Characterization of maize genotypes that differ in biological interactions with parasitic and symbiotic organisms with respect to strigolactones
（トウモロコシにおける寄生および共生生物相互作用とストリゴラクトン分泌特性との関係）

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Arbuscular mycorrhizal (AM) fungi associate with most land plants and supply phosphate to the host. Strigolactones, a group of sesquiterpene lactones, are exuded from plant roots in response to nutrient deficiency to attract AM fungi, but the compounds also stimulate seed germination of parasitic plants such as *Striga* and *Orobanche* spp. Susceptibility to the parasitic plants, as well as compatibility to AM fungi, are variable among plant genotypes/species, and under natural conditions AM fungal assemblages are different among plant species, that is, they show ecological host specificity/preference. Generally, plants exude structurally diverse strigolactones, leading to the hypothesis that strigolactones play a significant role in these interactions with the parasitic and symbiotic organisms.

1. Involvement of strigolactone stability interactions with *Striga* spp. and arbuscular mycorrhizal fungi

In this chapter, the hypotheses that qualitative and quantitative differences in strigolactone exudation would determine i) susceptibility to the parasites, ii) compatibility to AM fungi, and also iii) community composition of the fungi via promoting colonization of differ fungi are addressed. Two maize genotypes that differ in susceptibility to *Striga* spp. were grown in hydroponic culture for strigolactone analysis with LC-MS/MS as well as in natural soils under field and glasshouse conditions for AM fungal community analysis by fungal ribosomal RNA gene sequencing. Distinctive difference between the genotypes was that the susceptible genotype, but not the resistant genotype, exuded the most stable strigolactone 5-deoxystrigol. The levels of colonization and community compositions of AM fungi, however, were not different between the genotypes. These observations suggest that the difference in strigolactone stability is involved in susceptibility to *Striga* spp., but not in compatibility and host preference in AM symbiosis.

2. Involvement of compatibility to arbuscular mycorrhizal fungi in phosphorus acquisition strategy with respect to strigolactones

Intraspecific variability in compatibility to AM fungi has been observed in a wide range of plants, but physiological traits that define the compatibility has not yet been clarified. In this chapter, the hypotheses that i) difference in capability of phosphorus acquisition would alter strigolactone exudation, ii) which leads to alterations of the levels of colonization and community compositions of the fungi. Three maize genotypes that are highly compatible to AM fungi and three low-compatible genotypes were grown in the presence and absence of AM fungi in a glasshouse to investigate whether compatibility to the fungi is relevant to responsiveness to the fungi. The six genotypes were also grown in hydroponic culture for strigolactone analysis by *Orobanche minor*-seed germination test after fractionation by HPLC as well as in the field for AM fungal community analysis. In terms of phosphorus uptake, the responses of the genotypes to mycorrhizal formation were not correlated with their compatibility to AM fungi, implying that highly (low)-compatible genotypes did not necessarily show greater (lower) dependency to AM fungi. *O. minor*-seed germination activity in the root exudates, however, was significantly higher in several fractions of the exudates form the highly-compatible genotypes, although the community compositions of the fungi were not different between the highly-compatible and low-compatible genotypes. These results suggest that difference in compatibility to AM fungi is highly likely to be a reflection of quantitative and/or qualitative differences in strigolactone exudation, but not that of dependency to the fungi.

In contrast to the specific responses the parasitic plants to structurally different strigolactones, responsiveness to diverse strigolactones has not differentiated among AM fungal species, which might have maintained their broad host ranges during the long history of coevolution with land plants.