



Taxonomic studies on the genus *Glyphodes* Guenee (Lepidoptera: Crambidae: Spilomelinae) from Karnataka, India

P. Maheswara Reddy^{*1} and M. Shankara Murthy²

¹Department of Entomology, University of Agricultural Sciences, College of Agriculture, Raichur 584-104, Karnataka, India; ²Department of Entomology, University of Agricultural Sciences, College of Agriculture, Bheemarayanagudi, 585-287, Karnataka, India.

Email: pasammaheswarareddy@gmail.com; smurthyent@gmail.com

ABSTRACT: The specimens collected and reared to an adult stage on their respective hosts utilized to characterize the species of the genus *Glyphodes* based on morphological and genital characters of adults, revealed three species of the genus *Glyphodes* and were documented from Karnataka viz., *Glyphodes caesalis* Walker, *Glyphodes pulverulentalis* Hampson and *Glyphodes vertumnalis* Guenee on jack-fruit, mulberry and jasmine, respectively. These three species differ morphologically in having entire body green colour in *G. vertumnalis*, abdomen with oblique lateral stripes in *G. pulverulentalis* wherein, *G. caesalis* having sub-marginal black edged patch on costa with four spots. In genitalia, uncus greatly curved and beak shaped in *G. vertumnalis*, uncus slim and slightly curved in *G. caesalis*, whereas in *G. pulverulentalis* uncus long, narrow and slightly curved with short setae at apex. © 2019 Association for Advancement of Entomology

KEY WORDS: Taxonomy, three species, *Glyphodes*, Genitalia

INTRODUCTION

The genus *Glyphodes* was established by Guenee in 1854. This genus is more varied, omnipresent and comprises of 187 species throughout the world. It is one of the most economically important genera comprising fruit borers, shoot borers, leaf webbers, leaf rollers etc. Twenty-five species have been recorded in the Southeast Asia and seventeen species in Australia (Robinson *et al.*, 1994; Shaffer *et al.*, 1996). In India, so far 22 species of the genus *Glyphodes* have been reported (Nuss *et al.*, 2003-2019). In Tamil Nadu, three species namely *G. bivitalis*, *G. caesalis* and *G. canthusalis* were

recorded by Fletcher (1914) and Nair (1970). Recently, Rathikannu and Chitra (2017) reported 6 species of *Glyphodes* viz., *G. bivitalis*, *G. caesalis*, *G. canthusalis*, *G. onychinalis*, *G. pulverulentalis* and *G. stolalis* from Tamil Nadu by relying on light trap collection. They have provided taxonomic description of genitalia with line diagram and a key. Above studies indicate that in India, the taxonomic studies on the genus *Glyphodes* were carried out by the researchers predominantly based on light trap collections and none of them made any efforts to associate *Glyphodes* species with their host plants. Hence, the description of a species reared from actual hosts

* Author for correspondence

is the need of the hour for accurate identification and authentication of its host. In this context, in the present investigation, an attempt was made to study the host-based taxonomy of the genus *Glyphodes*, which were collected and reared on their actual hosts. In the current paper, synonyms and taxonomic descriptions for the species of *Glyphodes* are provided with photographic illustrations of genitalia, wing venation and adult habitus. Further, an illustrated key is provided for easy identification of the species.

MATERIALS AND METHODS

To study the adult morphological and genital characters, the specimens already collected (Karnataka) and reared from their host plants at the Department of Agricultural Entomology, College of Agriculture, Bheemarayanagudi, University of Agricultural Sciences, Raichur 584-104, Karnataka, India were utilized. The morphological as well as genital characters of the adult Spilomelinae were studied following Hampson (1896), Clark (1941), Robinson (1976), Thomas (2007) and Nagaraj (2014) with the necessary modifications. Before dissection of genitalia, adult specimens were photographed. Adult structures such as forewing and hindwing, palpi and genitalia were photographed using Trinocular microscope with auto-montage (Leica M 205C).

RESULTS

Genus *Glyphodes* Guenee, 1854; type species: *Glyphodes stolalis* Guenee, 1854

= *Caloptychia* Hubner, 1825; type species: *Phalaena chrysalis* Stoll, 1790

= *Calliptychia* Agassiz, 1847; type species: *Phalaena luciferalis* Snellen, 1780

= *Morocosma* Lederer, 1863; type species: *Phalaena margaritaria* Clerck, 1764

Diagnosis: Labial palpi inverted, the 2nd joint broadly scaled in front, the 3rd porrect and lying along the hair on the 2nd joint; maxillary palpi triangularly scaled; frons rounded; tibiae with inner spur twice the length of the outer spur; tuft of hairs

in forewing of the male; costa much arched towards apex.

