Transmission of Rice Gall Dwarf Virus by Cicadellid Leafhoppers *Recilia dorsalis* and *Nephotettix nigropictus* in Thailand

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ABSTRACT

Morinaka, T., Putta, M., Chettanachit, D., Parejarearn, A., Disthaporn, S., Omura, T., and Inoue, H. 1982. Transmission of rice gall dwarf virus by cicadellid leafhoppers *Recilia dorsalis* and *Nephotettix nigropictus* in Thailand. Plant Disease 66:703-704.

Rice gall dwarf was transmitted by *Recilia dorsalis* as well as by *Nephotettix nigropictus* in a persistent manner. The incubation period in the insects ranged from 5 to 11 days in *R. dorsalis* and 4 to 12 days in *N. nigropictus*, with an average of 7.6 and 7.9 days, respectively. *R. dorsalis* acquired the virus within 8 hr of feeding on a diseased plant and transmitted the virus within a 1-hr inoculation access period, the shortest time tested. Transmission efficiency was better in young nymphs than older ones. There was no evidence of seed transmission of the virus.

Rice gall dwarf found in Thailand in 1979 was identified as a new leafhopper-borne virus disease by Omura et al (5). The symptoms of infected rice plants are severe stunting, dark green leaf blades, and appearance of galls on the outer surface of leaf blades and leaf sheaths. Polyhedral virus particles about 65 nm in diameter are associated with the disease. Four species of *Nephotettix* leafhoppers have been reported as the vectors (3). The present report describes the transmission of rice gall dwarf virus (RGDV) by *Recilia dorsalis* Motsch. and *Nephotettix nigropictus* Stål. in Thailand.

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MATERIALS AND METHODS

Diseased rice plants (*Oryza sativa* L.) were originally collected from the field at Uthai Thani, central Thailand, in August 1979. RGDV was transmitted to the rice cultivar Taichung Native 1 by *N. nigropictus*, and the infected rice plants were used for subsequent transmission tests.

R. dorsalis and *N. nigropictus* were obtained from a stock colony maintained on young rice seedlings at the Rice Pathology Branch, Plant Pathology and Microbiology Division, Department of Agriculture, Bangkhen, Bangkok, Thailand. Transmission tests were conducted at room temperatures ranging from 28 to 34 C. Inoculated plants were kept in a screenhouse to observe symptom development.

RESULTS

Serial transmission tests by vectors. The third instar nymphs of *R. dorsalis* and the fourth to fifth instar nymphs of *N. nigropictus* were allowed to feed on diseased rice for 1 day. Each species was tested for retention period by serial daily transfers on healthy plants. Both species of insects transmitted the virus in a persistent manner, and most individuals transmitted it intermittently. Eleven out of 94 *R. dorsalis* and 12 out of 130 *N. nigropictus* individuals transmitted the virus. The incubation period ranged from 5 to 11 days (7.9 days average) in *R. dorsalis* and 4 to 12 days (7.6 days average) in *N. nigropictus*. No effect on transmission was observed by molting.

Acquisition feeding period of the virus. The second instar nymphs of *R. dorsalis* were allowed feeding access on the diseased rice plants for 1, 2, 4, 8, 16, 24, and 48 hr. After acquisition feeding, the insects were reared on healthy rice seedlings for 10 days as an incubation period. Each insect was tested for transmission ability by serial inoculation for 10 days on each healthy seedling by five transfers at 2-day intervals. The insects were unable to transmit the virus within an acquisition feeding period of 4 hr or less, but were capable of transmitting the virus within an 8-hr feeding.

Inoculation feeding period for the transmission. The second instar nymphs of *R. dorsalis* were allowed an acquisition access period of 5 days on the diseased

rice plants. They were reared on healthy rice seedlings for 10 days. Each insect was then allowed an inoculation feeding period of 1, 2, 4, 8, 16, 24, and 48 hr on individual test plants. The insects were able to transmit the virus within a 1-hr inoculation access period.

Effect of vector development stage on virus acquisition. Nymphs of *R. dorsalis* at different instar stages and adults were allowed acquisition feeding access on the diseased rice plants for 1 day and were tested on test plants. Young nymphs, especially the second instar nymphs, acquired the virus more efficiently than the older ones.

Nontransovarian transmission of virus in *R. dorsalis*. Viruliferous females were obtained by a 1-day acquisition feeding period from diseased rice plants and a 2-wk incubation period. They were allowed oviposition access on healthy rice seedlings for 1 day. Immediately after hatching, the young nymphs were transferred to healthy rice seedlings to avoid virus acquisition from the oviposited rice plants. The infectivity of individual nymphs was tested for transmission. None of the 89 individuals from 10 viruliferous females was found to be infective.

Seed transmission of the virus. Mature seeds of the variety Taichung Native 1 were collected from diseased plants and sown in seedling boxes kept in a screenhouse. None of 1,461 seedlings showed symptoms of the disease.

DISCUSSION

According to Inoue and Omura (3), *N. cincticeps, N. malayanus*, and *N. virescens*, as well as *N. nigropictus*, transmit RGDV. In this study, *R. dorsalis* was shown to be an additional vector. *R. dorsalis* is one of the vectors of rice dwarf virus (RDV) (2) and the vector of rice orange leaf disease (6). *N. nigropictus* (1,4) and *N. cincticeps* (1) also transmit RDV. RGDV has a wider vector range than RDV.

Nephotettix leafhoppers transmit RGDV in a persistent manner with about a 2-wk incubation period, and *N. nigropictus* females produce both infective and noninfective progenies (3). Transmission manner of RGDV by *R. dorsalis* was similar to that of *Nephotettix* species, except for a shorter incubation period and nontransovarian transmission. The difference cannot be clearly determined because of the difference in insect species and origins. *R. dorsalis* and *N. nigropictus* from Thailand and Japan should be tested on transovarian transmission. Because *R. dorsalis* is widely distributed in the paddy field and observed throughout the year, it probably takes part in the incidence of RGDV in Thailand.

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