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Title

Investigating some biological characteristics of the soil under the influence of various types of vegetation in Hamon International Wetland Biological Reserve

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February 2023

Abstract

Hamoon international wetlands is one of the most crucial and efficient ecosystems in the eastern part of Iran. By understanding how the vegetation in these wetlands affects the soil, we can determine the beneficial plants in affecting soil using it to plan, restore, and manage the vegetation. To achieve our goal, we conducted a field study using a completely random design. We collected 25 soil samples from each of the following vegetation types: *Tamarix hispida, Cyperus rotundus, Halocnemum strobilaceum, Phragmites communis,* and *Aeluropus lagopoides*. Additionally, we collected 25 soil samples from the bare and unplanted surfaces as a control. In total, we selected and collected 300 soil samples from 150 different locations. These samples consisted of 150 larger samples (2 kg) for physical and chemical soil tests, and 150 smaller samples (250 grams) for biological soil tests. All samples were collected from depth of 0-30 cm of the soils. After preparing the soil samples, the following characteristics were measured: total population, phosphate solubilizing, and nitrogen fixing microorganisms. Additionally, the measurements include: soil dry aggregate stability, soil erodible fraction, soil crust factor, K factor, and the percentage of total nitrogen, available potassium, and available phosphorus. The results indicate that, in comparison to the control (soil without vegetation), each of the studied soils with vegetation had higher total and phosphate-solubilizing microorganisms, total nitrogen and available phosphorus than the control. However, only soils with plants species *T. hispida*, *P. communis*, and *A. lagopoides* had 3.29, 3.03, and 2.99 times more nitrogen-fixing bacteria population, respectively, than the control. Additionally, the erodible fraction of the soil was found to be lower in soil in the presence of *P. communis, C. rotundus*, and *A. lagopoides* species, with values of 42.01%, 41.58%, and 28.86%, respectively. The soil, covered with *C. rotundus* and *H. strobilaceum*, had higher dry aggregate stability percentages of 9.29 and 7.18, respectively, than the control. The soil crust factor was higher in the cover of the *T. hispida* and *A. lagopoides* plants species, with percentages of 93.45% and 65.09% respectively. The soils covered by *T. hispida* and *A. lagopoides* had a higher (K) factor by 21.16% and 18.89%, respectively. Additionally, the control soil exhibited the highest level of available potassium, which did not significantly differ from that for *H. strobilaceum*. Based on the results of the random forest algorithm, in estimating of the characteristics of population of phosphate-solubilizing and nitrogen-fixing microorganisms, the total population of soil microorganisms, and also in estimating soil microbial respiration, soil available phosphorus were the most effective factors. Generally, in order to biological properties and also, total nitrogen and available phosphorus, the best type of soil was found in soil with *T. hispida*. The *P. communis* and *C. rotundus* had the highest potential for soil stability against wind erosion. But in order to stability indices against water erosion factors, the soil covered by any of the five vegetations of Hamon wetland was not superior to the control.

Keywords: Nitrogen fixing, Soil respiration, Phosphate solubilizing, Sistan plain, Microorganisms