Wing venation similar in almost all the *Glyphodes* species, but the external markings on wings of each species differs. So, wing venation of each species not discussed here, instead general venation for all the species is given below.

Wing venation: Fore wing with vein R₅ marginally approaching to R₃₊₄; M₁ arises close towards vein R₅; M₃, M₂ arising from angle of cell; Cu_{1a} from below the angle of cell, Cu_{1b} before angle of cell; hind wing with vein Rs stalked with Sc+R₁; M₂ and M₃ closely approximated for short distance; Cu_{1b} before angle of cell.

***Glyphodes caesalis* walker, 1859;** type locality: Sri Lanka (Fig. 1 A-H)

= *Glyphodes assimilis* Rothschild, 1915; type locality: Indonesia, Papua

Description: Head brown; labial palpi white; abdomen dark brown with white at side; forewing yellowish brown; an oblique ante medial fuscous line; a large fuscous edged iridescent white patch in and below end of cell; fuscous disco-cellular edged iridescent scales below lower angle of cell; hindwing ground colour, iridescent white with a broad marginal band with fuscous line on its inner edge; fringe yellowish mixed with brown.

Male genitalia: Uncus long, slim, curved, dentate and hooked at apex with hairs; valva broad with hairs; costa sclerotized; harpe thorn-shaped and straight; sacculus half the length of valva, inner surface granulated and thick; saccus triangular and slender, pointed at apex; aedeagus short and stout with cornuti inside vesica at apex.

Female genitalia: Ovipositor slit cut open; anal papillae thick; both the apophyses short, posterior apophysis half the length of anterior apophysis; sub-genital plate small; ductus bursae fairly long and stout; corpus bursae spherical with a scar like signum on the anterior apex.

Materials examined: India: Karnataka: Bellary, 1♂, 07.iii.2017, reared on jackfruit, S. Murthy;

