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Research Article

SOIL FERTILITY STATUS AS INFLUENCED BY CROPPING SYSTEM IN EASTERN DRY ZONE OF KOLAR DISTRICT IN KARNATAKA

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ABSTRACT

The current investigation was carried out to determine how farming systems under rainfed and irrigated conditions affected the soil's fertility. Thimmasandra of Bangarpet Taluka, Yadahalli of Kolar Taluka, Gaddur of Mulbagal Taluka, Thippasandra of Malur Taluka, and Kadudevandahalli of Srinivaspurua Taluka were the four villages from where the soil samples (0–15 cm) were gather. As a consequence of chemical examination, the samples' pH and electrical conductivity were found to be between 5.8 and 7.5 and below 0.4 and 08 dS/m, respectively. The percentage of soil organic carbon in soil samples from irrigated systems was higher than that of rainfed systems, where no soil sample fell into this group. In a similar vein, soils from tomato other vegetable-based cropping systems (irrigated) have lower accessible N, P, K, and Diethylene Triamine Penta Acetic acid extractable Zn, Cu, Mn, and Fe than soils from finger millet-fallow systems (rainfed).

Keywords: Tomato other vegetable, Finger millet-fallow, Major and micronutrient status.

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INTRODUCTION

Karnataka's eastern entrance is located in the Kolar district. Covering a size of 8223 sq. km., it is a landlocked district with hard rock topography in the maiden (plain) region of Karnataka. The district's location in the center of the Indian peninsula greatly influences its geoclimatic conditions. The primary sources of irrigation in this area are rainfall and groundwater due to its year-round tropical environment. In the state, the district has the most bore wells. Pulses, groundnuts, and finger millet are the main crops farmed. About 45% of the entire planted land is made up of finger millet. Tomato, potatoes, and other vegetables are the main crops that are irrigated; among these, tomato is grown across a wide region.

The Kolar area is located in the arid, eastern zone of the climate. It has a semiarid environment with scorching summers and mild winters typical of tropical monsoon weather. Four seasons typically separate the year. The terms "dry season" (Jan-Feb), "premonsoon" (Mar-May), "southwest monsoon" (June–September), and "post" (October–December) refer to the monsoon season. The region receives around 650 mm of rain annually on average. The Kolar district's soils are found on a variety of landforms, including plains, hills, ridges, pediments, and valleys. There is a wide variety of soil types present, including lateritic, red sandy, and red loamy soil. The pace at which organic matter decomposes in cropping systems based on tomatoes and other vegetables varies depending on the moisture regime. The native carbon input in the form of farmyard manures and biomass from leaves and roots had an impact on the soil's organic carbon pool as well. The quality of the soil organic matter primarily determined the amount of carbon sequestered and the amount of nutrients released in the soil during mineralization. The soil's organic carbon status was also impacted by the cropping system, climate, amount of soil tillage, soil wetness, and soil management interventions such as applying fertilizer and manures (Regmi *et al*., 2002). In contrast to finger millet-fallow system (rainfed) soils, the goal of the current study was to determine how the cropping system affected the fertility state of the soils under tomato other vegetable-based cropping system (irrigated).

METHODS

The research area is made up of the following villages: Thimmasandra of Bangarpet Taluka, Thippasandra of Malur Taluka, Yadahalli of Kolar Taluka, Gaddur of Mulbagal Taluka, and Kadudevandahalli of Srinivaspurua Taluka. Both rainfed and irrigated farming systems are covered by the soil in communities. Fertilizers for tomato crops included 200–250 kg N ha^{-1}, 100–150 kg P2O5 ha^{-1}, and 80–100 kg K2O ha^{-1}. Fertilizers for finger millet included 40–50 kg N ha^{-1} and 10–20 kg P2O5 ha^{-1}. Farmyard manure was applied at a rate of 10 tonnes ha^{-1} before tomato transplanting or finger millet sowing, every 2 years. Furthermore, in zinc-deficient soils, 25 kg of zinc sulfate (21% Zn) was treated to tomatoes, and in zinc-deficient soils, 10 kg of zinc sulfate (21% Zn) was applied to finger millet.

Five towns' worth of locations with varying land uses were selected to provide samples of the surface soil (0–15 cm depth). Samples of soil were taken in September for the tomato crop and in October following the harvest of finger millet. With the use of a soil augur, soil samples were randomly taken from four to five locations and composited. For chemical analysis, soil samples were air-dried and then sieved through a 2 mm sieve. A rapid titration method of Walkley and Black (1934) was used to measure the soil samples' pH (1:2 soil: water suspension), electrical conductivity (EC, 1:2 soil: water supernatant), soil organic carbon (SOC), available N (Subbaiah and Asija 1956), and available P (Bray and Kurtz 1945 for soil pH below 6.5 and Olsen *et al.*, 1954 for soil pH above). Available K (Mervin and Peech, 1950) and Diethylene Triamine Penta Acetic acid (DTPA) extract were used to measure the micronutrients zinc (Zn), copper (Cu), manganese (Mn), and iron (Fe) (Lindsay and Norvell, 1978). When the F-test was deemed significant, a mean comparison was performed using the Duncan multiple-range test.

