STUDY ON THE EFFECTS OF QTLS FOR WATERLOGGING TOLERANCE USING NEAR-ISOGENIC LINES OF SOYBEAN (Glycine max (L.) Merr.)

ダン, ティ, テュ, ヒエン

（様式３）Form3

氏　　名　：**DANG THI THU HIEN**
Name

論文名　　：**STUDY ON THE EFFECTS OF QTLS FOR WATERLOGGING TOLERANCE USING NEAR-ISOGENIC LINES OF SOYBEAN (*Glycine max* (L.) Merr.)**

Title

区　　分　：甲
Category

論　文　内　容　の　要　旨
Thesis Summary

Climate change is predicted to increase the probability of soil waterlogging due to severe rainfall, causing significant damage to soybean growth. Recently, quantitative trait loci (QTLs) for waterlogging tolerance at the seedling stage were detected on the chromosome 12 of soybean through the analyses of recombinant inbred lines developed from a cross between a hypoxia-sensitive cultivar, Tachinagaha, and a tolerant landrace, Iyodaizu. This study provides an illustration of the effects of QTLs for waterlogging tolerance of soybean using near-isogenic lines (NILs) selected from Tachinagaha/Iyodaizu BC_6F_3 population through marker assisted selection. The purpose of this study was to determine the specific morphological, physiological, and anatomical mechanisms of adaptations of soybean under waterlogging condition.

The yield of soybean and its root development is an important indicator of tolerance. Parents and NIL-9-4-5 was tested for yield performance under hypoxia exposed to 7-day waterlogging at the seedling stage in two years. Plants were grown in pots filed with soil for 7-day waterlogging (maintained at 2.0 cm above the soil surface) and drained. Results showed that seed yields and root development of Iyodaizu and NIL-9-4-5 were not reduced, whereas those of Tachinagaha were reduced. These indicate that the tested QTLs are able to increase yield by stimulating root development under waterlogging.

One of the most common anatomical responses of plants to soil hypoxia is the generation of aerenchyma in root tissues for transporting of oxygen from shoots to roots. The aerenchyma formation and the relationship with root development were evaluated. Adaptive response present in NIL 9-4-5 for better performance under waterlogging condition were identify as exhibited similar aerenchyma percentage to Iyodaizu, which was significantly higher compared to Tachinagaha. Results indicated that the QTLs confer rapid root development through the concomitant formation of aerenchyma, thereby enhancing the growth of not only the root system, but also of the total plant body.

Moreover, whether the candidate QTL region for root development is involved in seed waterlogging tolerance by soaking seeds for 2 days were investigated. Among the examined genotypes, Iyodaizu was classified as waterlogging tolerant at the germination stage, and Tachinagaha was classified as sensitive. Germination rate of NIL-9-4-5 was nearly the same as that of Iyodaizu and was significantly higher than that of Tachinagaha. These results may indicate that the candidate QTL region for root development under hypoxia at the seedling stage located on Chr.12 contributes to the seed waterlogging tolerance of soybean plants at the germination stage.