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Cecidomyiid Galls found on Jeju Island and in Suncheon and its Vicinity, South Korea

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Abstract. A total 25 sorts of cecidomyiid gall induced on at least 20 plant species across 12 families were found on Jeju Island in 2005 and in Suncheon and its vicinity in 2009. Among them, 13 sorts were new to Korea. These new findings have brought the total number of sorts of Korean cecidomyiid gall up to 67, of which 58 (86.6 %) are common to Japan. Figures for five sorts of gall that were not shown in the colored illustrated book (Yukawa & Masuda, 1996) are provided in the present paper for future convenience in identifying galls and gall-inducing cecidomyiids.

Key words: Cecidomyiidae, distribution record, gall midge, Jeju Island, South Korea, Suncheon.

Introduction

Studying entomofauna of the Korean Peninsula is essential for understanding the origin of entomofauna of the Japanese archipelago because the peninsula connected the archipelago to Eurasia as a land bridge during glacial periods (e.g. Gohara, 1975; Minato, 1978). Therefore, a lot of information about entomofauna has been accumulated both in Korea (e.g. ESK & KSAE, 1994) and in Japan (e.g., Hirashima *et al.*, 1989). However, the knowledge of gall midge (Diptera: Cecidomyiidae) fauna of Korea is relatively insufficient. Until today, 53 sorts of cecidomyiid gall (52 in the number of species, because one polyphagous species was included) were recorded from Korea (Paik *et al.*, 2004), which is much fewer than the 628 sorts found in Japan (Yukawa & Masuda, 1996), although the area of Korea is about 220,000 km², which corresponds to 58 % of 378,000 km² in Japan. Thus, we need to devote more time to search for gall-inducing cecidomyiids in Korea to examine similarities and dissimilarities of gall midge fauna between Japan and Korea.

After the study of Paik *et al.* (2004), JY, NU, TGK and

JCP visited Jeju Island in October 2005 in search of cecidomyiid galls, and JY and JCP surveyed gall-inducing cecidomyiids in Suncheon City and its vicinity in September 2009. Prior to the present paper, a new species, *Rhopalomyia longicauda* Sato *et al.* 2009 was described using some specimens collected from Jeju Island in 2005 (Sato *et al.*, 2009). In addition, *Pitydiplosis puerariae* Yukawa *et al.* 2012 was recently described using specimens collected from Suncheon and Damyang in 2009 (Yukawa *et al.*, 2012). In this paper, we enumerate all these gall midges that we found in South Korea after Paik *et al.* (2004) for future comparative faunistic study of gall midges between Japan and Korea.

Materials and Methods

In October 2005, we visited Jeju Island, which is about 1,845 km² in area and situated in the East China Sea about 80 km south of the southwestern tip of the Korean Peninsula, and spent two and half days on the island for field survey. The sites we surveyed were as follows: Gwaneumsa Temple (N33°25'23", E126°33'33", Alt.

about 600 m), Haengwon-ri, Gujwa-eup (N33°43'41", E126°43'48", Alt. about 2 m), near Jeju National University (N33°45'82", E126°56'08", Alt. about 700 m), Jeju Sinchang coast road (N33°19'43", E126°09'48", Alt. about 0 m), near Jeju YMCA Camp site (N33°26'00", E126°29'21", Alt. about 400 m), Jeolmul Natural Forest Resort (N33°18'39", E126°27'23", Alt. about 700 m), Jungmun Beach (N33°14'40", E126°24'55", Alt. about 20 m), Sanbang-san, Sagye-ri (N33°14'31", E126°18'40", Alt. about 28 m), near Seong-san Ilchulbong Peak (N33°27'49", E126°56'16", Alt. about 16 m) and Songdang, Susan-ri, Seongsan-eup (N33°45'78", E126°77'05", Alt. about 70 m).

From 22 to 24 September 2009, JY and JCP surveyed cecidomyiid galls in Suncheon City and its vicinity, South Korea, such as Suncheon Bay Wetland Nature Reserve (N34°53'01", E127°30'77"), Suncheon Minsokchon (N34°54'29", E127°20'18", Alt. about 53 m), Daedeok-myeon (N35°20'35", E127°01'34", Alt. about 52 m), Damyang Resort (N35°22'04", E127°02'17" Alt. about 111m), Gamyang Forest Park (N35°20'10", E127°02'59" Alt. about 135m) and Sunamsa (N34°59'44", E127°19'52", Alt. about 232 m).