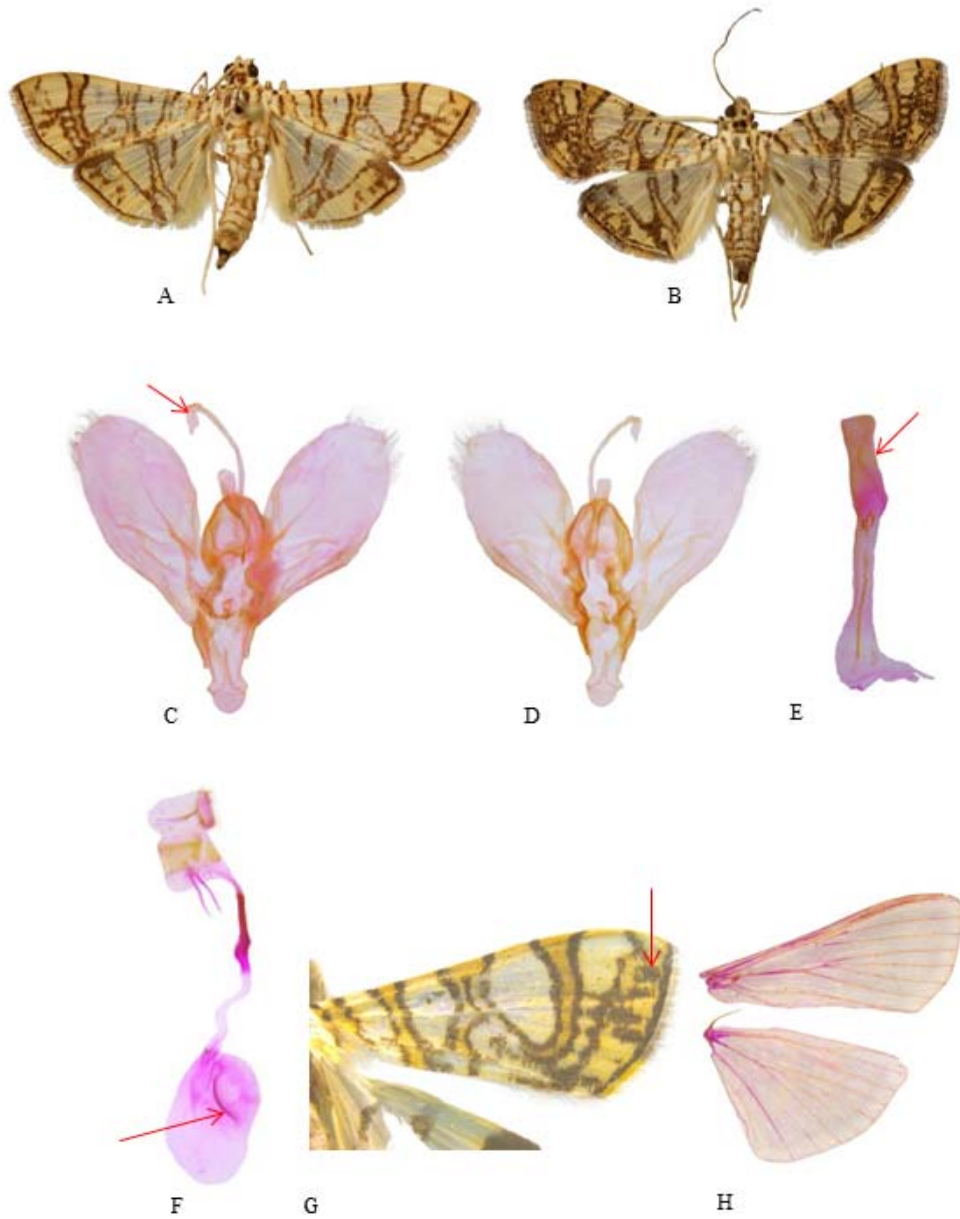


Figure 1. Genital and morphological characters of adult *Glyphodes caesalis* Walker
 (A. male; B. female; male genitalia, C. ventral view; D. dorsal view; E. aedeagus; F. female genitalia; G. sub-marginal black edged patch on outer margin with four spots; H. wing venation)

