

Two Species of the Genus *Grapholita* (Lepidoptera: Tortricidae: Oletherutinae: Grapholitini) New to Korea

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ABSTRACT

The genus *Grapholita* Treitschke, belonging to the tribe Grapholitini, comprises over 150 species worldwide with the majority occurring in the Holarctic region. However, in other regions, only few species are reported owing to a lack of collection and taxonomic study. The genus includes important agricultural pests worldwide that feed on several plants in the families Fabaceae and Rosaceae. In Korea, a comprehensive taxonomic study is required as only eight species have been reported to date. In this study, two species of *Grapholita* Treitschke, *G. latericia* Komai, 1999 and *G. pallifrontana* (Lienig & Zeller, 1846) are newly recorded from Korea. We provide redescribed and illustrated adult and available genitalia. Additionally, all available information, including collecting localities, distribution, host plants and biological characteristics is presented.

Keywords: Lepidoptera, Tortricidae, Oletherutinae, Grapholitini, *Grapholita*, new record, Korea, agricultural pest, taxonomy

INTRODUCTION

The genus *Grapholita* Treitschke, 1829, belonging to the tribe Grapholitini (Tortricidae: Oletherutinae) was established by Treitschke (1829) based on the type species, *Tortrix lunulana* [Denis & Schiffermuller], 1775. Adults of *Grapholita* are small to medium-sized moths (wingspan 7–16 mm) (Harrison et al., 2014). They can be distinguished from other allied genera by the following characteristics: (1) forewing marked with a well-defined ocellus and white or silvery costal and dorsal strigulae; (2) well-developed coremata with two lateral clusters of long scales on the membrane between the 8th and 10th segments in the male abdomen; and (3) female genitalia with a well-sclerotized cingulum in the form of an angular plate or short conical structure in the ductus bursae (Bae and Park, 1997; Gilligan et al., 2008; Harrison et al., 2014).

Grapholita comprises over 150 described species worldwide, with the majority occurring in the Holarctic region, whereas few species are reported in other regions owing to a lack of collection and taxonomic study (Rota and Brown, 2009; Gilligan et al., 2018; Fazekas, 2022). To date, eight species of *Grapholita* have been reported from Korea (Park, 1983;

Park and Kim, 1986; Bae and Park, 1997). Some species of the genus are well known as important agricultural pests worldwide, such as *G. molesta* (Busck), owing to their feeding habits during the larval period (Bae and Park, 1997). The larvae of *Grapholita* roll or fold several leaves of the host plant to build a shelter and feed on the entire plant body including leaves, stems, and fruits (Bae and Park, 1997; Bae et al., 2012). They mainly feed on various plants in the families Fabaceae and Rosaceae (Brown et al., 2008; Gilligan and Epstein, 2012; Harrison et al., 2014).

The present study reports two species of *Grapholita*, *G. latericia* Komai, 1999 and *G. pallifrontana* (Lienig & Zeller, 1846), for the first time in Korea. All adults and available genitalia of the two species were redescribed and illustrated. Additionally, all available information including synonyms, distribution, and biological characteristics is presented.

MATERIALS AND METHODS

Material examined in this study was collected using light traps and all adult specimens were imaged using a digital

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camera (Canon EOS 550D; Canon, Tokyo, Japan) before examination. Male and female genitalia were dissected and mounted with Euparal solution using a microscope (Nikon SMZ445; Nikon, Tokyo, Japan), following the procedure described by Holloway et al. (1987). Images of the genitalia were captured using a digital camera attached to a microscope (LEICA M205C; Leica Microsystems, Wetzlar, Germany) and then refined using Adobe Photoshop CC 2019. All specimens are deposited at two locations: the Systematic Entomology Laboratory, Hannam University, Daejeon, Korea (HNSUEL) and the Entomological Collection, Korea National Arboretum, Pocheon, Korea (KNAE).

