Impact of different photoperiods on *Dirhinus giffardii* (Silv.) Parasitism on Pupae of *Bactrocera correcta* and *Dacus ciliatus*

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**Abstract**

The study was carried out at Dipterian Research Laboratory Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam, on the impact of different photoperiods (8:16, 10:14, 24:0 and 0:24 Light & Darkness) were determined. The results were found that maximum emergence of female parasitoids 24.0±1.58 were noted on *B. correcta* at photoperiod 24:0 Light, followed by (10:14 L/D) 21.6±0.74, (8:16 L/D) 19.2±1.01, whereas the minimum % age of males and females 9.20±0.86, 15.4±0.92 pupae were obtained at photoperiod (0:24 Darkness), respectively. On the other hand, the *D. ciliatus* showed at photoperiod 24:0 Light highest ratios of male and female adults which were 15.4±0.92, and 20.0±0.70, while the lowest pupae emerged at 0:24 Darkness 6.00±0.70 and 10.8±0.80, respectively. The minimum emergence percentage was recorded at 0:24 Light for both sexes. The results further determined that *D. giffardii* prefer *B. correcta* as compared to *D. ciliatus* Furthermore, the analyzed data showed significant difference between different treatments (P<0.05).

**Key words:** *D. giffardii*, *B. correcta*, *D. ciliatus*, photoperiod, emergence.

**Introduction**

The fruit fly *D. giffardii* (Hymenoptera: Chalcididae), (Silvestri) originated in West Africa. The fruit fly well distributed in more than twenty countries specially Central American and Pacific regions. Pupal parasitoids deposited their eggs by pierce the pupae wall on the host pupa, the host developed into larva emerged, (Wang and Messing, 2004a)\(^1\). The Female fruit fly laying eggs in host flesh which developed into maggots inside the fruit in large quantity and damaged the fruit which are unfit for selling and feeding purpose. Fruit causes seven billion rupees annually losses by damaging the fruit in the orchard as well market. 100% losses in fruit market of India and 76.5% in Bannu caused by guava fruit fly and 76.5%. *B. zonata* causes 190 million euro’s annually in fruit industry in Egypt (El-Husseini et al., 2008)\(^2\). *D. giffardii* female preferred hosts which are bigger in size. Newly hatched wasp larvae of *D. giffardii* are white in colour, transparent, smaller in size and feed on host tissue. The pupae complete their life cycle within 2-3 days and male partner born earlier then their counterpart female. The fruit fly survived upto 18-30 days at 27 °C and 70-75 relative humidity. The life cycle includes egg stage (2 days), larva stage (9-10 days) pupa stage (7-8 days) and adult stage (10-15 days) (Wang and Messing, 2013b)\(^3\).

Fruit flies (Diptera: Tephritidae) cause most of the damage to fruits and vegetables in the Indo-Pak sub- continent. The members of the sub-family Dacinae infest almost all kinds of fleshy fruits, including solanaceous and cucurbitaceous plants. The peach fruit fly, *B. zonata* (Saunders), is a serious polyphagous pest originated in the South and South-East Asia where it attacks more than 50 host plants, including guava, mango, peach, apricot, fig and citrus (White and Elson-Harris, 1992; Ghanim et al., 2009)\(^4\). Most of the economic species of fruit flies (*B. zonata*, *D. ciliatus*, *B. dorsalis*, *B. cucurbitae*) are polyphagous in nature and damage a wide range of fruits and vegetables affecting their production (Imran et al., 2013)\(^5\).

The significance of parasitoids in the enhanced version of bio-control lot of harmful insects reported by numerous workers, *D. giffardii* attack on *B. dorsalis*, *B. correcta* as non-parasitized pupae on minor desired (Sangvorn et al., 2004)\(^6\). Pupal parasitoid has been explored as bio-control agent in a number of species in Pakistan as well neighbor countries. Provided information on interactions among *D. giffardii* and their parasitoids. On the
otherhand, Podoler and Mazor, 1981 documented the biological parameters of *D. giffardii* badly disturbed the agriculture production through parasitism in fruits. Steenwyk *et al.*, (1975) \[9\] stated that *D. giffardii* causes pre and post harvest losses upto 30-40%. The main objective of present study was To observe highest emergence % age of pupal parasitoids and effect of different photoperiods.

