



New record of parasitoids of mulberry leaf-roller *Diaphania pulverulentalis* (Hampson) (Lepidoptera: Pyralidae) in Karnataka

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ABSTRACT: *Apanteles recusans* (Walker) (Hymenoptera: Braconidae) and *Pristomerus secundus* (Morley) (Hymenoptera: Ichneumonidae) were recorded for the first time from leaf-roller of mulberry *Diaphania pulverulentalis*, a serious pest of mulberry, *Morus alba* L. *A. recusans*, a solitary, larval endo-parasitoid of *D. pulverulentalis* was one of the most common parasitoids of leaf-roller. The parasitoid occurred during rainy and winter seasons. The occurrence of *A. recusans* in different areas of Bangalore district and some aspects of morphology of its cocoon and adult, host stage attacked and life cycle are presented. The parasitism ranged from 0.5 to 62.5 per cent in different areas. *P. secundus*, a solitary, larval endo-parasitoid also occurred during rainy and winter seasons. The occurrence of *P. secundus* in different areas of Bangalore district and some aspects of morphology of its cocoon and adult parasitoids are presented. The mean parasitism of leaf-roller caterpillars by *P. secundus* ranged from 0.93 to 29.41 per cent in different areas.

KEY WORDS: *Apanteles recusans*, *Diaphania pulverulentalis*, leaf-roller, parasitoid, *Pristomerus secundus*

Pristomerus secundus (Morely) and *Apanteles recusans* (Walker) were recorded for the first time from leaf-roller pest of mulberry, *Diaphania pulverulentalis* (Hampson), a serious pest of mulberry, *Morus alba* L. The leaf-roller was recorded for the first time during 1995 in Karnataka (Geetha Bai *et al.*, 1997). This pest has spread to the neighbouring states of Andhra Pradesh, Kerala and Tamil Nadu. *P. secundus* was recorded during a survey conducted on leaf-roller and its parasitoids at Bangalore rural in 2000-2003 and is reported here. *P. secundus* was recorded from Bhanwar and Sagor in Madhya Pradesh and was re-described by Rao

& Kurian (1951). Parasitoids recorded earlier from *D. pulverulentalis* were *Phanerotoma noyesi* Zettel (Geetha Bai *et al.*, 1997), *Apanteles agilis* Ashmead (Geetha Bai & Marimadaiah, 2000) and *A. bisulcata* Cam. (Marimadaiah & Geetha Bai, 2000).

During a survey conducted from August 2001 to December 2003 in Bangalore rural areas, *P. noyesi* and *A. recusans* were the common parasitoids of *D. pulverulentalis*. Seasonal occurrence of *D. pulverulentalis* and its parasitoids was studied earlier in the same area from August 1995 to July 1998 and reported (Geetha Bai and Marimadaiah,

2002). *A. recusans* has earlier been recorded from Sri Lanka, but its host record is unknown (Wilkinson, 1928).

Survey for *D. pulverulentalis* and its parasitoids was carried out at monthly interval during the year 2000 and was continued till 2003 in mulberry plantations of Bangalore district, when the mean temperature ranged from 14°-31° C and relative humidity ranged from 55-90 per cent. The leaf-roller caterpillars were collected from the field in polythene bags (20x25cm) and were reared using mulberry leaves, under laboratory conditions, to record the field parasitism. Details of emergence of the parasitoid from the host and its further development and emergence of adult parasitoids from cocoons were noted. Morphology and measurements of the cocoon and adult parasitoids were studied.

The sex-ratio of parasitoids from each batch was noted. The life-history of *A. recusans* was studied at 25±1° C, relative humidity 75-85 per cent. To study the developmental period, two days old mated gravid parasitoids from the stock culture were released in a polythene bag with one-day-old leaf-roller caterpillars on mulberry leaf. These females were removed after two hours and this was replicated five times. The host was dissected at intervals and developing parasitoid was examined. To study the incubation period of the parasitoid eggs, infested host caterpillars were dissected 10 hours after host parasitoid contact, under stereozoom microscope, until hatching was recorded. The larval instars were determined by studying the shape and size of mandibles at different periods by clearing the larvae using Sinton's fluid (Marimadaiah, 2002). These observations were replicated five times.

Table 1. Occurrence of *Apanteles recusans* in Bangalore district

Period	Place of collection	Parasitism (%)
August, 2001	Yerehalli	23.75
September	KSSRDI, Bangalore	5.71
October	Kurigowdana doddi	6.45
October	Yerehalli	36.00
November	KSSRDI, Bangalore	1.00
August, 2002	Yerehalli	0.50
September	Yerehalli	16.13
November	KSSRDI, Bangalore	4.00
November	Yerehalli	20.00
December	KSSRDI, Bangalore	19.44
December	Yerehalli	20.00
January, 2003	Yerehalli	2.50
February	Yerehalli	62.50
September	Byrasandra	17.59
November	Yerehalli	2.11
November	Byrasandra	31.51
December	Byrasandra	5.00