Abbreviations used in this study are as follows: GB, Gyeong-sangbuk-do; GW, Gangwon-do; JJ, Jeju-do; TL, type locality; HNSUEL, Systematic Entomology Laboratory, Hannam University, Daejeon, Korea; KNAE, Entomological Collection, Korea National Insect Collection, Korea National Arboretum, Korea.

SYSTEMATIC ACCOUNTS

Order Lepidoptera Linnaeus, 1758
 Superfamily Tortricoidea Latreille, 1803
 Family Tortricidae Latreille, 1803
 Subfamily Olethreutinae Walsingham, 1895
 Tribe Grapholitini Guenée, 1845

Genus *Grapholita* Treitschke, 1829

Type species: *Tortrix lunulana* [Denis & Schiffermuller], 1775 = *Pyralis dorsana* Fabricius, 1775
 = *Grapholitha* Treitschke, 1829: 232.
 = *Grapholitha* Treitschke, 1830: 203 emend, for *Grapholitha* Treitschke, 1829.

= *Euspila* Stephens, 1834: 103.
 = *Aspila* Stephens, 1834: 104.
 = *Ephippiphora* Duponchel, 1834: 446.
 = *Opadia* Guenée, 1845: 182.
 = *Stigmonota* Guenée, 1845: 182.
 = *Endopisa* Guenée, 1845: 182.
 = *Coptoloma* Lederer, 1859: 370.
 = *Ebisma* Walker, 1866: 1803.

¹*Grapholita latericia* Komai, 1999 (Figs. 1A, 2A)

Grapholita latericia Komai, 1999: 97. TL: Japan (Honshu, Nagano Prefecture, Todai).

Grapholita pavonana sensu Kawabe, 1982: 146 (partim), pl. 30, fig. 6.

Material examined. Korea: 1 female, GB: Ulleung-gun, 10 Aug 1995 (leg. BK Byun), genitalia slide no. HNSUEL-6715-coll. HNSUEL.

Description. Adult (Fig. 1A). Wingspan 12 mm. Head and face grayish fuscous; antenna brown; labial palpus yellow whitish. Thorax and abdomen brown. Forewing ground color blackish brown with a strong greenish reflection in basal 2/3 part; costa black; marked with eight ochreous costal strigulae between apex and base, two strigulae near apex thick and relatively straight, six strigulae near base oblique; ocelloid patch containing five irregular black dots at tornus, one or two irregular black dots between ocelloid patch and outer margin; cilia grayish white; basal line black. Hindwing ground color fuscous; cilia brown; basal line fuscous. Male genitalia. For a Japan description, refer original description by Komai (1999). Female genitalia (Fig. 2A). Papillae anales large and thick. Sterigma weak. Ostium bursae wide cup-shaped. Ductus bursae entirely sclerotized, long and broad. Corpus bursae ovate, posterior with a patch of several small irregular spinules; two

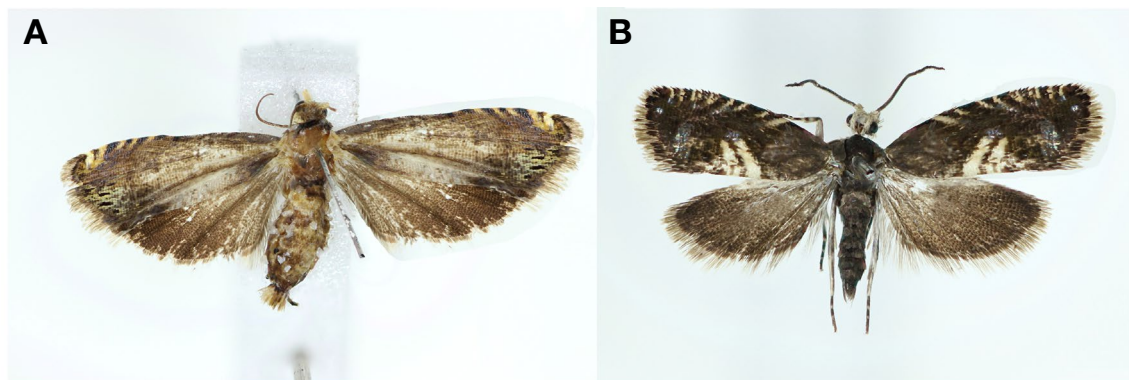


Fig. 1. Adult. A, *Grapholita latericia*; B, *G. pallifrontana*.