**Materials and Methods**

The study was conducted at Dipterian Research Laboratory Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam. The effect of photoperiod for the better emergence of *D. giffardii* on the pupae of *B. correcta* and *D. ciliatus* were conducted in the incubators. The temperature ranged from 27 °C. The parasitoid and pupae of two fruit fly species were obtained from Dipterian Research Laboratory.

**Adult diet:** *D. giffardii* were reared on artificial diet making solution of 30% honey and 70% water.

**Larval diet** The larvae were reared on different fresh fruits by eggs laying of adult females fruit fly. The infested fruits were transfer in the saw dust for pupation.

**Saw dust:** It were purchased from saw machine and placed inside the confined cages. The infested fruits were shifted in the saw dust cage, after few days larvae pop out and drop into the saw dust to pupate. The saw dust will sieve to separate the pupae of fruit flies.

**Experimental design:** 48 hours old pupae of fruit flies were kept in jar. Each jar will contain 150 unparasitized pupae of both sexes along with five pair of parasitoids. Four treatments of different photoperiods light/dark hours i-e **T1**=8/16, **T2**=10/14, **T3**=24/0 and **T4**=0/24 were 4 replications. The jars were placed in incubators for 48 hours, and then the jars were transferred to Dipterian Research Laboratory, and kept there until the emergence of *B. correcta* and *D. ciliatus*.

**Statistical analysis:** The data thus collected were subjected to statistical analysis using analysis of variance to know the significance of differences, and LSD (Least Significance Difference) test was applied to compare different treatments.

**Results and Discussion**

The data of present research work showed in table (1&2) that maximum ratio of male and female adults parasitoids were found at 24:0 Light, whereas the minimum at photoperiod 0:24 Darkness on both selective species, respectively. On the other hand, in photoperiod controlled experiments it is of primary significance to define the source of light used (Philogène, 1982) \[5\]. Our results are generally variance with primary significance to define the source of light used other hand, in photoperiod controlled experiments it is of 0:24 Darkness on both selective species, respectively. On the found at 24:0 Light, whereas the minimum at photoperiod maximum ratio of male and female adults parasitoids were.

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| Photoperiod (LD) | Male     | Female    | Overall Emergence |
|------------------|----------|-----------|-------------------|
| **T1**=8/16      | 14.8±0.91a | 19.2±1.01a | 34.0±1.75a        |
| **T2**=10/14     | 17.8±0.66a | 21.6±0.74a | 39.4±0.31a        |
| **T3**=24:0      | 21.8±0.86a | 24.0±1.58a | 45.8±2.22a        |
| **T4**=0:24      | 9.20±0.86c | 15.4±0.92c | 24.6±1.16b        |
| Total mean      | 61.44     | 79.12     | 142.18            |
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Table 2: Preference of *D. giffardii* on the pupae of *B. correcta* on various photoperiods

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| Photoperiod (LD) | Male     | Female    | Overall Emergence |
|------------------|----------|-----------|-------------------|
| **T1**=8/16      | 12.0±1.04a | 14.8±0.73b | 26.8±1.90c        |
| **T2**=10/14     | 12.6±0.50a | 16.4±0.81a | 29.0±1.24b        |
| **T3**=24:0      | 15.4±0.92a | 20.0±0.70a | 35.4±1.61a        |
| **T4**=0:24      | 6.00±0.70a | 10.8±0.80a | 16.8±1.49b        |
| Total mean      | 45.10     | 60.20     | 106.20            |
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Table 2: Preference of *D. giffardii* on the pupae of *D. ciliatus* at different photoperiods.
Conclusions

In view of the present findings the following conclusions found that Female emergence of both species were considerably higher than male emerged on various photoperiods. The 24:0 Light is better for mass rearing culture of pupal parasitoids D. giffardii at public and private sector, respectively. However, the release of it is suggested that these Bio control agents included in the IPM programs for effective control of fruit fly species.

Fig 1: During Research Work

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