw. and *G. palpalis* Robineau Desvoidy (Ferriere, 1935, and Thompson, 1954). Family Muscidae (*Musca domestica* (Herting, 1978, and De Santis, 1979)), and in Order: Lepidoptera: Family: Noctuidae, *Spodoptera litura* (Herting, 1976). *Dirhinus giffardii* has also been reported to attack other parasitoids, including, *Fopius vandenboschi* (Dresener, 1954, and Herting, 1977), *F. arisanus* (Sonan) (Wang and Messing, 2004), *Diachasmimorpha longicaudata* (Ashmead) (Wang and Messing, 2004),

*D. tryoni* (Cameron) (Wang and Messing, 2004) and *Psytalia incise* (Silvestri) (Wang and Messing, 2004).

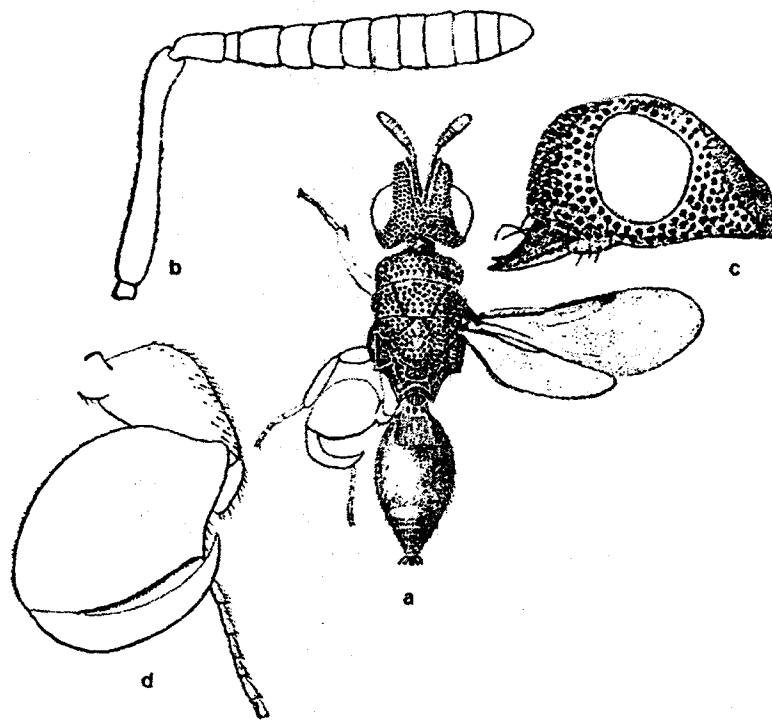


Fig.(1): *Dirhinus giffardii* Silvestri (a) Adult female, dorsal view (b) Antenna, lateral view (c) Head, lateral view (d) Hind leg, posterior view.

Table (1): Fruit fly hosts of the *Dirhinus giffardii* Silvestri and its distribution in different countries.

Fruit fly	Country	Reference
<i>Anastrepha ludens</i> (Loew)	Mexico	Jimenez-Jimenez, 1956; Lopez et al., 1999
<i>Anastrepha oblique</i> (Macquart)	Mexico	Jimenez-Jimenez, 1956
<i>Anastrepha suspense</i> (Loew)	Mexico	Lopez et al., 1999
<i>Bactrocera caryeae</i> (Kapoor)	India	Narayanan & Chawla, 1962
<i>Bactrocera ciliatus</i> Loew	India	Kapoor & Agarwal, 1982
	Pakistan	Ahmed et al., 1975
<i>Bactrocera cucurbitae</i> (Coquillett)	Hawaii	Thompson, 1943; Nishida, 1953, 1955
	India	Kapoor & Agarwal, 1982; Kapoor, 1993
	Reunion	Narayanan & Chawla, 1962; Etienne, 1973
<i>Bactrocera (Dacus) demmerezi</i> (Bezzi)	Hawaii	Silvestri, 1914; Thompson, 1943; Clausen, 1956
	Reunion	Etienne, 1973
<i>Bactrocera dorsalis</i> (Hendel)	Hawaii	Pemberton, 1949; Van den Bosch, 1952; Dresener, 1954; Narayanan & Chawla, 1962
	Pakistan	Syed, et al., 1964
<i>Bactrocera latifrons</i> (Hendel)	India	Narayanan & Chawla, 1962; Narayanan & Batra, 1963
<i>Bactrocera oleae</i> (Rossi)	Italy	Martelli, 1913; Thompson, 1943; Narayanan & Chawla, 1962;
<i>Ceratitis anonae</i> Graham	Nigeria	Silvestri, 1914; Wharton & Gilstrap, 1983
<i>Ceratitis capitata</i> (Weidemann)	Hawaii	Silvestri, 1914; Fullaway, 1920; Timberlake, 1924; Thompson, 1943; Clausen, 1956; Narayanan & Chawla, 1962; Cochereau, 1970
	France	Etienne, 1973
	Italy	Mortelli, 1913
	Reunion	Etienne, 1973
	Tunisia	Silvestri, 1914; Guillochon, 1916
	West Africa	Silvestri, 1914
<i>Ceratitis rosa</i> Karsch	Hawaii	Silvestri, 1914; Timberlake, 1924; Thompson, 1943; Clausen, 1956;
	Reunion	Etienne, 1973
<i>Dacus</i> spp.	Fiji	Narayanan & Chawla, 1962
<i>Dacus correctus</i> (Bezzi)	India	Nishida, 1955; Kapoor & Agarwal, 1982
<i>Dacus forntalis</i> Becker	Cape Verde Islands	Fry, 1987
<i>Glossina brevipalpis</i> Newst	Nyasaland	Ferriere, 1935
<i>Glossina merositans</i> Westw	Nyasaland	Ferriere, 1935
<i>Glossina palpalis</i> Rd.	Nyasaland	Ferriere, 1935
	Nigeria	Ferriere, 1935
<i>Toxotrypana curvicauda</i> Gerstaecker	Puerto Rico	Narayanan & Chawla, 1962
<i>Trirhithromyia cyanescens</i> (Bezzi)	Hawaii	Silvestri, 1914; Thompson, 1943; Clausen, 1956;
	Reunion	Etienne, 1973

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دير هينس جيفردى (غشائية الأجنحة: كالسيدى)  
كطفيل لذبابة ثمار الخوخ (ثنائيات الأجنحة: تيفرتيدى) فى مصر

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### الملخص العربى

دير هينس جيفردى (غشائية الأجنحة : كالسيدى) تسجيل جديد فى مصر. الغرض من هذه الدراسة هو تسجيل أحد أنواع طفيليات عائلة الكلسيديى والتابعة لرتبة غشائية الأجنحة كطفيل ضد عذارى ذبابة ثمار الخوخ (ثنائيات الأجنحة: تيفرتيدى) والتي تم رصدها حديثا فى مصر.