We identified gall midges based on their morphological features, host plant information and the shape of galls. Particularly because many gall-inducing cecidomyiids are mono- or oligophagous and the appearance and structure of cecidomyiid galls are generally specific to each gall midge species (e.g. Gagné, 1989; Yukawa and Masuda, 1996), we compared the galls found in Korea with allied Japanese cecidomyiid galls illustrated in Yukawa & Masuda (1996).

Result and Discussion

A total 25 sorts of cecidomyiid gall induced on at least 20 plant species across 12 families were found on Jeju Island and in Suncheon and its vicinity, South Korea (Table 1). Thirteen sorts out of the 25 were new to Korea, of which two sorts, leaf galls on *Celtis* sp. (Cannabaceae) and flower bud galls on *Lespedeza cuneata* (Dumont) G. Don (Fabaceae), have never been found in Japan. The finding of the 13 new sorts has brought the total number of sorts of Korean cecidomyiid gall up to 67, counting 53 in Paik *et al.* (2004) and the one sort induced on *Chrysanthemum indicum* Linnaeus (Asteraceae) by *Rhopalomyia longicauda* Sato, Ganaha & Yukawa, 2009 that was recorded from Jeju Island and China (Sato *et al.*, 2009). The 67 sorts of gall are induced on at least 46 plant species belonging to 21 plant families. Host plant species are mostly common to Japan.

Among 53 sorts of cecidomyiid gall enumerated in Paik *et al.* (2004), 47 (88.7 %) were common to Japan. The current data including *R. longicauda* indicated that the 11 sorts (84.6 %) out of 14 were common to Japan. Combining these data, 58 (86.6 %) out of 67 sorts were common to Japan. The number of sorts, 67, is still much fewer than 628 in Japan (Yukawa & Masuda, 1996). However, as predicted by Paik *et al.* (2004), an increase in the number of sorts of gall from 53 in 2004 to 67 in 2009 means that further cecidomyiid galls will be found in Korea by additional field surveys of plant species that are known as host plants in Japan.

Figures 1 to 5 show cecidomyiid galls that were not given in the colored illustrated book by Yukawa & Masuda (1996). The figures may be useful for identification of galls and gall-inducing cecidomyiids in future studies. Fruit galls induced by *Asphondylia* sp. on *Phytolacca americana* Linnaeus (Phytolaccaceae) is not shown in this paper because Uechi *et al.* give a photograph of the galls in a separate paper in this volume of *ESAKIA*. Long conical leaf galls induced on *Celtis* sp. by *Celticecis* sp. (Fig. 1) is taller and more slender than the conical leaf galls on *Celtis sinensis* Persoon (Cannabaceae) by *Celticesis japonica* Yukawa & Tsuda, 1987 (Yukawa & Tsuda, 1987; C-202 in Yukawa & Masuda, 1996). *Obolodiplosis robiniae* (Haldemann, 1847) that induces leaf margin roll gall on *Robinia pseudoacacia* Linnaeus (Fabaceae) (Fig. 2) is a North American species recorded from Japan and South Korea (Kodoi *et al.*, 2003). *Rhopalomyia longicauda* induces large subglobular swellings on the terminal and lateral buds of *C. indicum* (Fig. 3) on Jeju Island. This species is also distributed in China (Beijing and Hebei, Henan, Shandong, Anhui, Zhejiang, Hubei, and Hunan Provinces) but not in Japan (Sato *et al.*, 2009). Two unidentified gall midges induce flower bud galls on *L. cuneata* (Fig. 4) and *Rubia argyi* (H. Léveillé & Vaniot) H. Hara ex Lauener (Fig. 5), which have never been found in Japan.

In addition to the aforementioned gall-inducing cecidomyiids, Yukawa *et al.* (2011) regarded an unidentified gall midge that had been recorded as a pest of *Pyrus pyrifolia* (Burman, F.) (Rosaceae) from Gyeongsan Nam Do, South Korea (Aoyama, 1938) to be identical with *Resseliella yagoi* Yukawa & Sato, 2009. However, this species was excluded from the current data of gall-inducing cecidomyiids because its larvae live in the core of fruit or under the bark of *P. pyrifolia* without gall induction.

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Table 1. A list of gall-inducing cecidomyiids found on Jeju Island in 2005 and in Suncheon City and its vicinity in 2009.

