PalStudent Journal
A Palestinian Scientific Journal for the Youth

ABSTRACTS: VOLUME 7, SPECIAL ISSUE {7th Undergraduate Conference}

ABSTRACT

Biochar Mitigation of Phosphorus Leaching from Agricultural Soils and Reduction of Nutrient Pollution of Aquifers

Hamood Al-Hajri, Qais Al-Amri, Rawan Al-Jamudi, Fatma Al-Kashri, Ruqia Al-Sarihi.

Supervisor: Dr. Daniel Blackburn

Sultan Qaboos University, Oman.

Phosphorus (P) leaching from agricultural soils is a growing environmental concern in Oman, particularly in the Al Batinah region where sandy soils and heavy fertilizer use have led to elevated phosphorus levels near palm farms.

This study aimed to assess the effectiveness of iron-enriched biochar, produced from locally sourced palm tree waste through pyrolysis at 600 °C—in reducing phosphorus mobility and leaching in sandy soils.

Biochar was mixed with iron oxide to enhance its phosphorus-retention capacity and applied at varying concentrations (0%, 5%, 10%, 15%) to soils collected from high-P agricultural areas. Initial soil analyses confirmed sandy and sandy loam textures with neutral to slightly alkaline pH and acceptable EC levels. Pot experiments were conducted using different biochar treatments, followed by Olsen-P extraction and spectrophotometric analysis at 880 nm to determine available phosphorus. Data were collected from five soil sources, each with three replications.

Results showed varied responses across samples: in some cases (e.g., Sample 2 and Sample 4), increasing biochar levels led to lower Olsen-P concentrations, while in others (e.g., Sample 1 and Sample 5), higher biochar levels corresponded with increased P availability. This suggests that while iron-enriched biochar can influence phosphorus retention, its effect is not uniform and may

Correspondence concerning this article should be addressed to the mentioned authors at the mentioned institutes.

E-mail: research@admin.alquds.edu
Palestine, Abu Dis, Al-Quds University

depend on specific soil properties, initial P content, and interaction dynamics. Leachate data followed a similar mixed trend. Importantly, soil pH and EC remained stable across treatments, and no adverse effects were observed, supporting the safety of biochar application.

In conclusion, iron-enriched palm biochar has demonstrated potential to alter phosphorus availability in high-P soils, but its effectiveness varies by site. While 10%–15 % biochar generally showed more pronounced impacts, no single rate was optimal across all samples. These findings highlight the need for tailored biochar application strategies based on local soil characteristics. Nevertheless, the approach offers a promising, sustainable solution for reducing phosphorus runoff and protecting groundwater quality in Oman's agricultural zones.

PalStudent Journal
Correspondence concerning this article should be addressed to the mentioned authors at the mentioned institutes.

E-mail: research@admin.alquds.edu
Palestine, Abu Dis, Al-Quds University