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学 位 論 文 要 旨
Dissertation Abstract

氏名： Zhi-Hui Zhan
Name

学位論文題目：
Title of Dissertation

Studies on host recognition substances for sucking rice pests in the rice plant, *Oryza sativa* L.
（イネに含まれる吸汁性昆虫の寄主認識物質に関する研究）

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Rice planthoppers and leafhoppers are very notorious pests of rice plant in Asian countries. Although chemical insecticides, natural enemies and high resistant rice are widely applied to control these pests, the environmental pollution and insect resistances become extremely difficult problems in the world. Therefore, a new pest control method based on the feeding behaviors of planthoppers and leafhoppers is considered urgently.

The feeding behavior of sucking rice pests is well known to be classified into two phases: probing and sucking phases, which are controlled by physical and chemical factors in plants (Sōgawa K., 1974; Sōgawa K., 1982). In view of the precious study, the probing stimulants in the rice plant towards the pests have been partially studied. Eight *C*-glycosylflavones were isolated from rice plant as partial probing stimulants towards the brown planthopper, *Nilaparvata lugens* (Kim M., *et. al.*, 1985; Besson E., *et. al.*, 1985). The probing stimulants for the smaller brown planthopper, *Laodelphax striatellus* (Francis A. A., *et. al.*, 2000[b]) and the white-back planthopper, *Sogatella furcifera* (Francis A. A., *et. al.*, 2000[a]) also only were reported partially. The leafhoppers including *Nephotettix virescens*, *N. cincticeps* were studied by Takemura M.. (Takemura M., 2000). The green rice leafhopper, *Nephotettix nigropictus*, however, has scarcely been researched about probing stimulants. Therefore, the study of *N. lugen*, *L. striatellus*, *N. nigropictus* and *S. furcifera* were further undertaken in this study.

Rice plant (cv. Toyonishiki) was extracted three times with 90% methanol in water for 3 days and the extract was defatted three times with hexane to get crude rice extract. It was adjusted to a 2 g of fresh leaf and stem equivalent (eq)/ml concentration of the water crude rice extract. When three insects of *N. lugens*, *L. stratellus*, *N. nigropictus* and *S. furcifera* were fed on 2 g eq/ml aqueous extract through parafilm membrane, many stylet sheaths were deposited on the parafilm membrane. The results indicated that crude rice extract had high probing activities for three species. This extract was further loaded on an ODS medium pressure column and eluted in sequence with methanol and water solutions to get ODS water fraction, ODS 20% methanol in water fraction, ODS 40% methanol in water fraction and ODS 100% methanol fraction. Three species insects showed most active on ODS 40% methanol in water fraction among four fractions. However, when further bioassays were conducted on the individual fractions as well as

their various combinations from the ODS 40% fraction, three species insects showed significantly different responses. Among of them, only when thirteen *C*-glycosylflavonoids and one *O*-glycosylflavonoid were combined, the similar activity was recovered to ODS 40% methanol in water fraction for *N. lugens*. The structures of them were determined as peak **1** (carlinoside), peak **2** (neocarlinoside), peak **3** (schaftoside), peak **4** (isoorientin), peak **5-1** (neoschaftoside), peak **5-2** {isoorientin 2″-*O*-(6‴-(*E*)-feruloyl) glucoside}, peak **5-3** {isoorientin 2″-*O*-(6‴-*p*-(*E*)-coumaroyl)glucoside}, peak **5′** (isovitexin-2″-*O*-glucoside), peak **A** (isoscoparin 2″-*O*-glucoside), peak **6** (luteolin 7-*O*-glucoside), peak **7** {isoscoparin 2″-*O*-(6‴-*(E)*-feruloyl)glucoside}, peak **8-1** {isoscoparin 2″-*O*-(6‴-*p*-(*E*)-coumaroyl)glucoside} and peak **8-2** {isovitexin 2″-*O*-(6‴-(*E)*-feruloyl)glucoside} by using LC-MS and NMR spectra, respectively. On the other hand, *L. stratellus* required six *C*-glycosyl flavonoids (**3**, **5-1**, **5-2**, **5-3**, **7**, **8-1**, **8-2**) and three common *O*-glycosyl flavonoids {**9-1** (tricin 5-*O*-glucoside), **9-2** (tricin 7-*O*-rutinoside) and **10** (tricin 7-*O*-glucoside)} and *N. nigropictus* only needed four *C*-glycosyl flavonoids (**A**, **7**, **8-1**, **8-2**) as probing stimulants in the rice plant. Another insect, *S. furcifera* required three *C*-glycosyl flavonoids (**5-2**, **5-3**, **7**) and one common *O*-glycosyl flavonoid (**9-1**).