

SEASONAL VARIATION IN ADULT LONGEVITY OF *ALEOIDES PERCURRENS* LYLE (HYMENOPTERA : BRACONIDAE), A LARVAL PARASITOID OF POPLAR DEFOLIATOR *CLOSTERA CUPREATA* BUTLER

ARUN P. SINGH AND MUKHTAR AHMED

*Forest Entomology Division,
Forest Research Institute, Dehra Dun (India)*

Introduction

Aleoides is one of the largest genera in the sub-family "Rogadinae". The members of this genus attack macrolepidopteran larvae during second and early third instar stage. In most of the cases the host is killed in the course of its development (Shaw, 1983). *Aleoides percurrens* Lyle, a small (4-6 mm) yellowish-brown parasitoid is endoparasitic in larvae of Poplar defoliators, *Clostera cupreata* Butler and *C. fulgurita* Walker (Lepidoptera : Notodontidae), both being potential pests of *Populus deltoides*. Epidemic defoliation by these defoliators have often been reported from Tarai region of Northern India in Poplar plantations (Seth, 1969; Lohani, 1976; Chaturvedi, 1979; Singh *et al.*, 1983). Their infestation adversely affects the growth increment of the trees even if half of the foliage is lost (Gao *et al.*, 1985). Severe and repeated defoliation in young plantations results in the death of plants (Singh and Singh, 1986).

However, until now there is no information available on any aspect on the biology of *A. percurrens*. In parasitoids, adult longevity has been regarded as a

component of individual fitness (Waage and Ng, 1984; Hardy *et al.*, 1992), as the longer a male can live, the more females he can inseminate and therefore the more eggs he can fertilize. On the other hand longer a female can live the more eggs she will lay. Adult longevity is also studied from the point of view of population dynamics, because of its relationship to female fecundity and the prey death rate (Jervis and Copland, 1996).

Seasonal variation in adult parasitoid longevity was studied with respect to physical factors (ambient temperature and relative humidity) for establishing a correlation between them and also to determine the optimum temperature and relative humidity conditions for rearing the adults of this parasitoid.

Material and Methods

Larvae of *C. fulgurita*, *C. cupreata* and their mummies (parasitised larvae), were regularly collected from Poplar nurseries and plantations in Dehra Dun, Saharanpur and Central Tarai Forest Divisions, Uttar Pradesh, India from April to October during

1991-92. Field collected larvae were reared in the laboratory at Forest Research Institute, Dehra Dun on *P. deltooides* leaves until the formation of mummies by some of them, for experiments.

Adult parasitoids emerging from the mummies were differentiated for sexes and kept individually in glass tubes (14 cm length x 2.5 cm diameter), having one side open fitted with a cork (holed and covered with muslin cloth for aeration). These tubes were then labeled and each parasitoid was provided with food, a diluted honey-sugar solution (50%) on a chromatographic paper strip (4 cm x 1 cm), kept inside the tube. Food was replenished daily, until the death of adult parasitoid.

The experiments were carried out from April to early December for 2 years. Longevity of as many as 124 adults was studied during this period.

The minimum and maximum temperatures and relative humidity (uncontrolled) of the insectary (laboratory) at F.R.I., Dehra Dun (78° 01' N latitude 77°59' E longitude) were recorded daily for the experimental time period.

The temperature and relative humidity changed seasonally within a range of 5.3 - 36.5°C and 32-96%, respectively from winter to summer.

Statistical Analysis

Simple correlation and regression analysis (linear and square models) were used to determine the relationship between physical factors (temperature and relative humidity) and biological parameter (adult longevity) of the parasitoid. The mean temperature and relative humidity of each experimental time period of adult longevity were taken up for the analysis.

Table 1

Seasonal variation in physical factors (temperature and relative humidity) and adult longevity of Aleoidea percurrens Lyle at New Forest, Dehra Dun during 1991-92

Month	Temperature (°C)		Relative Humidity (%)		Number of parasitoids	Adult Longevity (days)	
	Range	Mean ($\bar{X} \pm SE$)	Range	Mean ($\bar{X} \pm SE$)		Range	Mean ($\bar{X} \pm SE$)
April	10.7-32.0	21.3 $\pm$ 2.3	36-75	54.5 $\pm$ 5.1	8	2-4	3.0 $\pm$ 1.0
May	17.4-36.5	26.1 $\pm$ 3.5	32-59	46.3 $\pm$ 1.6	12	2-8	3.5 $\pm$ 2.1
June	20.4-32.9	26.0 $\pm$ 1.2	56-85	74.9 $\pm$ 2.3	22	2-9	5.0 $\pm$ 2.1
July	22.0-31.6	26.2 $\pm$ 2.2	73-80	80.6 $\pm$ 1.0	11	3-15	10.3 $\pm$ 4.1
August	20.8-29.7	24.6 $\pm$ 2.1	78-95	85.5 $\pm$ 2.0	18	10-13	12.0 $\pm$ 1.2
September	19.2-31.3	24.2 $\pm$ 2.7	69-93	83.0 $\pm$ 2.1	17	8-16	12.8 $\pm$ 2.8
October	11.5-30.0	20.3 $\pm$ 3.1	49-92	69.8 $\pm$ 2.7	12	7-11	8.4 $\pm$ 1.0
November	6.1-25.1	15.1 $\pm$ 4.2	48-96	72.0 $\pm$ 3.1	14	7-9	8.0 $\pm$ 1.1
December	5.3-20.1	10.2 $\pm$ 3.0	53-95	76.0 $\pm$ 2.9	10	5-9	7.6 $\pm$ 1.4
Overall Range & Mean	5.3-36.5	20.5 $\pm$ 1.5	32-96	74.2 $\pm$ 1.0	124	2-16	7.2 $\pm$ 4.1