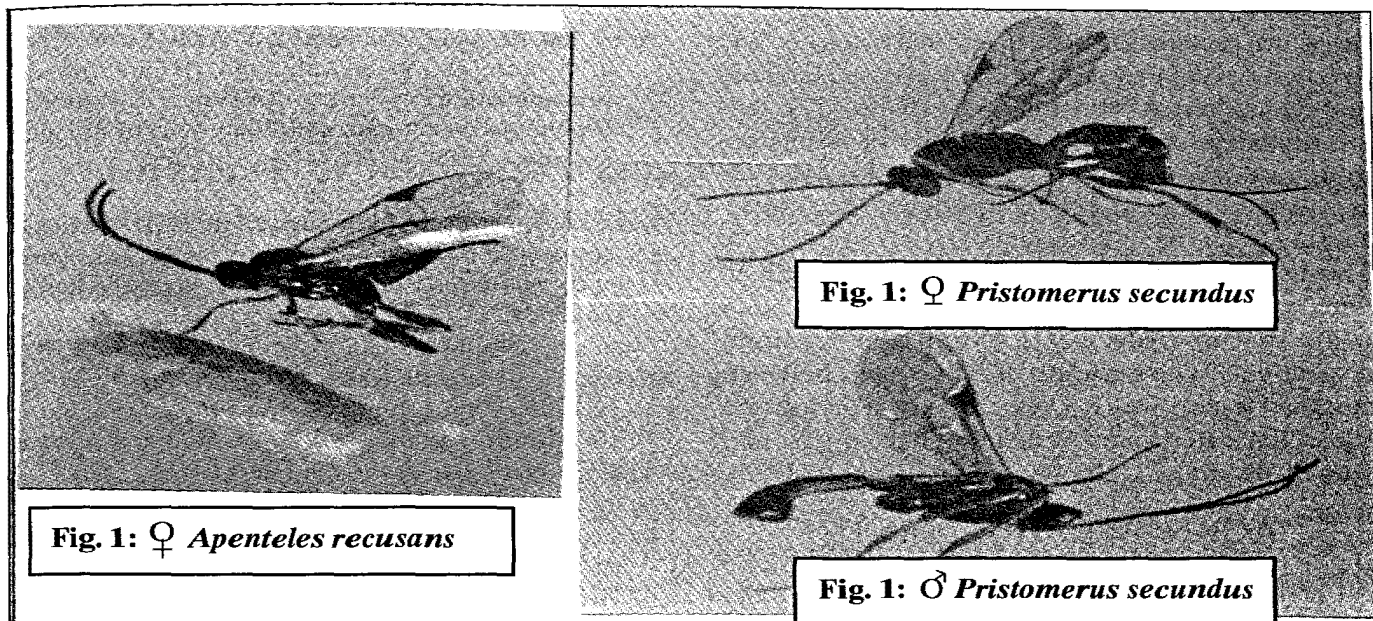


Fig. 1: ♀ *Apanteles recusans*

Fig. 1: ♀ *Pristomerus secundus*

Fig. 1: ♂ *Pristomerus secundus*

Apanteles recusans

A. recusans is a solitary, larval endo-parasitoid occurring during rainy and winter seasons in and near Bangalore (Table 1). It was first recorded at Yerehalli (Kanakapura) and the parasitism recorded during August 2001 was 23.75 per cent. The parasitism at Yerehalli ranged from 0.5 to 62.5 per cent at Byrasandra it ranged from 5.0 to 31.51 per cent and at KSSRDI it was 1 to 19.44 per cent. The parasitism at Kurigowdana doddi was 6.45 per cent. Full-grown parasitoid larva emerged from parasitised leaf-roller caterpillar, spun a cocoon on mulberry leaf, and pupated inside.

The cocoons are white in colour, elongated, cylindrical in shape with blunt ends (Fig.1). The parasitoid cocoons measured 3.45 ± 0.28 mm in length and 1.31 ± 0.16 mm in maximum breadth. Adult parasitoids emerged after cutting open a circular lid, which remained attached at one end of the cocoon. The body of the adult parasitoid is black and legs are brown in colour. Female parasitoids are larger than males. Male parasitoids measured 2.18 ± 0.07 mm in length and 0.72 ± 0.04 mm in maximum breadth. Female *A. recusans* (Fig.1) measured 2.30 ± 0.09 mm in length and 0.75 ± 0.05 mm in maximum width. The sex-ratio of *A. recusans*

between male and female was 1:1.88. The developmental stages comprise, egg, 3 larval instars and pupa. The duration of egg lasts for 1.2 days. The larval duration ranged from 4.3 to 5.2 days and pupal period ranged from 5.2 to 5.5 days. This parasitoid, parasitised only first instar leaf-roller caterpillars.

Pristomerus secundus

P. secundus is a solitary-larval endo-parasitoid of *D. pulverulentalis*. This parasitoid occurs rarely in the field. *P. secundus* emerged from only 4 samples out of 34 samples collected from mulberry plantations from December 2000 to September 2003 in Bangalore district. Parasitism ranged from 0.93 to 29.4 percent. Only female parasitoids emerged from the samples collected at KSSRDI and Byrasandra, while at Kumbalagodu only one male parasitoid emerged. Full grown parasitoid larvae emerged from parasitised leaf-roller caterpillars, when the host was in fifth instar. They spun a cocoon on the lower surface of mulberry leaf, and pupated inside. The cocoons are brown in colour, elongated, cylindrical with blunt ends. The mean length and maximum mean width of the cocoons was 6.49 ± 0.28 mm and 2.16 ± 0.12 mm, respectively. Adult parasitoids emerged after cutting a circular

lid, which remains attached to one end of the cocoon. The body of the wasp is black, compressed laterally and the abdomen is triangular in shape. The legs are brown in colour. The two pairs of wings are thin, papery and translucent. A pair of black eyes are located dorso-laterally on the head (Fig.3). Female wasps have a prominent ovipositor (Fig.2). The mean length and the maximum breadth of female parasitoid were 6.31 ± 0.14 mm and 1.38 mm, while that of male was 5.69 mm and 1.23 mm, respectively. The sex-ratio of *P. secundus* between male and female was 1:5, respectively. It parasitised leaf-roller caterpillars, when they are in first and second instars.

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