Effect of NPS and Vermicompost on the Physico-Chemical Properties of the Soil at the Bako Agricultural Research Center in Western Oromia, Ethiopia

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Abstract

The main chemical, physical, and biological limitations on soil production in western Ethiopia include low soil fertility and nutrient unavailability. Therefore, the purpose of the study was to evaluate how specifc physico-chemical properties of soil were infuenced by the combined application of vermicompost and NPS fertilizer rates at Bako Agricultural Research Center. Four vermicompost levels (0, 2.32, 3.48, and 4.64 tons ha-1) and four NPS fertilizer levels (0, 50, 75, and 100 kg ha-1) are combined in a factorial manner were laid out in Randomized Complete Block Design (RCBD) with three replications. The study's fndings demonstrated that while bulk density decreased below

signifcantly infuenced by the primary efects of vermicompost levels (P ≤0.01).

Keywords: Fertility; Depletion; NPS; Vermicompost; Improvement

Introduction

Nutrient depletion in Ethiopia has been accelerated by improper management of soil fertility and land use shi s, primarily from natural vegetation to cultivated areas. A reduction of the physical, chemical, and biological characteristics of the soil was the outcome of intensive and continuous farming of land with inadequate soil fertility management techniques. e country's declining agricultural output and food scarcity are made worse by these changes in the soil's properties [1]. According to this perspective, the main causes of the nation's declining soil fertility include nutrient input levels or absence, crop residue management issues, continuous cultivation, nutrient removal through erosion, and a lack of crop rotation programs [2]. us, the sustainability of agricultural productivity is impacted by inadequate management of soil fertility.

e fertility and productivity of soils are crucial factors in guaranteeing food security for the growing global population [3]. To maintain the productivity of the soil and balance the nutrient out ow from agricultural land, it is, therefore, necessary to improve soil fertility by adding nutrients in the form of fertilizer and managing it properly. Hence, soil fertility and plant nutrition are two closely related topics that focus on the types and availability of nutrients in soils, as well as their mobility, uptake by plants, and utilization by plants.

Among the main obstacles to crop development in Ethiopia are low soil fertility, acidity-induced nutrient unavailability, and high amounts of agricultural inputs [4]. Acid soil production is restricted by the toxic levels of manganese (Mn) and aluminum (Al), as well as by the lack of nutrients like phosphorus (P), calcium (Ca), magnesium (Mg), and molybdenum (Mo) [5]. Due to its high exchangeable aluminum content, Al lowers P uptake by xing P [6]. Applying organic fertilizer can improve soil aeration, reduce acidity, promote greater microbial activity, increase soil organic matter, CEC, and P availability, and signi cantly raise crop yields [11]. Maintaining increased soil production has become more successful recently when organic and mineral fertilizers are used in combination.

Methodology

Experimental materials

e NPS fertilizer containing (19% N, 38% P2O5, and 7% S) was used as sources of nitrogen, phosphorus, and sulfur. Vermicompost prepared from soybean residue and farmyard manure at Bako Agricultural Research Center was used for this study. e soya bean straw and cow dung were mixed 1:2 ratio respectively. e Vermicompost had been prepared from soya bean straw and cattle manure at Bako Agricultural Research Center, using red earthworms (Eisenia fetida). e vermicompost used in the experiment was selected based on its nutrient content information obtained from the laboratory analytical results.

Treatments and experimental design

Vermicompost rates (0, 50, 75, and 100%) and NPS (0, 50, 75, and 100 kg NPS ha-1) were the treatment levels. e experiment contained 16 treatments [7].

Soil sampling and sample preparation

Using the given auger, samples were collected across the diagonal of each block from the top soil surface (0–30 cm deep). e een samples were completely mixed in the eld right away following sampling, and

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