*Mongolian Journal of Biological Sciences 2010 Vol. 8(2): 33-41*

# A Native Arbuscular Mycorrhizal Fungus, *Acaulospora scrobiculata* Stimulated Growth of Mongolian Crested Wheatgrass (*Agropyron cristatum* (L.) Gaertn.)

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## Abstract

*Agropyron cristatum* (L.) Gaertn. (crested wheatgrass) is an endemic plant species, which dominates most area of the Mongolian steppe and forest steppe. In the present study, spores of arbuscular mycorrhizal fungi in the rhizosphere soil of crested wheatgrass were isolated with wet-sieving/decanting methods, and the major species was identified as *Acaulospora scrobiculata* Trappe. For arbuscular-mycorrhizal resynthesis, the spores of *A. scrobiculata* were propagated with corn pot-culture technique and inoculated onto the roots of crested wheatgrass seedlings. The inoculated crested wheatgrass seedlings exhibited vigor in growth, and examination of the root structure revealed the occurrence of arbuscules and vesicles in the cortical cells. These results demonstrated that *A. scrobiculata* could effectively form arbuscular mycorrhizas with crested wheatgrass and promote its growth, which can be used to restore Mongolian grassland.

**Key words:** *Acaulospora scrobiculata*, *Agropyron cristatum*, arbuscular mycorrhizas, biomass, crested wheatgrass, growth, mineral, mycorrhizal dependency

## Introduction

*Agropyron cristatum* (L.) Gaertn. (crested wheatgrass) is a dominant native plant species in the Mongolian steppe. Available forages in this area consist primarily of *Stipa krylovii,* crested wheatgrass and *Allium polyrrhizum* (representing 80% of available phytomass), all of which are regarded as desirable forage plants (Retzer, 2007). Crested wheatgrass is widely used in the restoration of the Mongolian prairie.

Arbuscular mycorrhiza (AM) is important components of virtually all terrestrial ecosystems (Brundrett, 1991; Smith & Read, 2008). Arbuscular mycorrhizal fungi (AMF) are one of the most important soil microbes as they form mutualistic association with more than 80% of land plants (Ulrich *et al.,* 2002). AMF are known to be widespread in semi-arid grasslands plants, and their association with grasses is important in biomes grazed by large ungulates (Trappe, 1981). It has been well documented that the major benefits of plants from these relationships are improvement of uptakes in water and inorganic nutrients, especially phosphorus (Sanders & Koide, 1994). Additional benefits include increased tolerance to the environmental stresses such as nutrient deficiency, diseases, drought and salinity (Smith & Read, 2008; Gupta & Kumar, 2000).

AMF may further influence plant community structure (Marler *et al.,* 1999), biodiversity (Hartnett *et al.,* 1993), primary production (Hedlund, 2002), ecosystem dynamics (Van Der Heijden *et al*., 1998), and survival of tree seedlings (Hetrick *et al.,* 1988; Smith & Read, 2008; Stinson *et al.,* 2006). Previous research has examined the distribution of AMF in sandy area (Blaszkowski *et al.,* 2002), in agricultural soils (Oehl *et al.,* 2009), and in certain natural ecosystems (Guadarrama & Alvarez-Sanchez, 1999**),** but few of them have looked into grasslands (Smith & Read, 2008), especially in arid and semiarid areas (Lugo *et al.,* 2002).

Mongolian grasslands are facing rapid desertification due to the uncontrolled growth of animal herding, mining and global warming. The grassland has been thinning out in 75 percent of the Mongolian land area, while 7 percent has completely turned into deserts.