

The predatory bug *Orius niger*: its biology and potential for controlling *Thrips tabaci* in Iran

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Abstract: We measured the basic life-history parameters of *Orius niger* on a diet of corn pollen and eggs of the moth *Ephestia kuehniella* at 3 constant temperatures (26, 29 and 32°C under 16L – 8D, 65±5 % RH) to provide information for the application of this predator in biocontrol programs. Bean pods were supplied as oviposition substrates. Results showed that the mean development times from egg to adult were 16.71, 13.16 and 13.42 days, sex ratios were 0.59, 0.56 and 0.52 females, respectively. The observed rates of sterile females were 20, 25 and 5 % and the longevity of adult females was 38, 25 and 24 days, respectively. This species preys upon thrips and is commonly found attacking *T. tabaci* throughout Iran. It was concluded that *O. niger* is an ideal predator to use as a biological agent in greenhouse crops which have enough pollen, or when they are mixed with banker plants.

Key words: *Orius niger*, biology, thrips, biological control

Introduction

Greenhouse crops are currently grown on 6,008¹⁵ ha., and are mainly located in southern and central parts of Iran. More than 50 pest species and diseases affect these greenhouse crops, of which 6 are thrips species. Two of these, *Thrips tabaci* Lind. and *Frankliniella occidentalis* Peregande, are important pests (Baniameri, 2005). In recent years, the use of predatory bugs of the genus *Orius* as biological control agents of thrips has greatly increased in many greenhouse crops (vegetables and ornamentals) (Cocuzza *et al.*, 1997; Van den Meiracker & Ramakers, 1991; Van den Meiracker, 1999). In 2001, *F. occidentalis* was imported from the Netherlands with gerbera seedlings and is now widely found in various areas, including Tehran province.

Thrips cause direct crop damage by feeding on parenchyma and puncturing plant tissue for oviposition, resulting in a reduction in photosynthetic capacity (Van Rijn, 2002; Royer *et al.*, 1986). They also cause indirect damage by transmitting plant viruses, such as TSWV and INSV (Broadbent *et al.*, 1987; German *et al.*, 1992). *Orius niger* Wolff is a Palearctic species (Loomans *et al.*, 1995) recorded in many parts of Iran (Baniameri, 2003). This species preys upon thrips and is commonly found attacking *T. tabaci* throughout Iran, suggesting that it is adapted to various different climatic conditions found within the country. The biology of *O. niger* was studied using *Ephestia* eggs as prey under laboratory conditions. The objectives of the current study were to determine the development time, sex ratio, oviposition period and total number of eggs per female of *O. niger* at three different temperatures. These data would be useful in biocontrol programs using *O. niger* as a predator of thrips.

Materials and Methods

Insect colonies

The predatory bugs used in the experiments were collected from marguerite, *Chrysanthemum frutescens* L. (Compositae) flowers, in Tehran, Iran. *O. niger* was separated and identified using the single rearing method (Yasunaga, 1997). Individuals were reared at 26°C, 70±5 % RH and with a photoperiod of L16:D8 hours with eggs of *E. kuehniella* as food. Green bean pods and corn pollen were used as oviposition sites and supplementary food, respectively.

Life history parameters

The experiment was carried out at the Agricultural Entomology Dept. of the PPDR. Fresh bean pods were placed in rearing jars of *O. niger* for oviposition. After four hours, pods with eggs were incubated at 26°C, 29°C or 32°C, 70±5 % RH and L16:D8 in plastic soft-drinks bottles (150 ml) lined with paper tissue, and closed with a screw cap. Three cohorts of 159, 103 and 96 eggs were used at 26°C, 29°C and 32°C, respectively. Ventilation was through two lateral holes covered with fine nylon mesh. Water was supplied in a small glass test tube closed with cotton wool. *E. kuehniella* eggs were provided for nymphs and adults on a small piece of paper which was replaced every day. Bottles were checked daily for egg hatching, egg and nymph survival, and adult emergence. Sex ratio, total nymph survival and development time from egg to adult were recorded at all three temperatures. A total of 30 females emerged at 26°C and 20 females emerged at the other two temperatures. They were separated and kept individually with 2-3 males in a small test tube for one hour to ensure mating. Mated females and their accompanying males were transferred to a plastic cup (100 ml) with a lid and two lateral holes covered with mesh to provide ventilation. The total number of eggs laid by the females, oviposition period and number of sterile females were all recorded.

Results and discussion

The duration of development for the eggs, nymphs and the total life cycle of *O. niger* at the three temperatures is presented in Table 1. The lowest mean development time from egg to adult was 13.16 days at 29°C. The development time and survival rate of the *Orius* species on Lepidoptera eggs had previously been studied. According to these studies, the duration of nymphal development at about 25°C varied from 10 to 18 days (Van den Meiracker, 1999). Nymphal survival was between 60% and 63% at the three temperatures. Nymphal survival for the *Orius* species was usually greater than 70% on average (Van den Meiracker, 1999), which is comparable with the results of this study.

② The highest sex ratio was 0.59 females at 26°C. The longevity of adult females was 38, 21 and 19 days, and the rate of sterile females was respectively 20%, 25% and 5%, at the three temperatures. The oviposition period and the number of eggs laid per female at the three above-mentioned temperatures was 33, 16 and 14 days, and 76.70, 80.82 and 85.05 eggs, while the hatching rates were 0.79, 0.90 and 0.88, respectively. Results showed that the mortality rate decreased with age. The highest mortality was during the nymphal period and the lowest occurred in pre-oviposition and in the early stages of the oviposition period.

In another study, Baniameri *et al.* (2003) recorded the mean parameters of the predation rate for *O. niger*, which were 6.22±1.18, 8.60±0.76 thrips larvae per hour; the encounter rate was 0.525±0.08, 0.724±0.029 per hour; the success ratio was 0.973±0.14, 0.852±0.041 and the handling time was 4.095±0.672, 3.006±0.520 larvae per minute with densities of 1 and 4 females, respectively. Of these parameters, the encounter rate and success ratio were significantly higher at densities of 4 than 1. *O. niger* preys upon thrips and is commonly

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