

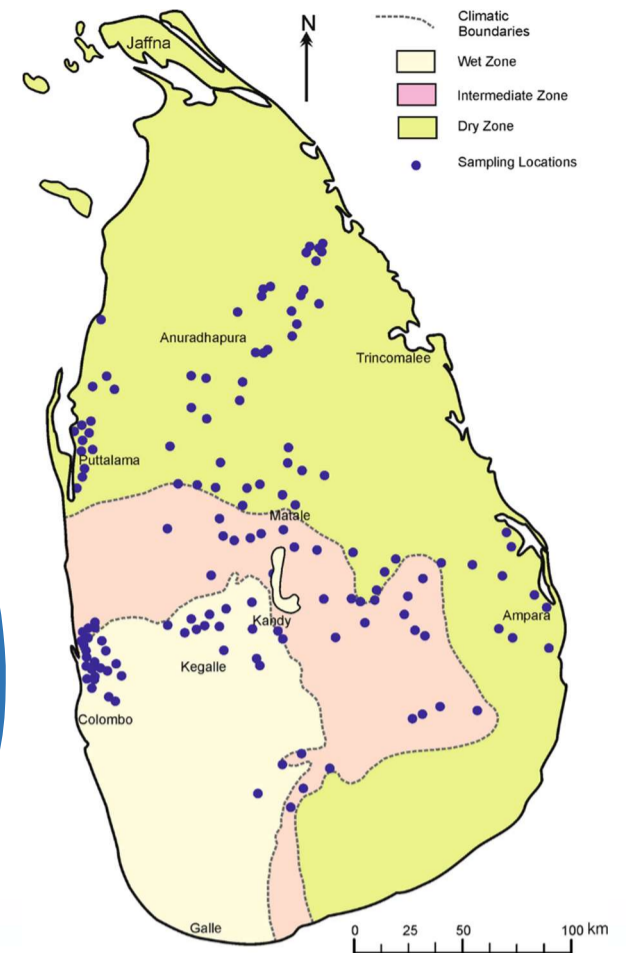


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Bioavailability of Major and Trace Elements in Paddy Soils from Different Climatic Zones of Sri Lanka

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Map of Sri Lanka showing climatic boundaries and sampling locations

INTRODUCTION

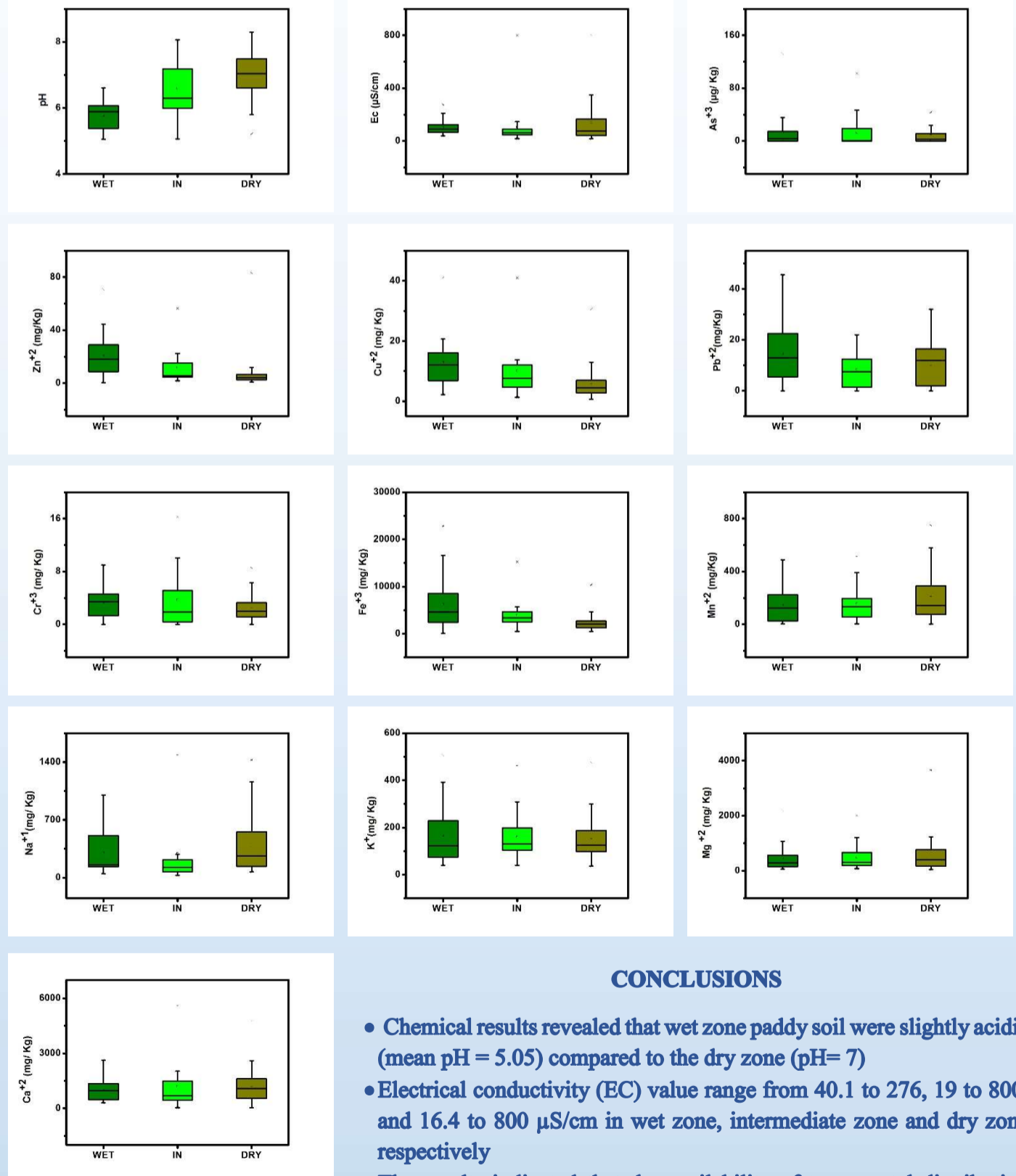
Rice farming is the most common agricultural practice in Sri Lanka. The principal cultivation season in the country known as "Maha", is from October to March and the subsidiary cultivation season, known as "Yala", is from April to September in Sri Lanka. There is enough water for the cultivation for all rice fields in Maha season nevertheless in Yala season is only enough water for cultivation of half of the land extent. According to the water usage, paddy land can be categorized as major and medium irrigated systems and rainfed systems. Rainfed systems are mainly found in the Wet Zone of the country which gets up to 2,000–2,500 mm of annual rainfall. It constitutes about one third of the country's total area and accommodates about 63% of the population. Paddy lands which cultivated under major and medium irrigated systems are found in dry zone in Sri Lanka which gets annual rainfall less than 1500mm. Due to the seasonal drought the major paddy producing season in the dry zone comes during the Yala season (Census and statistics dept.-2006).

