BAUET JOURNAL
Published by
Bangladesh Army University of Engineering & Technology
Journal Homepage: http://journal.bauet.ac.bd
https://doi.org/10.59321/BAUETJ.V4I1.8

Impact of Kitchen Waste Compost Amended with Coco Coir and Coconut Water on Soil Properties and Selected Vegetables

Tasnim Khan[1], Md. Abdullah Yousuf Al Harun[1*], Sultana Jahan Moule[1] and Md. Shaharuf Islam[1]

[1]Environmental Science Discipline, Life Science School, Khulna University, Khulna-9208, Bangladesh

Abstract: The study investigated the effectiveness of coco coir and coconut water-induced kitchen waste compost on soil fertility and vegetable growth. Using a household-based anaerobic composting method, three compost types were prepared: kitchen waste (KW) only, kitchen waste mixed with coco coir (KW+CC), and kitchen waste mixed with coco coir and coconut water (KW+CC+CW). A field laboratory experiment assessed the impact of prepared composts on *Lactuca sativa* (lettuce), *Solanum lycopersicum* (tomato), and Brassica oleracea var. gongylodes (turnip) growth, following a completely randomized design with four replicates. Results showed that soil pH, electrical conductivity (EC), macronutrients (nitrogen, phosphorus, potassium, sulfur, sodium), micronutrients (iron, chloride), and organic matter were significantly increased in all compost-amended soils compared with control. Growth parameters of the experimental plants cultivated with prepared composts were stimulated substantially compared with control, particularly root length, chlorophyll content, and lettuce height for the treatment of KW+CC+CW compost depicted the strongest significant impact ($p \leq 0.001$). The notable impact of composts on lettuce and tomato, and the negligible impact on turnip confirms the species-specific consequence. In summary, KW+CC+CW compost enriched valuable soil nutrients, enhancing vegetable production variably by species. This study highlights the potential of recycling waste into compost for sustainable organic agriculture.

Keywords: *Compost, Kitchen waste, Soil properties, Waste management, Plant growth.*

Introduction: In recent years, it has become a challenge to produce a maximum yield of crops for the increased population with the minimum impact on the environment. The sustainability of conventional agriculture in Bangladesh is under threat due to the continuous degradation of land and water resources and due to the indiscriminate use of agrochemicals [1]. One of the common materials used for organic soil amendment is compost [2]. Composting is the biological decomposition and stabilization of organic substrates by a mixed microbial population under optimum moisture, temperature, and aeration conditions [3, 4]. Apart from agricultural productivity composting offers several benefits which include the reduction of ecological risk with increased soil biodiversity. Further, compost helps soil retain nutrients, moisture, and air which stimulate plant growth.

A study shows that in 2015 waste generation in Bangladesh was around 22.4 million tons per year or 150 kg/cap/year [5] while the waste collection efficiency varies from 37 to 77% with an average of 55% [6]. This mound of uncollected wastes contributes numerous liquid and gaseous emissions that ultimately deteriorate the air and water environment. Recycling waste not only helps in protecting nature and public health but also brings economic solvency, especially in developing countries like Bangladesh. Composting, one of the best recycling options has advantages over incineration and disposal in landfills due to lower operating costs, reduced environmental pollution, and more importantly, the beneficial use of the final product, which can be used as a soil conditioner or fertilizer [7].

About 50 to 60% of the solid waste generated in urban areas is kitchen waste [6]. Kitchen waste, therefore, is a noteworthy option for preparing compost used in agriculture. Compost from fruit residues, manure, and kitchen waste can increase the retention of applied nitrogen (N) fertilizer in the soil-plant system by stimulating plant N uptake and microbial immobilization and reducing N leaching and gaseous losses [8]. However, composting with kitchen waste can alleviate poor water retention capacity of the soil [9]. Kitchen waste, such as fruit and vegetable scraps, coffee grounds, and eggshells, are high in nitrogen and can produce compost that is too rich in nutrients. Moreover, composting is a form of microbial farming as microorganisms derive their food and energy from complex organic substances present in the compost pile and through the process of aerobic decomposition turn them into humus [10].

Coco coir can be a suitable composting material as it is locally available, cheap, biodegradable, phytopathogen-free, and eco-friendly [11]. It has approximately 25% air-filled porosity (AFP) and 34% readily available water (RAW) with adequate water buffering capacity (WBC) [12]. When applied to agricultural soils, coco coir can increase available nutrient content, infiltration rate, total porosity, and hydraulic conductivity of soil [13, 14]. As a whole, coco-coir offers a suitable base material for excellent water retention, reliable drainage, and ideal aeration for soil and microbial growth. Previous studies found that water of dried matured coconut (generally dumped as waste) contains organic nutrients which enhance the growth and

Article history:
Received 10 March 2023
Received in revised form 14 august 2023
Accepted 28 October 2023
Available online 15 November 2023

Corresponding author details: Md. Abdullah Yousuf Al Harun
E-mail address: harun@es.ku.ac.bd
Tel: +8801918868606