

学 位 論 文 要 旨	
氏 名	Shun Kumashiro
題 目	Clarification of the mechanism underlying host-plant manipulation by gall-inducing insects
<p>Interactions of herbivores with their host plants play important roles in the evolution of their various traits. Approximately 13,000 herbivorous insects have an ability to manipulate their host plant tissue and induce galls for their own benefit. Although many researchers have been paid gall habits and its adaptive significances, the mechanism underlying gall induction by insects is still unknown. This is due to the difficulty in establishing mass rearing systems for most gall-inducing insects. The aim of my study is to clarify the mechanism underlying gall-induction by insects using a gall-inducing leafhopper <i>Cicadulina bipunctata</i> and its host plant poaceous crops. This species induces gall symptom characterized by stunted growth and swollen leaf veins on various Poaceae. This leafhopper is an ideal study material to clarify the mechanism of gall induction by insects because of the mass-rearing techniques has already been established for this leafhopper. In addition, model plants such as rice <i>Oryza sativa</i> L. and wheat <i>Triticum aestivum</i> L. are readily available as hosts in various experiments.</p> <p>First, the distribution of <i>C. bipunctata</i> in Japan and its geographical variation in gall-inducing ability was evaluated. As a result, <i>C. bipunctata</i> is also distributed in southwestern Shikoku as well as Kyushu in Japan. Laboratory experiment revealed that all populations collected from six localities had an ability to gall induction.</p> <p>Second, relationship between oviposition site preference and developmental performance of <i>C. bipunctata</i> was investigated using galled and non-galled host plants. Although the survival rate of nymphs was higher on wheat (galled) than on barley (non-galled), females significantly laid their egg into barley. The inconsistent correspondence between offspring performance and oviposition preference of <i>C. bipunctata</i> may reflect its high mobility of nymphs and/or differences in leaf area between host plants.</p> <p>Thirdly, effect of barley chromosome addition on the susceptibility of wheat to feeding by <i>C. bipunctata</i> was evaluated using wheat, barley, and six barley chromosome disomic addition lines of wheat (2H–7H). As the result, genes related to resistance and susceptibility to gall induction may exist on 5 and 3 chromosomes of barley, respectively.</p> <p>Finally, the varietal difference in susceptibility to gall induction was investigated among 68 rice cultivars. The clear difference in the degree of gall induction by <i>C. bipunctata</i> was detected between two rice cultivars, Taichung 65 and ARC10313. Additional survey was conducted using chromosome segment substitution lines derived from a part of ARC10313 in the genetic background of Taichung 65. The intensity of gall induction was related to chromosomes 3, 6, 8, 9 of rice.</p> <p>This study will contribute to the clarification of molecular mechanism underlying gall induction by insects and to development of novel cultivars of poaceous crops resistant to symptoms induced by <i>C. bipunctata</i>.</p>	