Gall midge	Host plant in Korea	Gall & Figure ¹⁾	Locality	Record ²⁾
<i>Asphondylia sphaera</i>	Oleaceae: <i>Ligustrum japonicum</i>	Fr (D-027)	Naganeupseong Folk Village, Suncheon	NK
<i>Asphondylia</i> sp.	Phytolaccaceae: <i>Phytolacca americana</i>	Fr ⁴⁾	Songdang, Susan-ri, Bonggae-dong, Jeju	NK
<i>Celticosis</i> sp.	Cannabaceae: <i>Celtis</i> sp.	Lf (Fig. 1)	Seonamsa, Suncheon	NK
<i>Lasioptera achyranthii</i>	Amaranthaceae: <i>Achyranthes bidentata</i> ,	St (C-245)	Jeolmul Natural Forest Resort, Bonggae-dong, Jeju; Seonamsa, Suncheon	5
<i>Daphnephila machilicola</i>	Lauraceae: <i>Machilus thunbergii</i>	Lf (C-256)	Jungmun Beach, Seogwipo, Jeju	5
<i>Lasioptera euphobiae</i>	Asteraceae: <i>Eupatrium lindleyanum</i>	St (D-092)	Gamyang Forest Park, Damyang	NK
<i>Lasioptera paederiae</i>	Rubiaceae: <i>Paederia foetida</i>	Vn	Gamyang Forest Park, Damyang	2, 5
<i>Masakimya pustulae</i>	Celastraceae: <i>Euonymus japonicus</i>	Lf (C-381)	near Jeju National Univ., Ara 1-dong, Jeju	5
<i>Obolodiplosis robiniae</i>	Fabaceae: <i>Robinia pseudoacacia</i>	Lf (Fig. 2)	Jeju Sinchang coast road, Yongsu-ri, Jeju	3, 5
<i>Pitydiplosis puerariae</i>	Fabaceae: <i>Pueraria lobata</i>	Lf (C-339)	Suncheon Bay Wetland Nature Reserve, Suncheon; Damyang Resort, Damyang	1, 6, 9
<i>Pseudasphondylia rokharaensis</i>	Caprifoliaceae: <i>Viburnum dilatatum</i>	Fr (D-059)	Gwaneumsa Temple, Ara 1-dong, Jeju	NK
<i>Rabdophaga salicivora</i> ³⁾	Salicaceae: <i>Salix</i> spp.	Tw (C-021)	Suncheon Bay Wetland Nature Reserve, Suncheon	1, 2, 5, 7
<i>Rhopalomyia cinerarius</i>	Asteraceae: <i>Artemisia princeps</i>	Lf (D-113)	near Jeju National Univ., Ara 1-dong, Jeju; Songdang, Susan-ri, Bonggae-dong, Jeju; near Jeolmul Natural Forest Resort, Jeju	NK
<i>Rhopalomyia longicauda</i>	Asteraceae: <i>Chrysanthemum indicum</i>	Bd, Lf (Fig 3)	near Seong-san Ilchulbong Peak, Seongsan-ri, Jeju; Sanbang-san, Sagye-ri, Jeju	8
<i>Rhopalomyia longitubifex</i>	Asteraceae: <i>Artemisia princeps</i>	Ab (D-109)	Jeonnam, Suncheon	4, 6
<i>Rhopalomyia struma</i>	Asteraceae: <i>Artemisia princeps</i>	St (D-102)	Gwaneumsa Temple, Ara 1-dong, Jeju; Haengwon-ri, Gujwa-eup, Jeju; Damyang Resort, Damyang	1, 2, 4, 5
<i>Rhopalomyia yomogicola</i>	Asteraceae: <i>Artemisia princeps</i>	Lf (D-112)	Damyang Resort, Damyang	1, 2, 4, 5
<i>Rhopalomyia</i> sp.	Asteraceae: <i>Chrysanthemum indicum</i>	Bd (D-087)	Sanbang-san, Sagye-ri, Jeju; Jungmun Beach, Seogwipo, Jeju	NK
Gen. sp.	Amaranthaceae: <i>Achyranthes bidentata</i>	Fr (C-246)	near Jeju YMCA Campsite, Nohyeong-dong, Jeju	NK
Gen. sp.	Asteraceae: <i>Solidago</i> sp.	Fl (D-071)	Gwaneumsa Temple, Ara 1-dong, Jeju	NK
Gen. sp.	Fabaceae: <i>Lepedeza cuneata</i>	Fb (Fig. 4)	near Jeju YMCA Campsite, Nohyeong-dong, Jeju	NK
Gen. sp.	Fabaceae: <i>Pueraria lobata</i>	Lf (C-338)	Suncheon Bay Wetland Nature Reserve, Suncheon	NK
Gen. sp.	Lauraceae: <i>Machilus thunbergii</i>	Lf (C-262)	Songdang, Susan-ri, Seongsan-eup, Jeju	NK
Gen. sp.	Rubiaceae: <i>Rubia argyi</i>	Fb (Fig. 5)	Jungmun Beach, Saekdal-dong, Jeju	NK
Gen. sp.	Vitaceae: <i>Vitis</i> sp.	Lf (C-394)	Seonamsa, Suncheon	1, 5

