World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:17, No:11, 2023

Comparison of Soils of Hungarian Dry and Humid Oak Forests Based on Changes in Nutrient Content

Authors : István Fekete, Imre Berki, Áron Béni, Katalin Juhos, Marianna Makádi, Zsolt Kotroczó

Abstract : The average annual precipitation significantly influences the moisture content of the soils and, through this, the decomposition of the organic substances in the soils, the leaching of nutrients from the soils, and the pH of the soils. Climate change, together with the lengthening of the vegetation period and the increasing CO_2 level, can increase the amount of biomass that is formed. Degradation processes, which accelerate as the temperature increases and slow down due to the drying climate, and the change in the degree of leaching can cancel out or strengthen each other's effects. In the course of our research, we looked for oak forests with climate-zonal soils where the geological, geographical and ecological background conditions are as similar as possible, apart from the different annual precipitation averages and the differences that can arise from them. We examined 5 dry and 5 humid Hungarian oak soils. Climate change affects the soils of drier and wetter forests differently. The aim of our research was to compare the content of carbon, nitrogen and some other nutrients, as well as the pH of the soils of humid and dry forests. Showing the effects of the drier climate on the tested soil parameters. In the case of the examined forest soils, we found a significant difference between the soils of dry and humid forests: in the case of the annual average precipitation values ($p \geq 0.0001$, for dry forest soils: 564±5.2 mm; for humid forest soils: 716±3.8 mm) for pH ($p = 0.0004$, for dry forest soils: 5.49±0.16; for wet forest soils: 5.36±0.21); for C content ($p = 0.0054$, for dry forest soils: 6.92%±0.59; for humid forest soils 3.09%±0.24), for N content ($p = 0.0022$, dry forest in the case of soils: 0.44%±0.047; in the case of humid forest soils: 0.23%±0.013), for the K content ($p=0.0017$, in the case of dry forest soils: 5684±732 (mg/kg); in the case of humid forest soils 2169±196 (mg/kg)), for the Ca content ($p = 0.0096$, for dry forest soils: 8207±2118 (mg/kg); for wet forest soils 957±320 (mg/kg)). No significant difference was found in the case of Mg. In a wetter environment, especially if the moisture content of the soil is also optimal for the decomposing organisms during the growing season, the decomposition of organic residues accelerates, and the processes of leaching from the soil are also intensified. The different intensity of the leaching processes is also well reflected in the quantitative differences of Ca and K, and in connection with these, it is also reflected in the difference in pH values. The differences in the C and N content can be explained by differences in the intensity of the decomposition processes. In addition to warming, drying is expected in a significant part of Hungary due to climate change. Thus, the comparison of the soils of dry and humid forests allows us to predict the subsequent changes in the case of the examined parameters.

Keywords : soil nutrients, precipitation difference, climate change, organic matter decomposition, leaching
Conference Title : ICSSPN 2023 : International Conference on Soil Science and Plant Nutrition
Conference Location : Kyoto, Japan
Conference Dates : November 20-21, 2023