

JAPAN-KOREA COOPERATIVE STUDIES ON THE BIOLOGICAL CONTROL OF THE PINE NEEDLE GALL MIDGE, *THECODII' LOSIS JAPONENSIS* (DIPTERA, CECIDOMYIIDAE) : A PROGRESS REPORT

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<https://doi.org/10.5109/2477>

出版情報 : ESAKIA. 23, pp.111-114, 1985-11-30. Entomological Laboratory, Faculty of
Agriculture, Kyushu University

バージョン :

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OF THE PINE NEEDLE GALL MIDGE, *THECODIPLOSION JAPONENSIS*
(DIPTERA, CECIDOMYIIDAE) : A PROGRESS REPORT*

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The pine needle gall midge, *Thecodiplosis japonensis*, infests the red pine, *Pinus densiflora* and the black pine, *Pinus thunbergii* in Korea and Japan. An outbreak of this pest was recorded in Japan toward 1949 on the islands of Tsushima (Nagasaki Prefecture) and Iki (Shimane Prefecture). In recent years the damage is most serious in Korea. Because these tree species are the major component of Korean forests, the control of this pest has been regarded as one of the most important problems.

Fortunately, some hymenopterous parasites of the genera *Inostemma* and *Platygaster* were found to attack the pine needle gall midge in both countries, and some leading studies on the biological control of this pest have been carried out (Miura, 1962 ; Ko, 1963, 1981 ; Kuranaga and Morimoto, 1974-75).

In May 1977, Y. Hirashima of Kyushu University visited Korea as a specialist of the Japan International Cooperative Agency (JICA) in order to investigate the natural enemies of the pine needle gall midge and to promote the biological control of the latter in Korea. Afterwards, two Japanese entomologists visited Korea in 1980 in regard to the control of the gall midge ; K. Morimoto of Kyushu University in October and T. Miura of Shimane University in November.

* Supported by a grant (1983-84) from the Japan Society for the Promotion of Science, Tokyo (Principal investigators : T. Miura and J. H. Ko).

During the 8th Korea-Japan Minister Meeting on Science and Technology held in Seoul on July 19 and 20, 1978, a joint project entitled "Research on biological control of the pine needle gall midge" was adopted. Based on this governmental agreement, J. H. Ko and Y. Hirashima developed an international joint work on biological control of the pine needle gall midge in 1979, but Japanese financial support was not available at that time. In 1982, the same project was again proposed to the Japan Society for the Promotion of Science, Tokyo, by T. Miura and J. H. Ko and a two-year joint project (1983-1984) was approved. Then, the field studies were carried out in Korea by the following organization.

(Japan)

Principal investigator : T. Miura (Professor of Entomology, Shimane University)

Co-investigators :

Y. Hirashima (Professor of Entomology, Kyushu University)

K. Yano (Professor of Entomology, Yamaguchi University)

K. Morimoto (Associate Professor of Entomology, Kyushu University)

Y. Maeta (Associate Professor of Entomology, Shimane University)

(Korea)

Principal investigator : J. H. Ko (Chief, Department of Forest Entomology and Pathology, Forest Research Institute)

Co-investigators :

K. N. Park (Chief, Department of Forest Entomology and Pathology, FRI)

B. Y. Lee (Department of Forest Entomology and Pathology, FRI)

M. J. Jeon (Department of Forest Entomology and Pathology, FRI)

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Location and environment of study areas: In order to investigate the environmental factors, especially the natural enemy complex, which may suppress outbreaks of the pine needle gall midge, fixed research plots were set up. Midge-infested forests at Hongch'ŏn-gun, Gangwon-do, which lies at northern part of Korea, and at Poryŏng-gun and adjacent areas in Ch'ungch'ŏngnam-do in the western part of the nation were selected.

The plots at Hongch'ŏn-gun are in 20-year-old pure stands of the red pine, which have been infested by the midge since about 1970 ; some heavily damaged areas and lightly damaged areas are adjacent. Oaks and azaleas are the main shrub species and coverage by vegetation is about 50 %. Five research sites, about 10 to 15 km apart, were selected from Poryŏng-gun and the adjacent areas. The time of initial attack by the pine needle gall midge ranged from 1975 to 1980 depending on the site. At some sites, the damage is increasing, while in others, the trees are recovering. The main shrub species are oaks, azaleas and bush clover, and coverage by vegetation about 40 %.