1) Galled portion. Ab: axillary bud, Bd: leaf bud, Fb: flower bud, Fl: flower, Fr: fruit, Lf: leaf, St: stem, Tg: twig, Vn: vein. Letter and numeral in parentheses indicate the photograph number of an allied gall recorded from Japan by Yukawa and Masuda (1996).

2) References of collecting record. 1: Saitô (1932), 2: ESK & KSAE (1994), 3: Kodoi *et al.* (2003), 4: Ganaha *et al.* (2004), 5: Paik *et al.* (2004), 6: Ganaha *et al.* (2007), 7: Sato & Yukawa (2006), 8: Sato *et al.* (2009), 9: Yukawa *et al.* (2011), NK: New to the Korean Peninsula (the current data).

3) *Rabdophaga salicivora* was recorded as *R. rigidae* in Paik *et al.* (2004) based on Nijveldt and Yukawa (1982) but resurrected by Sato and Yukawa (2006).

4) See Uechi *et al.* in this volume of *Esakia* for the photograph of fruit galls on *Phytolacca* sp.



Figs. 1-4. Photographs of the Korean cecidomyiid galls found after 2004. 1. Slender conical leaf gall induced on *Celtis* sp. by *Celticis* sp.; 2. Leaf margin roll gall induced on *Robinia pseudoacacia* by *Obolodiplosis robiniae*; 3. Terminal bud galls induced on *Chrysanthemum indicum* by *Rhopalomyia longicauda*; 4. Flower bud galls induced on *Lepedeza cuneata* by an unidentified gall midge.

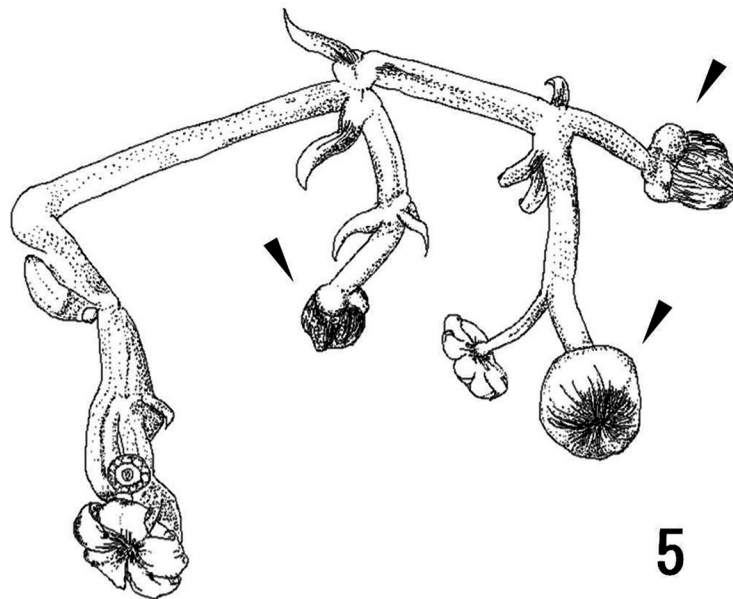


Fig. 5. Flower bud galls induced on *Rubia argyi* by an unidentified gall midge. Arrows point toward flower bud galls.

