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Arbuscular mycorrhizal fungi of the North Caucasus and the Gorny Altai: biodiversity and role in plant-microbial interactions

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The aim of our study was to estimate the species diversity of arbuscular mycorrhiza (AM) fungi in two well-known biodiversity "hot-spots" in Russia – the North Caucasus (subalpine meadows of Alibek mountain and Malaya Khatipara mountain, wet ruderal meadow of the Kuban River valley near the village Ordzhenikidzevsky, Karachay-Cherkess Republic) and the Gorny Altai (undisturbed alpine meadow, rocky talus and disturbed ecosystem near the shaft of the abandoned Aktash mercury mine at the level of alpine meadows in Lysukha mountain, Altai Republic). Identification was carried out using primers for Illumina MiSeq: ITS5 primer and modified ITS-2RK primer (5-CGTTCAAAGATTCGATGATTCAC-3) for amplification of the ITS1 region and ITS3 and ITS4 primers for amplification of the ITS2 region.

In the North Caucasus the greatest species diversity of AM fungi was shown for the subalpine grassland of the south-eastern slope of Malaya Hatipara (43°25'48.0"N 41°42'31.0"E, 2400 m above sea level): *Archaeospora spainiae*, *Claroideoglomus claroideum*, *Diversispora versiformis*, *Entrophospora infrequens*, *Funneliformis mosseae*, *Glomus indicum*, *Paraglomus laccatum*, *Rhizophagus irregularis* (8 species); the Shannon index was 3.11, the Margalef index was 2.52. In the Gorny Altai the greatest biodiversity of AM fungi was shown for the rocky talus at the level of the alpine meadows of the western slope of Lysukha (50°19'44"N 87°43'08"E, 2466 m above sea level): *Diversispora arenaria*, *Glomus macrocarpum*, *Otospora bareae*, *Rhizophagus intraradices*, *Septoglomus africanum* (5 species); Shannon index was 2.32, the Margalef index was 2.49. It should be noted the species composition of AM fungi in the presented stationary sample areas of the North Caucasus and the Gorny Altai was completely different, but the diversity indices for the ecosystems with the highest biodiversity were similar, and the largest number of identified AM fungi species (8 species) was observed in the subalpine meadow of Malaya Hatipara. On the other hand the identification with ITS1 sequences was more effective (more species of AM fungi were identificated) than with ITS2 sequences, probably because of the fact that in the first case the PCR was more specific due to the use of our modified primer ITS-2RK. However, the identification of AM fungi species should be carried out for both regions, since some AM fungi species (for example, *Entrophospora infrequens*, *Rhizophagus melanus*, *Glomus indicum*) were determined only for the ITS2 region. For the first time from the soils of the North Caucasus and the Gorny Altai, we isolated AM fungi, which will be deposited in the collection of All-Russian Research Institute for Agricultural Microbiology (ARRIAM). The symbiotic efficiency and activity of AM fungi is being studied. It is planned to commercialize AM fungal strains with high efficiency of phosphate transfer to the host plant.

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