In Sri Lanka, paddy soils cannot be considered as natural, but are highly modified by anthropogenic activities such as puddling, submerging and by artificial fertilizer applications. Therefore, paddy soil has been highly contaminated due to application of chemical fertilizers. Trace metal pollution in soil is of a great concern because of long term sink of potential toxic elements in soil. Accumulation of these metals in human body with entering via various agricultural products has been given high attention recently due to their possible health impacts. Bioavailable fraction of metals is very important to predict the risk of the metal to human body rather than comparing the total. So this study was focused to study the distribution of bioavailable fraction of trace and major elements in paddy soils from wet zone, dry zone and intermediate zone in Sri Lanka.

MATERIALS AND METHODS

- Total of 120 soil samples were collected from wet, dry, and intermediate zone
- Soil samples were dried at 35° C in an oven and then sieved to obtain the 2 mm fraction. Subsamples of this fraction were finely ground with an agate ball mill (FRITSCH)
- Soil physical parameters such as pH, EC, and Oxidation-Reduction Potential (ORP) were measured using 1: 5 w/v slurry
- Powdered soil samples, bio available fraction was extracted with diluted HCL and trace ions such as As³⁺, Zn²⁺, Cu²⁺, Pb²⁺, Cr³⁺ and major ions Na⁺, K⁺, Ca²⁺, Mg²⁺, Mn²⁺, Fe³⁺ were measured using Atomic Adsorption Spectrometer (AAS)

Results and Discussion



WET - Wet Zone
 IN - Intermediate Zone
 DRY - Dry Zone

CONCLUSIONS

- Chemical results revealed that wet zone paddy soil were slightly acidic (mean pH = 5.05) compared to the dry zone (pH= 7)
- Electrical conductivity (EC) value range from 40.1 to 276, 19 to 800, and 16.4 to 800 μS/cm in wet zone, intermediate zone and dry zone respectively
- The results indicated that the availability of trace metal distribution from intermediate and wet zones are much higher compared to that of the dry zone
- Major metals of Na⁺, Ca²⁺, Mg²⁺, Mn²⁺ higher in dry zone and Fe³⁺ and K⁺ concentrations are high in wet zone region
- Bioavailability of metals can be affected by intensive agricultural activities, soil properties and climatic conditions.