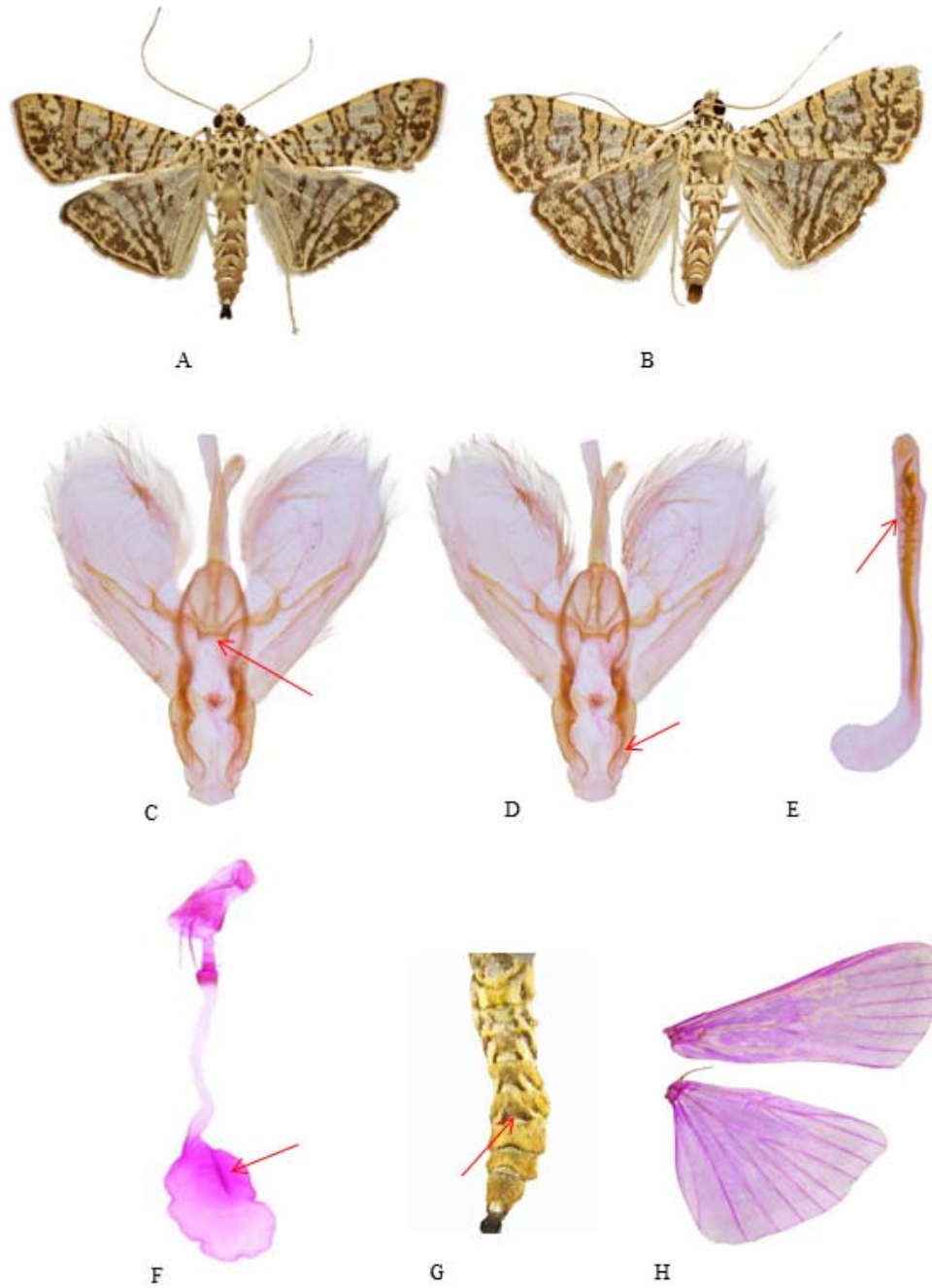


Figure 2. Genital and morphological characters of adult *Glyphodes pulverulentalis* Hampson

(A. male; B. female; male genitalia, C. ventral view; D. dorsal view; E. aedeagus; F. female genitalia; G. abdomen with oblique lateral stripes; H. wing venation)

