Arbuscular Mycorrhiza Symbiosis of *Dactylis glomerata* L. and *Anthoxanthum odoratum* L. in an Acidic Pasture

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Key words: Arbuscular mycorrhiza, specific symbiosis, *D. glomerata*, *A. odoratum*, Acidic pasture

Introduction *D. glomerata* is the main grass on artificial pastures in the north region of Japan. In recent years, most of those pastures have problems with weeds that decrease the growth, productivity and quality of the grasses. Among the weeds, *A. odoratum* is the most widespread weed in the region that is dominated by acid soils. However, the mechanism of dispersion of this weed is not known. Many studies showed that clear beneficial effect of arbuscular mycorrhiza on grass tolerance to Al toxicity and soil acidity (Cuenca and Meneses 2001). Therefore we propose that mycorrhizal symbiosis of both plants may explain their relative success in the field. In this study, we investigated the arbuscular mycorrhizal symbiosis of *D. glomerata* and *A. odoratum* in a strongly acidic artificial pasture.

Materials and methods The Field study was conducted in artificial pasture of the College of Agricultural Science of Tohoku University, Osaki, Miyagi prefecture, Japan (38°45′N, 140°45′E, elevation=585m) in Oct. 2003. The used soil was a strongly acidic Andisol. Samples were randomly collected from 52 10m×20m plots. The samples of *D. glomerata* and *A. odoratum* were collected from a 10cm (diameter) × 10cm (depth) hole in the each plot. The samples included the roots and rhizosphere soil of each plant. The spores were collected from 10g rhizosphere soil of both plants. The number of spores of each sample were counted and then divided in 6 morphological types. The roots were stained with trypan blue / lactic acid and the mycorrhizal colonization (percentage of root infected by arbuscular mycorrhizal fungi) was calculated using the line-intersect method (Giovannettti and Mosse 1980).

Results The frequency of *A. odoratum* in the study area was much higher than that of *D. glomerata*. The mycorrhizal colonization and coverage of *A. odoratum* were substantially higher than those of *D. glomerata* (Table 1). The total spore number in the rhizosphere of *A. odoratum* was prominently higher than that of the *D. glomerata*. The spore density of *A. odoratum* and *D. glomerata* were 15 and 4 spores per 10g fresh soil, respectively. Four different morphological types of spores occurred in the rhizosphere of *A. odoratum* and only one morphological type of spore occurred in the rhizosphere of *D. glomerata*.

Table 1 *Mycorrhizal colonization, frequency and coverage of* A. odoratum *and* D. glomerata *in the study area.*

Plants	Mycorrhizal colonization (%)	Frequency (%)	Quadrat number with dominating plants in sampling points (Percentage %)	Coverage (%)
A. odoratum L.	22.3	84.6 (44/52)	18 (34.6)	35.5
D. glomerata L.	7.1	7.7 (4/52)	0	0.5

Conclusions These results indicated that the differences in the spore type, density and the mycorrhizal colonization of the arbuscular mycorrhizal symbiosis of *D. glomerata* and *A. odoratum* in study area may have originated from differences in the relationships between both plants and the associated fungi in the acid soil. We concluded that the low soil pH had a strong effect on the mycorrhizal symbiosis of *D. glomerata*, decreasing substantially the fungal species in the rhizosphere of *D. glomerata*m, and leading to a decreased mycorrhizal colonization, nutrient uptake and tolerance to acidity. On the other hand, for *A. odoratum*, the low soil pH did not effect its mycorrhizal symbiosis, nutrient uptake and tolerance to acidity (Rufyikiri et al. 2005), leading to increasing its competitive ability to survive in the acid soil.

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