Research progress and activities of Japanese specialists in Korea (1983-1984) :

From the selected research plots and pine forests surrounding them, biology of the pine needle gall midge in each stadium and population densities of the hymenopterous parasites and other natural enemy species were studied. Concurrently, some environmental factors such as site and stand conditions, distribution of shrubs, and extent of vegetation coverage were studied.

Japanese specialists visited Korea in 1983 and 1984 as follows :

- T. Miura, May 10-16, 1983, for set up research plots and fixing pine needle gall midge emergence cages.
- K. Morimoto, June 6-15, 1983, for biology of pine needle gall midge adults.
- Y. Hirashima, June 27-July 6, 1983, for the natural enemies of the gall midge such as spiders and ants.
- T. Miura, July 5-13, 1983, for hymenopterous parasites.
- T. Miura, Nov. 1-10, 1983, for vegetative condition investigation.
- K. Yano, Nov. 1-10, 1983, for arthropod fauna.
- K. Morimoto, Nov. 1-10, 1983, for natural enemy survey and stages of tree decline.
- T. Miura, Apr. 10-16, 1984, for natural enemy study.
- K. Morimoto, May 15-22, 1984, for natural enemies of the gall midge adults.
- T. Miura, June 12-21, 1984, for vegetative conditions and natural enemies.
- K. Yano, June 12-21, 1984, for arthropod fauna.
- K. Morimoto, Sept. 3-9, 1984, for stages of tree decline.
- Y. Maeta, Sept. 3-11, 1984, for arthropod fauna.
- K. Yano, Oct. 30-Nov. 6, 1984, for phenomena during the fall season ; and discussion on research report.
- Y. Maeta, Oct. 30-Nov. 6, 1984, for the same as above.

Results obtained : Many important informations were accumulated on the biology and ecology of the pine needle gall midge and its natural enemies, especially on *Platygaster matsutama* and *Inostemma seoulis*. In this issue of ESAKIA, the following papers are published as a part of our results.

- (1) Outbreaks history and present status of the pine needle gall midge in Korea. By Ki-Nam Park, T. Miura and Y. Hirashima.
- (2) Survivorship and other factors relating to population fluctuations of the pine needle gall midge, *Thecodiplosis japonensis* (Diptera, Cecidomyiidae). By Buom-Young Lee, T. Miura and Y. Hirashima.
- (3) Ecology of *Platygaster matsutama* and *Inostemma seoulis* (Hymenoptera : Platygasteridae), egg-larval parasites of the pine needle gall midge, *Thecodiplosis japonensis* (Diptera : Cecidomyiidae). By Mun-Jang Jeon, Buom-Young Lee, Je-Ho Ko, T. Miura and Y. Hirashima.
- (4) Utilization of Proctotrupoid wasps in Korea for control of the pine needle gall

- midge, *Thecodiplosis japonensis* (Diptera : Cecidomyiidae). By Buom-Y oung Lee, Je-Ho Ko, Byung-Hoe Choi, Mun-Jang Jeon, T. Miura and Y. Hirashima.
- (5) Loss of tree vigor and role of boring insects in red pine stands heavily infested by the pine needle gall midge in Korea. By Je-Ho Ko and K. Morimoto.
- (6) Ants collected in pine forests infested by the pine needle gall midge in Korea (Hymenoptera, Formicidae). By K. Ogata, Y. Hirashima, T. Miura, Y. Maeta, K. Yano and Je-Ho Ko.

Papers (1)-(5) will also be published in the Research Notes (No. 26) of the Forest Research Institute, Seoul, Korea, which is primarily for domestic use.

Acknowledgement : For the help and constructive comments during the research, we thank Director Yeun-Pyo Kim and many others of Forest Research Institute, the personnel of the Kangwon-do Forest Experiment Station, the county officers of Hongch'ŏn-gun, Inje-gun and Poryŏng-gun, and the Central and Eastern National Forest Management Stations. We are also indebted to Dr. R. W. Carlson, Asian Parasite Laboratory (USDA, ARS), Seoul, and Mr. Seung-Chan Park of the Forest Research Institute for assisting in manuscript preparation. Finally but not least, we thank the Japan Society for the Promotion of Science, Tokyo and Forest Research Institute, Seoul for financial support.