Results

Female parasitoids were found to live longer than the males under laboratory conditions. The mean ($\bar{X} \pm \text{SE}$) adult longevity of the females was 9.4 ± 2.3 days as compared to 6.2 ± 1.5 days for the males, from April to December. Adult longevity ranged from 2-13 days for females as compared to 2-16 days for the males.

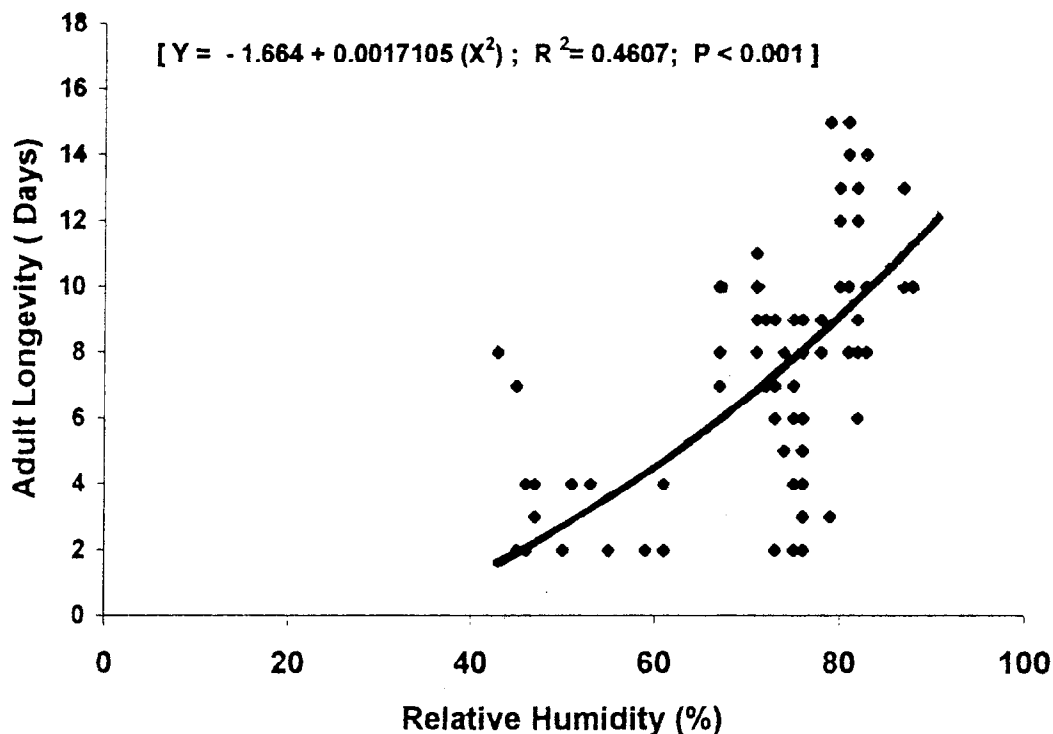
The mean ($\bar{X} \pm \text{SE}$) monthly longevity for both the sexes combined was shortest 3.0 ± 1.0 days in April. It peaked to 12.8 ± 2.8 days in September and then again decreased in early December to 7.6 ± 1.4 days (Table 1). The overall longevity of

this parasitoid (both sexes combined) was 7.2 ± 4.1 days ranging between 2-16 days, from April to early December (Table 1).

A high significant and positive correlation ($R^2 = 0.4361$; $\text{df}=122$; $p>0.001$ - linear model; $R^2=0.4607$; $\text{df}=122$; $p>0.001$ - square model) existed between the parasitoid adult longevity (both male and female combined) and the mean relative humidity of each experimental period from April to December. Since the square relationship provided better estimate to longevity, it is expressed in Figure 1.

However, correlation between adult longevity and mean temperature of each

Fig. 1



Square relationship between adult longevity of *Aleoides percurrens* Lyle and relative humidity (1991-1992)

experimental period was found to be non-significant ($r = 0.0174$).