Korean name: ¹*녹빛애기잎말이나방 (신칭)

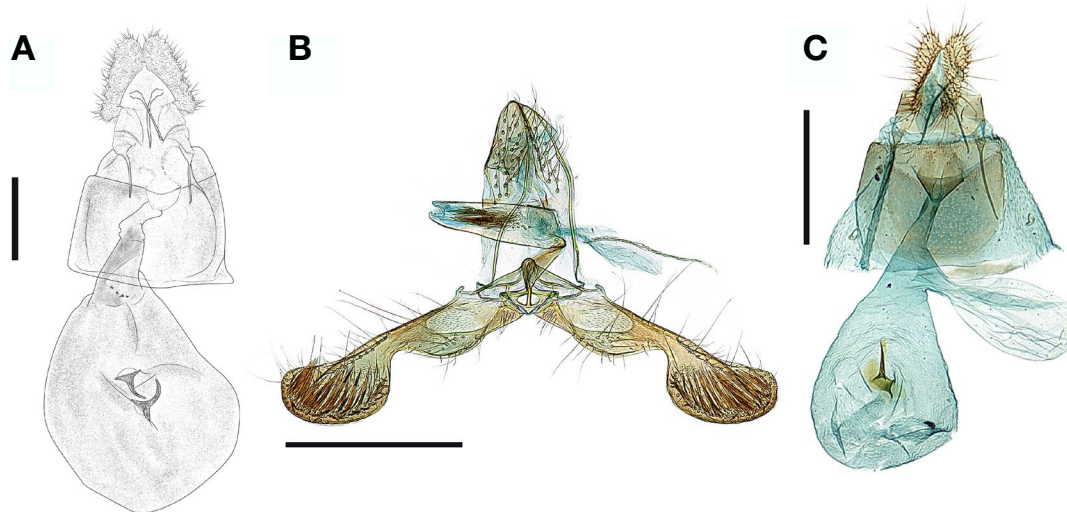


Fig. 2. Male and female genitalia. A, *Grapholita latericia*, female (gen. slide no. HNUSEL-6715); B, *G. pallifrontana*, male (gen. slide no. HNUSEL-6695); C, ditto, female (gen. slide no. HNUSEL-2988). Scale bars: A–C=0.5 mm.

signum large spine-shaped, basal area slightly concave and round, distal area curved. Ductus seminalis membranous, arising near anteriores of corpus bursae. Seventh sternite trap-ezoidal, excavated in posterior edge above the ostium bursae.

Distribution. Korea (South, new record), Japan (Hokkaido, Honshu) (Komai, 1999).

Host plant. Unknown.

Remarks. This species is first reported in Korea by this study. It can be distinguished from other *Grapholita* species by the forewing having a strong greenish reflection in the basal part. In Japan, the adults of this species are reported to emerge from July to August (Komai, 1999).

¹**Grapholita pallifrontana* (Lienig & Zeller, 1846)

(Figs. 1B, 2B, C)

Tortrix elegantana Frolich, 1828: 87. TL: Germany (Wrttemberg).

Grapholitha pallifrontana Lienig & Zeller, 1846: 251, TL: Latvia; Lithuania.

Grapholitha filana Herrich-Schäffer, 1851: 267 (1848, *ibid.*, pl. 40, fig. 285-non binom). TL: Germany.

Cydia pallifrontana Karsholt & Razowski, 1996.

Material examined. Korea: 1 female, JJ: Jeju-si, Mt. Hallasan, 27 May 1987 (leg. KT Park), genitalia slide no. HNUSEL-2988-coll. HNUSEL; 1 female, GW: Mt. Bannan, Jeongseong-gun, 15 Jun 2010 (leg. SY Park, JS Lim, BK Byun), genitalia slide no. HNUSEL-6694-coll. KNAE; 1 male, Mt. Maebongsan, Inje-gun, 22 Jul 2010 (leg. SY Park, JS Lim, KM Kim),

genitalia slide no. HNUSEL-6695-coll. KNAE.

