Microbial diversity in forest soil from Vitosha mountain

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INTRODUCTION

The composition of forest soil microorganisms, which can be found at high altitudes of the Bulgarian Vitosha mountain has not been studied systematically and deserves more attention. Gaining a better insight into the biodiversity of the microbial community in soils with different land use – coniferous forest and high meadow vegetation - will contribute to a better understanding of their role in forest ecosystems and their relative importance.

METHODOLOGY

Soil sampling was performed at two experimental sites as follows – one with forest vegetation of Norway spruce (*Picea abies (L.) Karsten*.) (SS 1) and one with high meadow vegetation (SS 2) in Vitosha mountain (Tables 1 and 2). This sampling area is important because Vitosha mountain is the oldest natural park on the Balkan Peninsula. On the park's territory, 61 types of habitats have been identified, among them of greatest interest, as far as nature conservation is considered, are the natural spruce forests, the peat areas, the moraines and the caves. The sampling sites are spread on the territory of Bistrishko Branishte Reserve, which was established with the aim to preserve in their natural condition high-mountain spruce forests, sub-alpine grass cohabitations, rock formations and stone rivers.

Table 1: Characteristics of sampling sites

Sampling site	Dominant vegetation	Altitude, m	Geographical positions
SS1	Picea abies (L.) Karsten	1520	42°33'48.5"N 23°18'56.9"E
SS2	Subalpine grasslands	1969	42°34'32.4"N 23°17'47.9"E

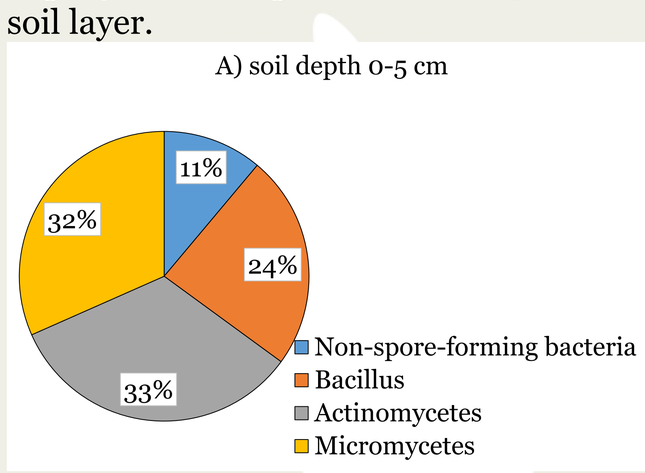
Table 2: Main soil characteristics

Sampling site	Soil depth	Carbon (C, %)	Nitrogen, (N, %)	pH
SS1	0-5	18.11	0.77	6.16
	5-20	11.09	0.48	5.53
SS2	0-5	16.94	0.77	5.88
	5-20	9.79	0.48	5.18

RESULTS

The quantity of soil microflora both as total amount as well as within microbial groups is higher in the surface 5 cm soil layer Table 3, Figures 1 A and B. The composition of the bacillus group in the studied soils is characterized by the dominance of Bacillus megaterium and Bacillus cereus species. Along the soil profile depth the quantity of microflora decreases substantially.

In both studied soil layers – 0 -5 cm and 5 -20 cm, the non-spore-forming bacteria prevail – 75 and 67 %, respectively (Figure 2 A and B). The contents of actinomycetes and micromycetes present are lower in comparison with spruce forest and varies between 15 % and 20% slightly increasing in the lower (5-20 cm) soil layer.



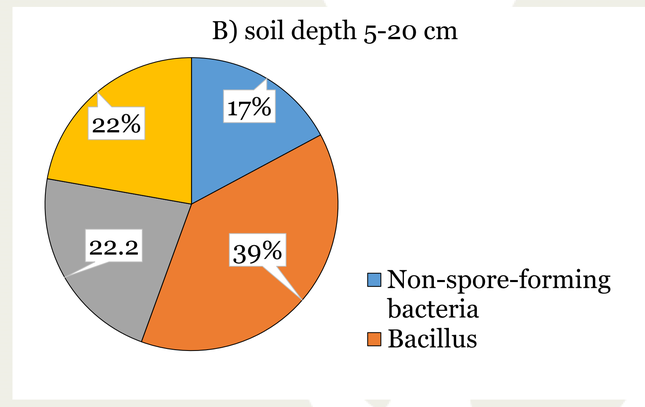


Table 3: Total microflora

Soil depth, cm	Total microflora, (thousand per gram dry soil)	
	Picea abies (L.) Karsten	Subalpine grasslands
0-5	2.340	2.280
5-20	0.198	0.714

