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Study of four symbiosis genes required for root-knot nematode infestation

-ネコブ線虫感染に必要な４つの共生遺伝子に関する研究-

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1.Background & Aim

Root-knot nematodes (RKNs) are obligate plant parasites that collapse plant root. RKNs modify plant root cells into giant cells (GCs) for feeding. This reprogramming step is important to obtain nutrient because RKNs take nutrient from the GCs. However, the detail molecular mechanism which RKNs establish and maintain feeding area is unknown. On the other hand, there are microbes that give advantages on taking nutrient for plant. Rhizobia and arbuscular mycorrhizal fungi (AMF) provide host plant nitrate and phosphate respectively, are well-known symbiosis microbes with plant. Recent study has revealed that these symbiotic interaction are controlled by specific genes called as symbiosis genes in plant and there are independent signalling pathway for symbiosis respectively, but some of genes are necessary for both rhizobia and AMF symbiosis. Considering RKNs still can infest despite RKNs are plant parasites, it is hypothesised that RKNs can invade and infest plant by mimic or hijack this symbiosis process. The aim of this research is to verify the hypothesis and investigate RKN infestation mechanism.

2.Materials & Methods

Lotus japonicus Gifu Wild-type, and *symrk, castor, ccamk, nsp2* mutants which are defective in symbiosis genes and RKN (*Meloidogyne hapla*) were used for infestation assay in this study. The number of RKN egg mass 8 week post infestation (wpi) are counted for checking if there is difference of completely infestation phenotype, and the number of RKNs categorised in several growth stages 2 wpi and 4 wpi were counted for determining which timing RKNs infestation arrested. And also gall sectioning of WT, *ccamk* and *nsp2* at 2 wpi were carried out for observation of inside gall structure.

3.Result & Discussion

The number of egg mass at 8 wpi significantly reduced in *symrk, castor, ccamk,* and *nsp2*. And also the number of well-grown RKN at 4 wpi was reduced in the mutants, though many RKNs that partially grew were observed at 2 wpi in the mutants. Induction of GCs was observed in WT, *ccamk* and *nsp2*. Direct connection between xylem and GCs was observed in WT, however indirect connection was observed in the *ccamk* and *nsp2*.

4.Summary

These results suggest that infestation of RKNs in *ccamk* and *nsp2* mutants were arrested because xylem connection with GCs was indirect and it caused malnutrition of RKNs inside plant. And also it is suggested that these symbiosis genes are not necessary for recognition of RKNs or RKNs don’t mimic the symbiosis pathway, but have important roles for development of feeding sites, especially xylem connection with GCs during RKNs infestation. Additional analysis of gall sectioning of *symrk* and *castor* is also expected to have difference.