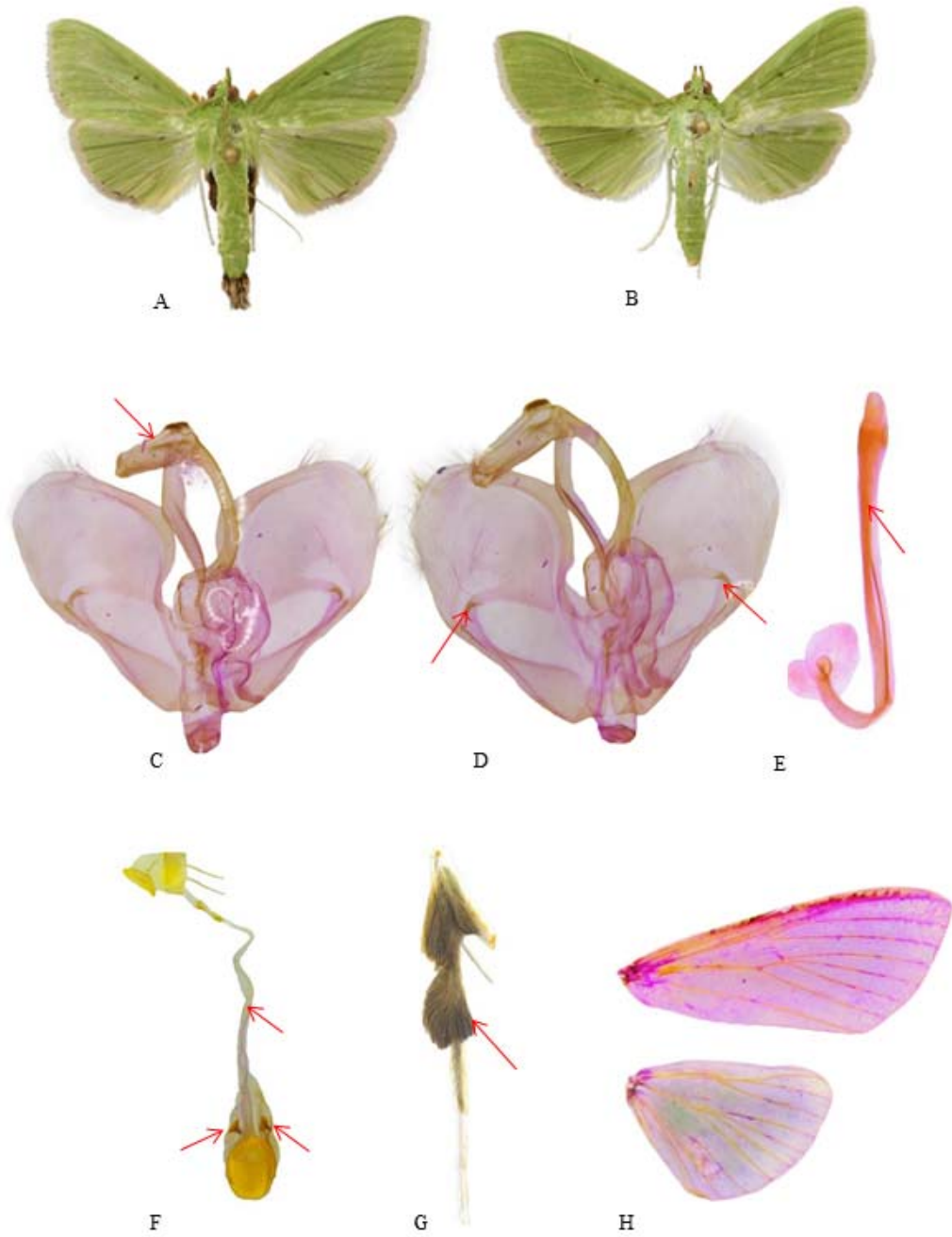


Figure 3. Genital and morphological characters of adult *Glyphodes vertunnalis* Guenee (A. male; B. female; male genitalia, C. ventral view; D. dorsal view; E. aedeagus; F. female genitalia; G. male hind tibia with tuft of hairs on outer extreme region; H. wing venation)

Bellary, 1♂, 1♀, 06.iii.2017, reared on jackfruit, S. Murthy; Bellary, 1 ♂, 2♂, 15. Vi. 2012, reared on jack fruit, S. Murthy; Bellary, 2♂, 1♀, 17.vi. 2012, reared on jack fruit, S. Murthy.

Remarks: It feeds on jack fruit as a fruit borer. Externally, this can be easily discriminated from other species by the presence of a large sub-triangular medial black edged patch with black below it on inner margin, a post medial band formed of two irregular black edged patches with their inner and outer edged indented and sub-marginal black edged patch on costa with four spots on black suffusion extending from it to inner margin.

***Glyphodes pulverulentalis* Hampson 1896;** type locality: India (Fig. 2 A-H)

Description: General body thickly irrorated, striated with black; abdomen with oblique lateral stripes; anal tuft black with brown middle; forewing with all the markings obscured by the spots and striae, the antemedial, medial and post-medial bands broader and less irregular, the 2nd vein without disco-cellular spot on it, the 3rd with series of pale specks on its outer edge from vein 4 to inner margin; hindwing thickly striated, oblique black edged brown post-medial and sub-marginal bands almost meeting at a point near anal angle; cilia of both wings fuscous, with fulvous and brown lines at base.

Male genitalia: Uncus long and narrow, anterior tip enlarged and pointed, beak-shaped dorsally with short setae; tegumen longer than wide, sclerotized and arched; vinculum long, sclerotized; saccus long, U-shaped; valva long, membranous, apex broadly rounded; costa weakly sclerotized, dorsally fringed with long hairs; juxta narrow, sclerotized, arrow-like; phallus almost straight, vesica with long sclerotized bar with lateral spine-like projection; curved sclerotized hook-like cornutus.

Female genitalia: Ovipositor slit swollen; anal papillae thick; both the apophyses short, thin and tapering, posterior apophysis half the extent of anterior apophysis; ductus bursae fairly short and thick; corpus bursae spherical with a scar like signum.

Materials examined: India: Karnataka: Bellary, 2♂, 10.x.2017, reared on mulberry, Manjunath; Bellary, 1♂, 1♀, 06.x.2016, reared on mulberry, Manjunath; Bellary, 1♂, 01.x.2017, reared on mulberry, Manjunath; Bellary, 1♂, 2.x.2017, reared on mulberry; Manjunath.

Remarks: This is one of the leaf-webber species which sustains on mulberry. Morphologically, this can be easily differentiated from other species of *Glyphodes* by the presence of oblique lateral stripes on the abdomen.