Description. Adult (Fig. 1B). Wingspan 10–12 mm. Head and frons grayish ochreous; vertex dark grayish brown; antenna fuscous; labial palpus whitish. Thorax and abdomen blackish brown. Forewing slightly narrow; apex round; ground color blackish brown; marked with eight creamy white costal strigulae between apex and basal 1/3 part of costa, two strigulae near basal part rather broad and oblique, six strigulae near apex rather straight and slender, three metallic leaden striae inwardly; dorsal blotch consisting two thick and broad creamy white strigulae at middle of hind margin with one leaden striae in middle of strigulae, parallel to each other and slightly curved to outer margin; ocelloid patch represented by thick violet leaden striae at tornus; cilia dark gray; basal line black. Hindwing ground color blackish brown; paler towards the base; apex round; cilia gray; basal line blackish brown. Male genitalia (Fig. 2B). Tegumen weakly developed with hairs, narrow and apical round. Valva long, basal part round and half of lower part strongly concave, neck short, basal cavity angled. Cucullus spatulate rounded distally and stout spines along lower margin. Saccus well sclerotized, lower part straight. Aedeagus as long as half of valva, basal part broad than distal, cornuti consisting tuft of spine-shaped. Female genitalia (Fig. 2C). Papillae anales large and broad, apex broad than distal part. Sterigma quadrangular and broad. Ostium bursae wide cup-shaped. Ductus bursae moderate in size. Corpus bursae ovate with two broad plate-shaped signums. Ductus seminalis membranous, arising near anteriores of corpus bursae, basal part broader than ductus bursae, nar-

Korean name: ¹*두줄무늬애기잎말이나방 (신칭)

row distally.

Distribution. Korea (South, new record), Japan (Honshu, Shikoku), China, Europe, Asia Minor-Russian far east (Komai, 1999; Kishida, 2013).

Host plant. Fabaceae - *Astragalus glycyphyllus* L., *Indigofera pseudotinctoria* Matsum. in Japan (Bradley et al., 1979; Komai, 1999). Solanaceae - *Capsicum annuum* L. in Europe (Ezzat and Nazmi, 1970; Brown, 2022).

Remarks. This species is first reported in Korea by this study. This species can be distinguished from the allied species by the dorsal blotch on the forewing consisting of two thick and broad strigulae. This species is reported to have two generations per year, with the larvae overwintering inside pods in the fall (Sep to Nov) and pupating in the following spring (May) in the Kansai region of Japan (Kishida, 2013).

Key to species of *Grapholita* Treitschke in Korea

1. Head ochreous, vertex covered dark gray..... 2
– Head and vertex gray or blackish brown 5
2. Dorsal blotch of forewing spread, scattered with pale brown..... *G. funebrana*
– Dorsal blotch of forewing distinct..... 3
3. Dorsal blotch of forewing consisting two long striae.....
..... *G. pallifrontana*
– Dorsal blotch of forewing consisting four long striae 4
4. Dorsal blotch of forewing consisting thick striae
..... *G. yasudai*
– Dorsal blotch of forewing consisting slender striae
..... *G. delineaana*
5. Hindwing in male present sexual dimorphism 6
– Hindwing in male absent sexual dimorphism..... 7
6. Hindwing in male with large, gray-ochreous patch at outer margin *G. molesta*
– Hindwing in male concaved near dorsum at outer margin...
..... *G. dimorpha*
7. Ground color of forewing monochromatic 8
– Ground color of forewing partially covered with different color 9
8. Dorsal blotch of forewing present..... *G. scintillana*
– Dorsal blotch of forewing absent *G. inopinata*
9. Ground color of forewing covered with reddish orange
..... *G. endrosias*
– Ground color of forewing covered with intense green
..... *G. latericia*

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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