（学位第３号様式）

学　位　論　文　要　旨

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題　目	Genetic and breeding studies for resistance to brown planthopper (*Nilaparvata lugens* Stål) resistance in the genetic background of *japonica* rice (*Oryza sativa* L.)（日本型水稲(*Oryza sativa* L.)の遺伝的背景におけるトビイロウンカ抵抗性に関する遺伝育種学的研究）

Rice (*Oryza sativa* L.) is the calorie source for half of the global population and one of the staple foods for people living in Asia. Rice production is drastically reduced by several insect pests, including brown planthopper (BPH) *Nilaparvata lugens* Stål (Homoptera: Delphacidae), the most destructive pests in rice. To reduce BPH damage, the utilization of host plant resistance in rice has been an effective approach. However, BPH populations have sufficient ability to overcome specific BPH resistance genes in a resistant cultivar but are durable to multiple resistance genes carrying varieties. Heat tolerance commercial *japonica* rice 'Sagabiyori', with superior grain quality 'Special A' rating, and highly soluble starch in the stem, is highly susceptible to damage by BPH.

Therefore, our first study aimed to enhance the BPH resistance of 'Sagabiyori'. We concentrated on the development and characterization of seven near-isogenic lines carrying *BPH2*, *BPH17-ptb*, *BPH32*, *BPH3*, *BPH17*, *BPH20* and *BPH21* in the genetic background of 'Sagabiyori' through marker-assisted selection (MAS). Most lines were more resistant to the Hadano-1966 BPH population than Sagabiyori but were less effective against Koshi-2013 population with high virulence. In addition, the resistance levels of lines carrying *BPH17* and *BPH3* (derived from 'Rathu Heenati') indicated higher resistance to Koshi-2013 than Sagabiyori. In the second study, to recognize markers that tightly linked to *BPH3* and *BPH17* introgressed into the 'Sagabiyori' genetic background, we performed substitution mapping. Moreover, to determine the resistance level of pyramided lines (PYLs) that carry *BPH3* and *BPH17* (Saga-*BPH3+17*), we characterized against recent migratory BPH strains (Koshi-2013 and Koshi-2020). Through substitution mapping, *BPH3* was delimited between RM3132 and RM589 on chromosome 6, and *BPH17* between RM16493 and RM16531 on chromosome 4. Moreover, the pyramided effect of Saga-*BPH3+17* was significantly greater against virulent BPH populations than that of either gene alone. In the third study, to identify additional BPH resistance genes from 'Rathu Heenati' other than *BPH3* and *BPH17*, we screened the populations derived from crossed between T65 and 'Rathu Heenati' for BPH resistance, then performed QTL analysis. We detected a QTL, denoted as *qBPH3*, on chromosome 3. We revealed that the resistance level conferred by *qBPH3* against BPH feeding was high in 7-day-old seedlings but lower in 30-day-old seedlings.

The NILs and PYLs developed in this study could be valuable breeding lines for enhancing BPH resistance of commercial *japonica* rice cultivars. The identified *qBPH3* from 'Rathu Heenati' might be facilitated to develop cultivars with more durable BPH resistance and simultaneously minimize the outbreaks of BPH populations in Japan.