Discussion

Only relative humidity was found to influence the longevity of the adult parasitoid significantly (Fig. 1). Longevity was maximum (12.8 ± 2.8 days) during September as compared to all other months from April to early December at Forest Research Institute, Dehra Dun, with parasitoid being reared only on artificial diet (honey-sugar solution and in the absence of host larvae). Relative humidity at this time was $81.0 \pm 2.1\%$ ($\bar{X}$) and ranged between 69-93% at a temperature of $24.2 \pm 2.7^\circ\text{C}$ ($\bar{X}$) ranging between $19.2-31.3^\circ\text{C}$ (Table 1). This data can be utilized for

rearing adults of *A. percurrens* in the laboratory for experiments and its field release.

The findings of this study also support the view that natural enemy adults have particular humidity requirements for survival (Kfir and Van Hamburg, 1981; Herard *et al.*, 1988).

Observations reveal that *A. percurrens* can be reared in the laboratory with little effort. However, there is a need to work out its biology in detail under varying bio-ecological conditions to assess its specific requirement for different physical factors (temperature, humidity), food, host density, etc., before being recommended for mass rearing in biological control programmes.

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SUMMARY

Seasonal variation in adult longevity of *Aleoides percurrens* Lyle was studied with respect to ambient temperature and relative humidity from April to early December for 2 years (1991-1992) at Forest Research Institute, Dehra Dun ($78^\circ 01' \text{ N}$ latitude $77^\circ 59' \text{ E}$ longitude), India. Longevity was studied in presence of food (honey-sugar solution) and in the absence of host larvae. Parasitoid longevity peaked in September (12.8 ± 2.8 days) when mean relative humidity was $81.0 \pm 2.1\%$ (69-93%) and mean temperature was $24.2 \pm 2.7^\circ\text{C}$ ($19.2-31.3^\circ\text{C}$). Longevity was shortest in April (3.0 ± 1.0 days) when the mean relative humidity was $54.5 \pm 5.1\%$ (36-75%) and mean temperature was $21.3 \pm 2.3^\circ\text{C}$ ($10.7-32.0^\circ\text{C}$). A high significant and positive correlation ($r = 0.6604$) was established between relative humidity and adult longevity. The linear and square relationships established are given by the expressions [Longevity = $-7.9127 + 0.22049 \text{ (RH)}$, $R^2 = 0.4361$, $P < 0.001$ and Longevity = $-1.664 + .0017105 \text{ (RH}^2\text{)}$, $R^2 = 0.4607$, $P < 0.001$, respectively]. However the correlation between ambient temperature and adult longevity was non-significant ($r = 0.0174$).

पोपलर निषपत्तक क्लोस्टेरा क्युप्रिआटा बटलर के जातक परजीवाभ एलिओआयडिस पक्युरेंस लाइले

(कंचुकपक्षा : बैकोनिडी) की प्रौढ़ दीर्घजीविता में मौसमी अन्तर आना

अरूण पी. सिंह व मुख्तार अहमद

सारांश

एलिओआयडिस पक्युरेंस लाइले की प्रौढ़ दीर्घजीविता में पाए जाने वाले मौसमी अन्तर का अध्ययन अप्रैल से प्रारम्भिक दिसम्बर तक वातावरण तापमान और आपेक्षिक आर्द्रता के सन्दर्भ में वन अनुसन्धान संस्थान, देहरादून ($78^\circ 01' \text{ उत्तर अक्षांश}$

77° 59' पूर्व देशान्तर), भारत में दो वर्ष तक किया गया। दीर्घजीविता का अध्ययन भोजन उपलब्ध रहने (शहर शर्करा विलयन) और पोषी जातक अनुपस्थित रहने की दशाओं में किया गया। परजीवाभ दीर्घजीविता सितम्बर में शिखर पर पहुँची (12.8 ± 2.8 दिन) जिस समय माध्य आपेक्षिक आर्द्रता $81.0 \pm 2.1\%$ (69-93%) तथा माध्य तापमान $24.2 \pm 2.7^\circ$ से. (19.2-31.3° से.) था। सबसे कम दीर्घजीविता अप्रैल में रही (3.0 ± 1.0 दिन) जब माध्य आपेक्षिक आर्द्रता $54.5 \pm 5.1\%$ (36-75%) तथा माध्य तापमान $21.3 \pm 2.3^\circ$ से. (10.7-32.0° से.) था। अति सार्थक और घनात्मक सहसम्बन्ध ($r = 0.6604$) आपेक्षिक आर्द्रता और प्रौढ़ दीर्घजीविता में स्थापित किया गया। रेखीय और वर्गीय सम्बन्ध क्रमशः इन अभिव्यक्तियों से मिले। (दीर्घजीविता = $-7.9127 + 0.22049$ (आ. आ.) $R^2 0.4361$, $P < 0.001$ तथा दीर्घजीविता = $-1.664 + .0017105$ (आ.आ.²) $R^2 = 0.4607$, $P < 0.001$)। किन्तु वातावरण के तापमान और प्रौढ़ दीर्घजीविता का सम्बन्ध सार्थक नहीं पाया गया ($r = 0.0174$)।

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