References

- Aoyama, T., 1938. Pear codlin midge *Diplosis* n. sp. *Nippon Gakujutsu Kyōkai Hōkoku*, **13**: 473-476.
- ESK & KSAE (The Entomological Society of Korea & The Korean Society of Applied Entomology), 1994. *Check list of insects from Korea*. 744 pp., Kon-Kuk University Press, Seoul.
- Gagné, R. J., 1989. *The Plant-Feeding Gall Midges of North America*. 356 pp., Cornell University Press, Ithaca.
- Ganaha, T., J. Yukawa, N. Uechi, M. Nohara & J.-C. Paik, 2004. Identifications of Some Species of the Genus *Rhopalomyia* (Diptera: Cecidomyiidae) Inducing Galls on *Artemisia* (Asteraceae) in Korea. *Esakia*, (44): 45-55.
- Ganaha, T., M. Nohara, S. Sato, N. Uechi, K. Yamagishi, S. Yamauchi & J. Yukawa, 2007. Polymorphism of axillary bud galls induced by *Rhopalomyia longitubifex* (Diptera: Cecidomyiidae) on *Artemisia princeps* and *A. montana* (Asteraceae) in Japan and Korea, with the designation of new synonyms. *Entomol. Sci.*, **10**: 157-169.
- Gohara, Y., 1975. The Japanese archipelago during the glacial period. *Urban Kubota*, **11**: 4-11.
- Hirashima, Y. (supervisor), Entomological Laboratory, Faculty of Agriculture, Kyushu University & Japan Wild Life Research Center (eds.), 1989. *A Check List of Japanese Insects*. 1,767 pp., Fukuoka. (In Japanese.)
- Kodoi, F., H.-S. Lee, N. Uechi & J. Yukawa, 2003. Occurrence of *Obolodiplosis robiniae* (Diptera: Cecidomyiidae) in Japan and South Korea. *Esakia*, (43): 35-42.
- Minato, M. (editorial supervisor), 1978. *The history of the Japanese archipelago, illustrated book of ancient geography*. 133 pp., Tsukiji Shokan, Tokyo.
- Nijveldt, W. C. & J. Yukawa, 1982. A taxonomic study on *Salix*-inhabiting gall midges in Japan (Diptera, Cecidomyiidae). *Bull. Kitakyushu Mus. Nat. Hist.*, **4**: 23-56.
- Paik, J.-C., J. Yukawa, N. Uechi, S. Sato & T. Ganaha, 2004. Gall-inducing species of the family Cecidomyiidae (Diptera) recorded from the Korean Peninsula and surrounding islands, in comparison with the gall-midge fauna of Japan. *Esakia*, (44): 57-66.
- Saitō, K., 1932. [Studies of insect galls in Korea]. *Bull. Sci. Res. Alumni Assoc. Morioka Coll. Agr. Forest.*, (7): 93-107. (In Japanese.)
- Sato, S., T. Ganaha, J. Yukawa, Y. Liu, J.-C. Paik, N. Uechi & M. Mishima, 2009. A new species of the genus *Rhopalomyia* (Diptera: Cecidomyiidae) inducing large galls on wild and cultivated *Chrysanthemum* (Asteraceae) in China and on Jeju Island, Korea. *Appl. Entomol. Zool.*, **44**: 61-72.
- Sato, S. & J. Yukawa, 2006. Resurrection of *Rabdophaga salicivora* Shinji, a Japanese gall midge formerly misidentified as a North American species, *Rabdophaga rigidae* (Osten Sacken), (Diptera: Cecidomyiidae), with observations on the phylogenetic relationships of its populations in Japan and the Russian Far East. *Entomol. Sci.*, **9**: 423-434.
- Yukawa, J. & H. Masuda, 1996. *Insect and Mite Galls of Japan in Colors*. 826 pp., Zenkoku Nōson Kyōiku Kyōkai, Tokyo. (In Japanese with English explanations for color plates.)
- Yukawa, J. & K. Tsuda, 1987. A new gall midge (Diptera: Cecidomyiidae) causing conical leaf galls on *Celtis* (Ulmaceae) in Japan. *Kontyū*, **55**: 123-131.
- Yukawa, J., S. Sato, K. M. Harris, M. Tokuda, M. Sasaki, A. Arakawa, K. Nakada & N. Sawamura, 2009. A new species of *Resseliella* (Diptera: Cecidomyiidae), infesting Japanese pear, *Pyrus pyrifolia* (Rosaceae). *Appl. Entomol. Zool.*, **44**: 655-666.
- Yukawa, J., H. Ikenaga, S. Sato, M. Tokuda, T. Ganaha-Kikumura, N. Uechi, K. Matsuo, M. Mishima, G. H. Tung, J. C. Paik, B. Q. Ren & X. O. Don, 2012. Description and ecological traits of a new species of *Ptydiplosis* (Diptera: Cecidomyiidae) that induces leaf galls on *Pueraria* (Fabaceae) in East Asia, with a possible diversification scenario of intraspecific groups. *Entomol. Sci.*, **15**: 81-98.