Movement ability of vector insects of sugarcane white leaf disease

Sugarcane White Leaf Disease (SCWLD) is a dominant limiting factor of sugar production in Thailand, the world's second largest sugar-exporting country. This disease is transmitted by the planting of infected seed-cane and the migration of two insect species, *Matsumuratettix hiroglyphicus* and *Yamatotettix flavovittatus* (Fig. 1). A good knowledge of the movement ability of vector insects is thus required to establish control techniques. However, it is difficult to estimate the insects' movement ability by visual observation because the vectors are tiny species and they hide at the lower part of the sugarcane stalk. Therefore, we carried out mark-recapture experiments at a sugarcane field to evaluate the movement ability of the vector insects.

We made sticky plastic traps based on the vector insects' color preferences. The traps were distributed in a stellate pattern, radiating from a common center to 50m outwards (Fig. 2). The marked vectors were released from the center, and we counted the number of trapped specimens every two days. We stopped the experiment after 20 days because no vector insects were trapped by the 20th day. The experiment was replicated three times for *M. hiroglyphicus* and the number of released specimens were 1980, 1200 and 800, respectively. In the case of *Y. flavovittatus*, the experiments were replicated two times and the number of released specimens was 2700 and 2100, respectively. On the first experiment, the specimens were trapped most frequently at the nearest trap (for both species) (Fig. 3, left). On the other hand, the percentage of trapped *M. hiroglyphicus* at the farthest trap from the release point was only 3.9%. The trapping percentages of the vectors calculated from the cumulative total of all replications were about 10% for *M. hiroglyphicus* and about 13% for *Y. flavovittatus*. These values were deemed sufficient for evaluation of movement abilities. The probability distribution of the reached distance by each species on the 20th day was calculated (Fig. 3, right). We corrected the underestimation caused by trapping and moving out of the trapping range using Yamamura's method (Yamamura, 2003). Based on the probability distance, the estimated average movement distance after 20 days was 162.1m for *M. hiroglyphicus* and 387.5m for *Y. flavovittatus*.

In SCWLD-infested areas, the risk of disease invasion to newly established healthy seed-cane production fields by the vector insects is high. Our results suggest that if we establish a large field and treat it with pesticides, the infection risk inside the field will be low because the movement ability of the vector insects is not high. It means that we probably can produce healthy seed-cane in a SCWLD-infested area. Our results will also be helpful in establishing control techniques when SCWLD occurs in Japan. It must be noted, though, that the specimens in our experiments were forced to move at least once because they were released from plastic boxes that did not have food. Thus, our estimated movement distance values were possibly overestimated compared with actual values using wild vector insects.

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Fig. 1. The vector insects of sugarcane white leaf disease.
Left: *Matsumuratettix hiroglyphicus* (body length: 4mm)
Right: *Yamatotettix flavovittatus* (body length: 5-6mm)

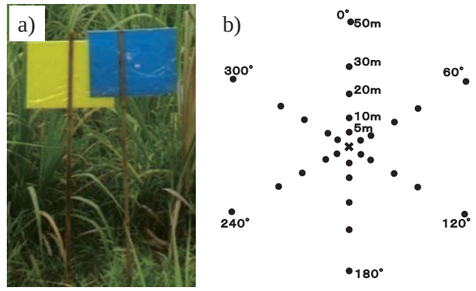

Fig. 2. Details of the sticky trap and the layout.
a) One set of sticky traps made from blue and yellow plastic plates (about 40 x 50cm).
b) The traps were distributed in a stellate pattern at 5, 10, 20, 30, and 50-m intervals from the center. The height was same as the plant height.

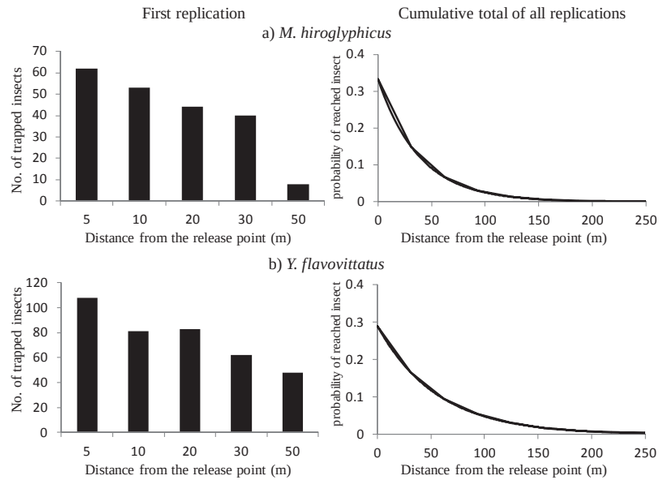

Fig. 3. Frequency-distance graphs of trapped vector insects from the release point (left) and the probability distribution of reached distance (right).
Left: Results from the first replication. 1,980 *M. hiroglyphicus* and 2,700 *Y. flavovittatus* specimens were released.
Right: The probability distributions were calculated using a cumulative total of 20 days. The underestimation was corrected. The data from all replications were pulled.