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Park, Kr-Nam

Miura, Tadashi

Hirashima, Yoshihiro

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OUTBREAKS HISTORY AND PRESENT STATUS OF THE PINE NEEDLE GALL MIDGE IN KOREA[1)2)3)]

Kr-NAM PARK

Department of Forest Entomology and Pathology,
Forest Research Institute, Seoul 131, Korea

TADASHI MIURA

Laboratory of Insect Management, Faculty of Agriculture,
Shimane University, Matsue, Shimane 690, Japan

and

YOSHIHIRO HIRASHIMA

Entomological Laboratory, Faculty of Agriculture,
Kyushu University, Fukuoka 812, Japan

The first infestation of the pine needle gall midge in Korea was reported by Takagi in 1929 as killing red pine trees in Ch'anggyŏng-won Palace in Seoul and at a reservoir in Mokpo City, Chbllanam-do. At that time, tree mortality was found in these areas, indicating that the insect had been present for 5-6 years prior to its discovery. In Japan, the insect was first reported from Mt. Horai, Aichi Prefecture (Sasaki, 1901) ; thus, the first discovery of the insect in Korea was about 20 years later than in Japan. During the period 1925-1928, which approximates the time of the first outbreaks in Korea, notable infestations were found in Ooita and Kumamoto Prefectures (Takagi, 1954 ; Miura, 1962 ; Nagai, 1978).

Expansion of the pine gall midge infestation in Korea was mainly initiated from the following three areas (Kim, 1955) :

Seoul : In 1936, the insect was found in a natural red pine stand at the Forest Research Inst., Ch'ŏngnyangni, Seoul. In Ch'anggyŏng-won Palace, 7,745 heavily infested trees were cut in **1942.**

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Mokp'o : Though almost all infested trees were removed in 1932, the infestation spread over an area of about 40,000 ha in 1937, 60,403 ha in 1942, and 106,966 ha in 1948, reaching as far north as Kwangju City.

Pusan : In 1936, a new outbreak was found on Mt. Kudŏk, which is located in suburbs of Pusan City.

There is no record concerning the expansion of the infestation during the 1940-1960 period, but extensive damage at the beginning of the 1960s again arose the interest of the public. In 1964, a new outbreak was found in Tanyang, Ch'ungch'ŏngbuk-do, a place remote from the earliest infested areas. By the early 1970s, the insect had spread northward from the locus of the earliest infestation in Pusan City and reached Kyŏngju, Kyŏngsangbuk-do, and the infestation originating from Mokp'o City spread into Ch'ungch'ongnam-do via Chŏllanam-do and Chŏllabuk-do. During the same period, another separate outbreak was discovered at Hyŏnch'ungsa Shrine, Asan, Ch'ungch'ongnam-do, and it is speculated that pines from the infested region were planted in the garden of the shrine. From Seoul, the insect has spread across the north

