Potential to use plant-sourced humic acid for soil remediation in post-fire Mediterranean forests

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Introduction

Forest fires have many effects on the ecosystem[1] and increase the soil pH from soil properties and is one of the most important issues that directly affect the ability to take soil nutrients and plant growth conditions[2,3,4]. Ulery[5] found that the topsoil pH could increase as much as three units immediately after burning. In Turkey, 30 thousand hectares of forest area were burned in 2008, and this figure was the biggest fire between 1990-2020[6], while approximately 140 thousand hectares of forest area were burned in 2021.
Humic acids (HA) are a significant component of soil that can decrease soil pH and increase the availability of nutrients[7]. The optimum pH for most plants is between 6.3 and 7.3[8], while the majority of Central Anatolian soils are about 8[9]. Humic acid is an important source to bring soil pH to pre-fire levels in post-fire areas.

Objectives

- Determining the effects of plant-derived humic acid use on soil pH in a laboratory study.
- To determine the effects of plant-derived humic acid doses and concentrations on the soil.
- To ensure the sustainability of Mediterranean forests for future generations and to determine the effectiveness of restoration materials.

Methods

In this study, the effects of plant-derived humic acid on soil pH were investigated. From the first 0-80 cm depth, 10 different soil samples were taken in the same amount from each depth to be a homogeneous mixture. After adding humic acid at a certain density to the laboratory, mixing, keeping it for 3 days, pH values were measured and the graph of pH change was created with the amount of humic acid added. The concentration 1, 2,5 and 5 % were selected as a concentration, and 1, 3 and 5 ml volume was added to 10 gr soil.

Table 1 .Humic acid concentrates and volume applied to soil samples

Concentration of humic acid (%)	Volume of humic acid (ml/10g)	Dose of humic acid (mg/kg)
1	1	5,6
1	3	16,8
1	5	28
2,5	1	14,2
2,5	3	42,6
2,5	5	71
5	1	28,3
5	3	85,1
5	5	141,9

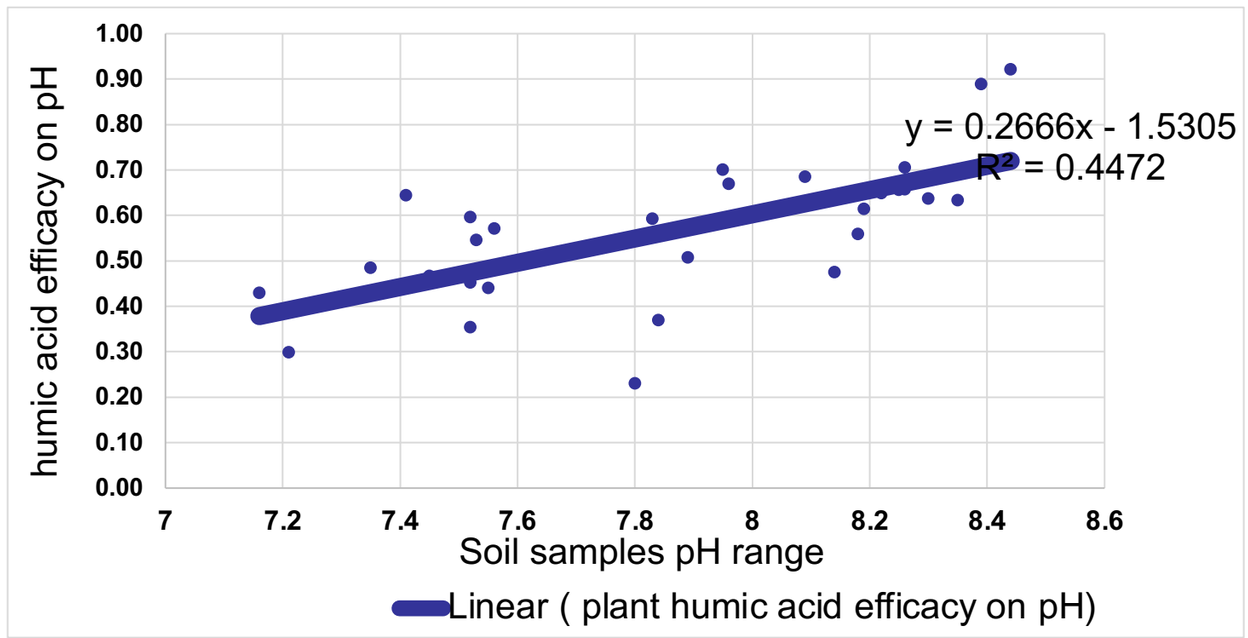

Figure 1. Relationship of soil pH to plant-sourced humic acid effect

Pearson correlation test was performed in Microsoft Excel and as it is clearly seen in the graph, it lowered the pH value more in high pH soils for plant-sourced humic acid (figure 1).

According to the Pearson correlation test, there is a positive correlation with plant-derived (0,67) humic acid efficacy and soil pH

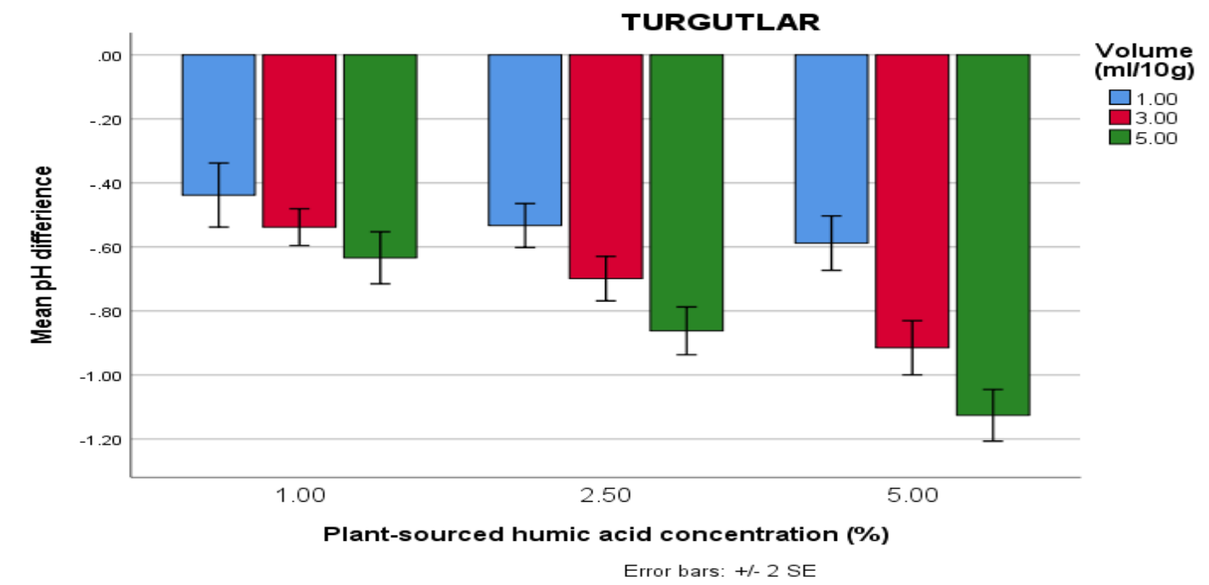

Figure 2. The volume corresponds to 1.3 and 5 ml / 10 g of soil volume. Concentration is expressed in 1%, 2.5% and 5%. The mg/kg humic acid equivalents of all dose and concentration pairs are given in table 1

Conclusion

According to the pair sample test results, plant-sourced humic acid applied to all soil samples collected from Turgutlar caused a statistically significant decrease in pH.

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