***Glyphodes vertumnalis* Guenee, 1854;** type locality: India (Fig. 3 A-H)

= *Enchocnemi diafusicitibia* Warren, 1896; type locality: Indonesia, Maluku, Tanimbar Islands

= *Margaronia herbidalis* Walker, 1866; type locality: Indonesia, Maluku, Seram

= *Margaronia melanuralis* Walker, 1866; type locality: Indonesia, Flores

= *Margaronia morvusalis* Walker, 1859; type locality: Malaysia, Borneo, Sarawak

= *Margaronia phryneusalis* Walker, 1859; type locality: North India

= *Margaronia proximalis* Walker, 1866; type locality: Indonesia, Maluku, Makian; Sulawesi

= *Pachyarches tibialis* Moore, 1877; type locality: India, South Andamans

Description: Body green, neither of the wings fulvous; marginal specks often obsolescent; cilia fulvous; abdomen small and profuse; male having black anal tuft of hairs; female devoid of anal tuft of hairs on hind tibiae; male with black tuft of hairs on hind tibiae at outer margin and extremity; hindwing of male with the inward area compactly clothed below with clumps of yellowish hair.

Male genitalia: Uncus broad and greatly curved, bending forward giving a beak like appearance; gnathos equal to uncus and broad; base of the gnathos and uncus darken laterally; vinculum wide and V-shaped; coremata with long thick as well as

finehair; valvae small, broad, fan-like having chitinous hook-like clasper in the costal base; phallus equally long,

Female Genitalia: Ovipositor slit swollen, wide dorsally and tapered ventrally; anal papillae thick; apophyses short; anterior apophysis twice the length of posterior apophysis; sub-genital plate small, ductus bursae fairly long and thick; corpus bursae spherical with two triangular signa one on each side near the apex.

Materials examined: India: Karnataka: Gulbarga, Raddewadigi, 1♀, 05.ii.2015, reared on jasmine, Nagaharish; Gulbarga, Hattekuni, 1♀, 12.viii.2015, reared on jasmine, Nagaharish; Yadgir, Bgudi, 4♂, 20.iv.2013, at light, S. Murthy; Gulbarga, Raddewadigi, 1♂, 15.x.2015, reared on jasmne, Nagaharish; Yadgir, B gudi, 5♂, 1♀, 03.xii.2012, jasmine, S. Murthy; Yadgir, B gudi, 1♂, 4.ix.2012, at light, S. Murthy; Yadgir, B gudi, 1♂, 16.vii.2012, jasmine, S. Murthy; Yadgir, B gudi, 1♂, 18.vii.2012, jasmine, S. Murthy.

Remarks: *Glyphodes vertumnalis* Guenee intently looks like *G. marginata* Hampson. Both are recognized by wing character. In *G. marginata* Hampson, wings are fulvous; however, in *G. vertumnalis* Guenee wings are not fulvous.

An illustrated key to *Glyphodes* species

1. Moth green coloured, male hind tibia enclosed with tuft of hairs on outer extreme margin, male genitalia with hook like clasper at base of costa, bursa copulatrix with two triangular signum near the apex.....*Glyphodes vertumnalis* Guenee (Fig. 3. A, B, C, D, E, F & G)
- Moth straw-yellow coloured, male hind tibia without tuft of hairs on the outer extreme margin, male genitalia without clasper at base of costa, bursa copulatrix without two triangular signum near the apex.....2
2. Abdomen marked with lateral oblique stripes; both apophysis small, phallus slim and long; ductus bursae thin and narrow.....

.....*Glyphodes pulverulentalis* Hampson (Fig. 2. C, D, E, F & G)

- Abdomen marked without lateral oblique stripes; anterior apophysis larger than posterior apophysis, phallus stout and short, ductus bursae thick and wide ...*Glyphodes caesalis* walker (Fig. 1. C, E, F & G)

In the present investigation, three species of the genus *Glyphodes* were identified with *G. caesalis* on jack fruit, *G. pulverulentalis* on mulberry and *G. vertumnalis* on jasmine. The taxonomic descriptions for these species were provided with photographic illustrations of genitalia, wing venation and adult habitus. An illustrated key was also provided for the same for easy identification of the species. Further, current taxonomic status of each species was given.

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