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RESEARCH ARTICLE

IMPACT OF DIFFERENT PHOTOPERIODS ON *DIRHINUS GIFFARDII* (SILV.) PARASITISM ON PUPAE OF *BACTROCERA CORRECTA* AND *DACUS CILITAUS.*

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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).

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). 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). *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^{o}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).

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

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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). 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).

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)). 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 other hand, Podoler and Mazor, 1981 documented the biological parameters of *D. giffardii* badly disturbed the agriculture production through parasitism in fruits. Steenwyk *et al*, (1975) 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^{o}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 lying of adult female's 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 pupaeof 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 transfered 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). Our results are generally variance with the data noted by Raspi*et al.* (2002) using variable photoperiods, in where markedly different responses were found as a function of treatments administered. Another researcher investigated, (Saunders 1982). Since the majority of insects are summer active, the most frequent photoperiodic response curve is the long-day type (the insects develop or reproduce in long days but become dormant in short days), while the short-day type of photoperiodic response characterizes a small number of insect species that are spring-autumn or winter-active. The further results indicated that highest number of female adults emerged as compared to male at all photoperiods, Moreover death of parasitoids occurred during maximum hours of darkness. However, further investigations are necessary in order to fully clarify the different role of the constant and variable photoperiod on ovarian maturation in *B. oleae*. Overall, with regard to the rearing of this species, the results of this work confirmed that the olive fruit fly can be uninterruptedly reared in laboratory by using a constant photoperiod and temperatures ranging from 20°C to 26°C (Tzanakakis, 1989). However, the use of a long photophase may be useful, because it makes it possible to go beyond the natural photoperiod. The evidence that the amount of mature eggs is influenced by light intensity suggests it may be effective to use a number of neon tubes producing high light intensities. In present study it was also found that increasing of light is beneficial for *D. giffardii*in table 2 data indicated optimum % age *male and female adults (12.6±0.50,16.4±0.81 pupae) at*

photoperiod (10:14 L/D) followed by (11.80±1.04,14.8±0.73) at photoperiod (8:16 L/D), respectively. However, these agreements are duplicated by Alifio *et al*., (2005) in order to evaluate the effect of temperature on the production of mature eggs the treatments 15:9, 12:12 and 9:15 were also conducted at temperature of 26 °C. Moreover, to evaluate a possible effect of light intensity, the treatments 16:8, 15:9 and 12:12 were also performed by using lights producing an estimated light intensity of approximately 3000 lux. all the photoperiodic treatments induced egg ripening in almost the totality of females (from 86.7% to 100%) and the mean number of eggs per female was relatively high (from 21.95 to 52.8), while in the DD treatment it was evident that this photoperiod induced egg maturation only in 10% of the treated populations and the mean number of eggs/female was the lowest. With regard to ovarian maturity, the treatments with a 16:8, 12:12, 10:14 and LL photoperiod induced a significantly higher response than the other treatments. Moreover, with the treatments including two different light intensities, it was evident that the light intensity can positively influence only the number of eggs/female and not the percentage of treated specimens with mature eggs. Overall, it was concluded that *B. correcta* fruit fly can be reared in laboratory by using a constant photoperiod and, indifferently, a temperature of 25°C or 27°C. In view of the statistical analysis, there was significant ($P<0.05$) difference in emergence of male and female *B. correcta* on various photoperiod

Table 1:- Preference of *D. giffardii* on the pupae of *B. correcta* at different photoperiods.

PHOTOPERIOD (L/D)	Male	Female	Overall Emergence
T^1 8:16	14.8 ± 0.91^{b}	19.2 ± 1.01^{a}	34.0 ± 1.75^{a}
T^2 10:14	17.8 ± 0.66^{ab}	21.6 ± 0.74^{a}	39.4 ± 0.31^{a}
T^3 24:0	21.8 ± 0.86^{a}	24.0±1.58a	45.8 ± 2.22^{a}
T^4 0:24	9.20 ± 0.86^{c}	15.4 ± 0.92^{b}	24.6 ± 1.16^{b}
Total mean	**61.44**	**79.12**	**142.18**

Table 2:-Preference of *D. giffardii* on the pupae of *D. ciliatus* at different photoperiods.

PHOTOPERIOD (L/D)	Male	Female	Overall Emergence
T^1 8:16	12.0 ± 1.04^{a}	14.8 ± 0.73^{b}	26.8 ± 1.90^{b}
T^2 10:14	12.6 ± 0.50^{a}	16.4 ± 0.81^{b}	29.0 ± 1.24^{ab}
T^3 24:0	15.4 ± 0.92^{a}	20.0 ± 0.70^{a}	35.4 ± 1.61^{a}
T^4 0:24	6.00 ± 0.70^{b}	10.8 ± 0.80^{c}	16.8 ± 1.49^{c}
Total mean	**45.10**	**60/20**	**106.20**

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.

During Research Work

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