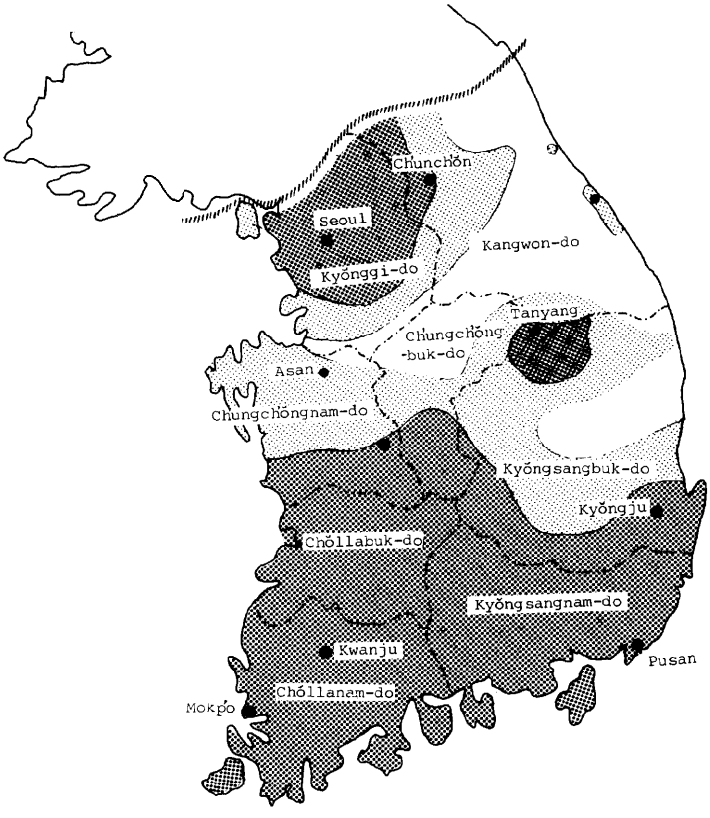

Fig. **1.** Expansion of the pine needle gall midge in Korea. ▩ : 1975, ▨ : 1984.

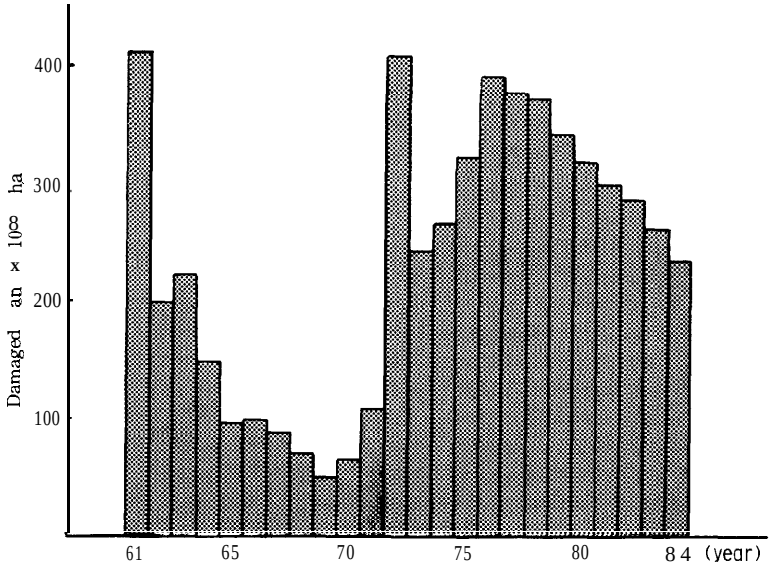

Fig. 2. Damaged area by the pine needle gall midge in Korea.

branch of Han River into the Ch'unch'ŏn area, Gangwon-do (Fig. 1).

Surveys of the outbreak areas have been carried out every year since 1960 ; the pine gall midge now occurs in nearly all parts of Korea (Fig. 1). Fig. 2 shows that the extent of the outbreak reached its peak in 1961, when approximately 410,000 ha of red pines and black pines were infested. The extent of the area with severe damage diminished afterward, supposedly as a result of the large-scale sanitation salvage cutting : 90,000 ha in 1965, and 49,000 ha in 1969. At that time, some trees severely damaged by the midge were observed to survive and recover. Accordingly, in the 1970s, cutting of infested trees was discouraged. Thereafter, the total area with appreciable damage has remained more or less static.

In Japan, the damaged area had increased in the 1950s and reached more than 50,000 ha in 1964. From about 1970, it drastically decreased, and as of 1978, the damaged area was only about a tenth of what it was at the peak of the infestation. Compared with the damage level in Japan, that in Korea is far more serious. As shown in Fig. 2, the Korean infestation keeps spreading, but due to the recovery areas with a long history of outbreak, such as Chŏllanam-do, Chbllabuk-do, and Kyŏngsangnam-do, there is a decreasing trend in the total hectarage incurring damage. Observations on the progress of the pine gall midge infestations in several areas of the country have shown that the percentage of gall formation reaches its peak 6 to 7 years after initial attack and decreases thereafter. The percentage of gall formation stabilizes at a low level 12 years after initial infestation, and the surviving trees begin to recover (Park and Hyun, 1983).

In recent years, pine gall midge damage has been essentially confined to the frontal zone of range advancement. It, however, remains to be seen whether out-

breaks will cyclically recur in areas where midge populations have now subsided to endemic levels.

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