

学位論文要旨 Dissertation Abstract

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学位論文題目 : Elucidation of Elicitors in *Sogatella furcifera* (Horváth)
Title of Dissertation Causing the *Japonica* Rice Plant (*Oryza sativa* L.) to Induce the Ovicidal Substance, Benzyl Benzoate
(セジロウンカ由来の日本型水稻にセジロウンカ殺卵物質の生産を誘導させる物質の探求)

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Some *Japonica* rice plant varieties show the resistance to the whitebacked planthopper (*S. furcifera*) and the varieties produce ovicidal compound, benzyl benzoate, to kill their eggs lying in the rice plant. We have tried to elucidate the mechanism for inducing the production of the benzyl benzoate by the *Japonica* rice varieties.

Even when the rice plant was given physical damages by needle or the damages with water, benzyl benzoate was not produced at all. On contrary, only when the plant was give the damages with the 80 % methanol extract of *S. furcifera* (method F) or homogenate of *S. furcifera* (method E), benzyl benzoate was significantly produced. The produce amount of benzyl benzoate of the extract was higher than that of the homogenate and the extract of female only induced the produce of benzyl benzoate. Judging from these results, we concluded that benzyl benzoate was induced by some elicitor being in female of *S. furcifera*.

The active 80% MeOH/H₂O extract was chromatographed on ODS open column and separated into 6 fractions; 100% H₂O, 20% MeOH/H₂O, 60% MeOH/H₂O, 80% MeOH/H₂O, 100% MeOH, 100% EtOH. Of these 6 fractions, 100% MeOH and 100% EtOH fractions evidently induced benzyl benzoate at 43.95 µg/g of fresh rice plant (frp) and 31.04 µg/g frp, respectively. The active 100% MeOH fraction was further separated by reverse phased HPLC into fractions from A to E. The bioassay had the activities of each fraction. Most active C fraction was separated from C-1 to C-3 and each fraction was evaluated by the bioassay. The Highest active compound of C-2 fraction was further divided 4 fractions by HPLC. The Fr-C-2-3 and the Fr-C-2-4 showed the active about bioassay, compounds were submitted to analyses by using NMR and GC- and LC-MS in order to elucidate the structure. As a result, the structure is confirmed as 1,2-dilinoleoyl-*sn*-glycero-3-phosphatidylcholine, 1,2-dipalmitoyl-*sn*-glycero-3-phosphoethanolamine, 1-palmitoyl-2-oleoyl-*X*-glycero-3-phosphoethanolamine, and

1,2-dioleoyl-*sn*-glycero-3-phosphoethanolamine, respectively.

The other active fraction of frs. C-1, C-3, and E in the 100% methanol fr. separated by using a HPLC and these compounds showed an activity to make an induce production of benzyl benzoate. These 3-compounds elucidated structures as 1,2-dilinoleoyl-*sn*-glycero-3-phosphatidylethanolamine, 1-stearoyl-2-linoleoyl-*X*-glycero-3-phosphatidylethanolamine, and 1,2-dioleoyl-*sn*-glycero-3-phosphatidylcholine by using NMR, LC-MS, and GC-MS.

When the active 80% MeOH extract of *S. furcifera* was separated on a reverse-phase ODS-MPLC, the elicitor(s) was eluted in 100% MeOH and 100% EtOH frs. Bioassay-guidanced fractionations lead to isolate two active compounds from the 100% EtOH fr. and the structures of each compound were determined as 1,2-dioleoyl-3-palmitoyl-*X*-glycerol, and triolein respectively.

We find elicitors to induce with *S. furcifera*. The elicitors are in the female of *S. furcifera* and the structures of elicitors are species of phospholipid and glycerol. This results are made us why Japanese rice plants killed only the eggs of *S. furcifera*? We will compare the eggs of *S. furcifera* with the eggs of *N. lugens* and *N. cincticeps*. Using same bioassay method with *S. furcifera*, we checked the activities with three insects. This bioassay result showed the other insects, *N. lugens* and *N. cincticeps* induced ovicidal compound (benzyl benzoate). This result showed that the induced benzyl benzoate with *S. furcifera* is not specific phenomenon to have only *S. furcifera*. The different resistance with three insects showed different mortality.