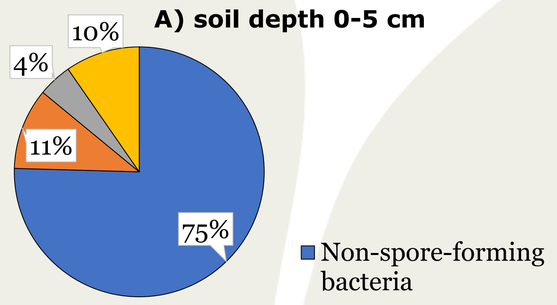


Fig. 1. Variability of main groups of microflorae in soil from spruce forest

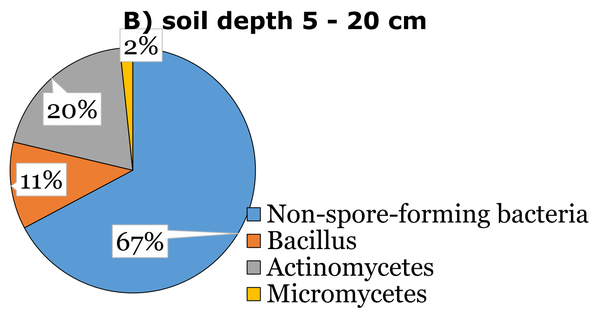


Fig.2: Variability of main groups of microflorae in soil from grassland

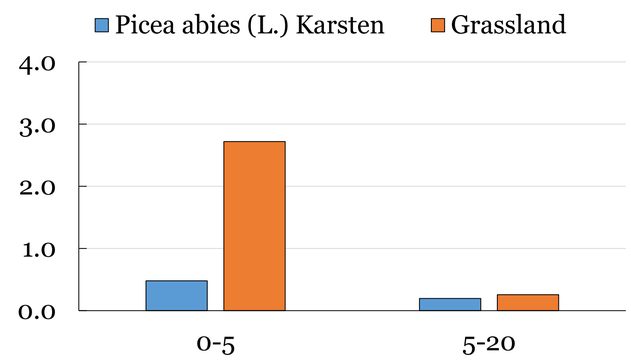


Fig. 3. Bacteria assimilating mineral nitrogen , tousand.g-1

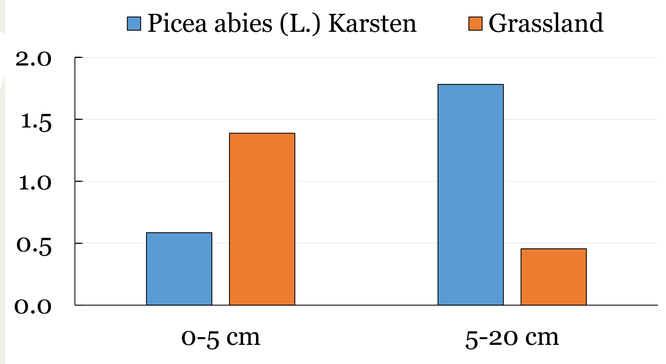


Fig. 4. Coefficient of mineralization

CONCLUSIONS

The results demonstrate a higher quantity of soil microflora, both as total amount and within groups in the surface 5 cm of the studied soils. In deeper soil layers, where the humidity and pH decrease, the quantity of microflora is significantly diminished. The percentages of actinomycetes and micromycetes prevail in soil from spruce forest. On the contrary, the microbial diversity in subalpine grassland is mainly dominated by non-spore-forming bacteria. Despite the important role of fungi in forest soils, bacteria accomplish multiple and essential ecosystem roles in the investigated forest environment, including organic matter decomposition, regulation of mycorrhizal symbiosis, and involvement in N cycle processes.