RESULTS AND DISCUSSION

In an irrigated tomato other vegetable-based cropping system, the pH, EC, and SOC values varied from 5.8±6.2, 0.6±0.8 (dS m^{-1}) and 0.58±0.65 (%) to 6.9±7.5, 0.3±0.4 (dS m^{-1}) and 0.41±0.43 (%) in a rainfed finger millet-fallow system, respectively. As compared to the finger millet-fallow rainfed system, the results showed that the irrigated tomato other vegetable-based cropping system had higher pH and EC (Table 1). When comparing the tomato-other vegetable cropping system to the finger millet-fallow rainfed system, the SOC content in the former was much greater; this difference might be attributed to the irrigated system's increased root biomass.

Table 1: Effect of cropping patterns on chemical characteristics, accessible macronutrients status, and DTPA extractable micronutrient status in soils

Cropping system	Irrigated tomato other vegetable system	Rainfed finger millet-fallow system
pH	5.8±6.2^{a}	6.9±7.5^{b}
EC (dS m^{-1})	0.6±0.8^{a}	0.3 ± 0.4^{b}
OC (%)	0.58±0.65^{a}	0.41±0.43^{b}
Available Nitrogen (Kg ha^{-1})	300.15±325.50^{a}	175.46 ±180.25^{b}
Available Phosphorus (Kg ha^{-1})	44.45±48.45^{a}	19.45± 22.12^{b}
Available Potassium (Kg ha^{-1})	174.45±180.45^{a}	139.45±141.25^{b}
Exchangeable Calcium (C mol 100^{-1})	5.28±5.32^{a}	5.19±5.22^{b}
Exchangeable magnesium (C mol 100^{-1})	1.74±1.76^{a}	1.71±1.73^{b}
Available Sulfur (ppm)	12.50±15.00^{a}	7.50±9.00^{b}
DTPA Extractable- Zinc (ppm)	1.55±2.75^{a}	0.66±0.75^{b}
DTPA Extractable- Copper (ppm)	4.45±8.85a	1.08±1.33^{b}
DTPA Extractable- Manganese (ppm)	12.45±14.23	8.99±9.74^{b}
DTPA Extractable- Iron (ppm)	29.15±58.44^{a}	25.53±28.53^{b}

At the <0.05 probability level, distinct letters in each column indicate significant differences

Comparably, in the irrigated tomato-other vegetable-based cropping system, the available N P K values were from 300.15±325.50, 44.45±48.45, and 174.45±180.45 kg ha^{-1}; in the finger millet-fallow rainfed system, they were 175.46±180.25, 19.45±22.12, and 139.45±141.25 kg ha^{-1}, respectively. The irrigated system had much more accessible N, P, and K than the rainfed system. This was mostly brought on by increased usage of fertilizers rich in phosphorus, potassium, and nitrogen (Harinder and Jagdish, 2017). In all of the soils, the available NPK nutrient concentration ranged from low to medium.

The exchangeable calcium and magnesium contents in the soils of both cropping systems were determined to be adequate and comparable to each other, measuring 1.74±1.76 and 1.71±1.73 (C mol 100^{-1}) respectively. Sulfur was added to phosphoric fertilizers and organic matter, which may have contributed to the much greater accessible sulfur in the tomato other vegetable-based cropping system (12.50±15.00 ppm) compared to the finger millet-fallow rainfed system (7.50±9.00 ppm). All locations, however, have low-to-medium levels of accessible sulfur.

Zinc, copper, manganese, and iron were found to be above critical in all of the soil samples that were taken, indicating an adequate availability of these micronutrients in the soil for both rainfed and irrigated farming systems. The data also showed that in comparison to the finger millet-fallow rainfed system, which had Zn-0.66±0.75 ppm, Cu-1.08±1.33 ppm, Mn-8.99±9.74 ppm, and Fe-25.53±28.53 ppm, the tomato other vegetable-based cropping system had higher values Zn-1.55±2.75 ppm, Cu-4.45±8.85 ppm, and Fe-29.15±58.44 ppm. This could be explained by the addition of organic matter and Zn fertilizers. The irrigated tomato other vegetable cropping system's increased soil moisture content creates a favorable microenvironment for the more solubility and availability of DTPA extractable micronutrients.

CONCLUSION

When compared to a rainfed system, the irrigated tomato and other vegetable cropping systems had higher pH, EC, and SOC levels. The irrigated system has more accessible N, P, K, DTPA extractable Zn, Cu Mn, and Fe than the rainfed system. In addition, it has been shown that intensive farming has caused SOC to buildup in soils that are irrigated.

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