

Studies on the Fecundity and Longevity of *Cyrtobagous salviniae* (Coleoptera : Curculionidae), an Effective Biocontrol Agent of *Salvinia molesta* in India

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ABSTRACT

Cyrtobagous salviniae Calder and Sands (Coleoptera : Curculionidae), of Brazilian origin, is an effective biocontrol agent of the floating aquatic weed *Salvinia molesta* D.S. Mitchell in India. Laboratory studies on the fecundity and longevity of the weevils showed that the females lived for 231 days (average) and laid 290 eggs (average). The mean daily egg production per female was 1.08. Egg laying in *C. salviniae* was distributed uniformly throughout the life of the adult.

KEY WORDS : *Salvinia molesta*, *Cyrtobagous salviniae*, fecundity, longevity

The floating aquatic fern *Salvinia molesta* D.S. Mitchell (Salviniaceae), originating in Brazil, is a serious aquatic weed in many countries around the world including India (Harley and Mitchell, 1981). As part of an effort to bring about biological control of this weed in India, *Cyrtobagous salviniae* Calder and Sands (Coleoptera : Curculionidae), of Brazilian origin, was introduced from Australia in 1982 under the All India Coordinated Research Project on Biological Control of Crop Pests and Weeds. Exhaustive host-specificity tests, under quarantine conditions, involving 75 species of plants belonging to 41 families confirmed the safety of this insect to cultivated crops in the country (Jayanth and Nagarkatti, 1987).

Although the biology (Forno *et al.*, 1983), feeding characteristics and development of larvae (Sands *et al.*, 1983) and of adults (Forno and Bourne, 1985) have been studied, information is not available on the total fecundity and longevity of adults of *C. salviniae*. The present paper reports the results of detailed studies carried out in Bangalore on the above aspects.

MATERIALS AND METHODS

The study was carried out under glass house conditions using 10 pairs of freshly emerged adults of *C. salviniae*. Individual pairs of adults were released in separate clear plastic jars (6.5 x 6 cm) with wire-mesh windows on the lids for aeration. A growing tip of *S. molesta* rhizome consisting of 2 or 3 nodes, each with a pair of young aerial leaves and a submerged rootlike leaf, was

placed in each jar with a 3 cm column of water. The selected portion of the plant had the terminal and one or more of the axillary buds in various stages of growth.

The exposed plants were removed everyday and replaced by fresh ones. This process was repeated until all the adults died. The exposed plants were then dissected under a binocular stereo microscope and the number of eggs and their distribution pattern recorded. Every week about 25 eggs of *C. salviniae* were kept for hatching on a moist filter paper in a petridish and percentages of hatching were worked out. Records of adult mortality were also kept. The mean daily temperatures ranged between 24.00 and 37.75°C in the glass house in which the studies were carried out.

RESULTS AND DISCUSSION

Adults of *C. salviniae* fed on freshly emerged leaves and buds of *S. molesta*. They were observed to mate periodically throughout their life. The pre oviposition period of *C. salviniae* was observed to be 12.7 days with a range of 7.25 days. Adult males and females survived for up to 284 (mean 243 ± 30.9) and 271 (mean 23 ± 23.1) days respectively. Females were observed to oviposit up to the 263rd day. The females laid an average of 290.4 ± 100.9 (range 148-383) eggs. They were capable of laying up to 10 eggs per day but the mean daily egg production was only 1.08. The rate of egg production obtained in this study was higher when compared to 1 egg every 2 to 5 days at 25.5°C reported by Forno *et al.* (1983). This difference could be due to the higher temperature range under which the present studies were carried out. Observations on the distribution pattern of

TABLE 1 Distribution of eggs of *C. salviniae* in different parts of *S. molesta*

| Zone | Part | % Oviposition | Total for Zone |
|---------|------------|---------------|----------------|
| Leaf | Leaf Keel | 59.30 | 71.45 |
| | Leaf Bud | 12.15 | |
| Root | Root Stalk | 1.17 | 5.62 |
| | Root Hairs | 0.90 | |
| | Root Bud | 3.55 | |
| Rhizome | - | 22.93 | 22.93 |

eggs on the different parts of *S. molesta* plant showed that the leaf zone is the most preferred, followed by the rhizome (Table 1). The root zone was the least preferred for oviposition. The maximum number of eggs (59.30%) were laid in the leaf keel.

The age-specific weekly egg production data are summarized in Fig.1. Females of *C. salviniae* survived for 39 weeks and oviposition was noticed up to the 38th week. Egg laying was found to be almost uniformly distributed throughout the adult life. Thus 25, 50, 75 and 90% of the eggs were laid by the 7th, 19th, 29th and 32nd weeks respectively. Peak egg production of 20.3 per female was observed during the 4th week. Between the 6th and 23rd weeks, egg production remained below 10. An increase in fecundity was recorded during the 24th (12.8 eggs) and again between 29th and 32nd weeks (14-19 eggs). The latter increase in oviposition was observed to follow increases in glass house temperature from the 28th week onwards (34.75°C) which peaked during the 32nd

week (36.92°C). However, the correlation between temperature and oviposition for the entire life of the female was not significant. Egg production in *C. salviniae* declined rapidly from the 33rd week. It is interesting to note that females started dying only from the 30th week, after the mean weekly temperature crossed the 36°C mark. Adults are thus likely to survive longer in areas where temperatures do not exceed 35°C. It was also observed that percentages of hatching of *C. salviniae* eggs remained high (76-96) up to the 23rd week, moderate (52-72) between 24th and 33rd weeks and low from the 34th week (below 27). None of the eggs laid during the 38th week hatched.

Adults of *C. salviniae* damaged the leaf buds and young terminal leaves and feeding by larvae caused browning and decay of leaves of *S. molesta* (Forno *et al.*, 1983). Suppression of *S. molesta* by *C. salviniae* releases has already been reported from Bangalore (Jayanth, 1987) and Kerala (Joy *et al.* 1985) in India and also from Australia (Room *et al.*, 1981) and Papua New Guinea (Thomas, 1985). Studies by Room *et al.*, (1984) have shown that the weevil can exist in diverse habitats and climates ranging from 0 to 45°C. Control of the weed has been obtained at numerous sites in Australia where air temperatures exceeded 20°C. The results of the present studies indicate that the capacity of the adults to survive for as long as 8 months combined with their ability to lay eggs continuously throughout their lives may have contributed to the effectiveness of the insect.

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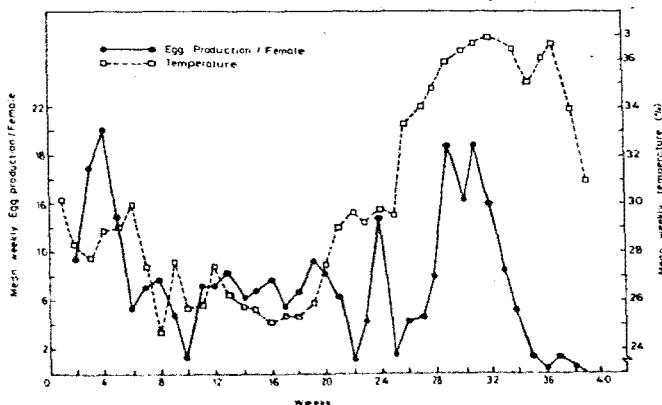


Fig. 1 Age-Specific weekly egg production of *C. salviniae* under glass conditions

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