Biochar: A Sustainable Approach for Food Waste Management to Reduce Water Stress and Enhance Plant Growth

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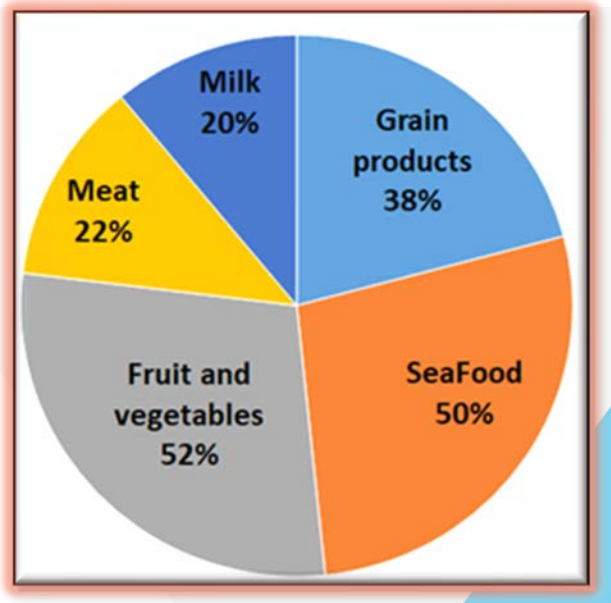
INTRODUCTION



Global food waste generation: 1.3 billion tonnes (FAO, 2017)

In comparison to other commodities 630 MMT of fruit and vegetable are wasted with a total loss of 10.6 billion USD

FOODWASTE VALORIZATION

Reduce overburden on waste management

Improved agricultural productivity

Reduce water stress in agriculture land

Energy conservation and climate change

Improved bioeconomy

Carbon foot print reduction

OBJECTIVES

- **Production of biochar from mixed vegetable wastes**
- **Application of biochar in sustainable agriculture**
  - **to improve soil fertility and plant growth**
  - **to increase soil water retention capacity**

MATERIALS AND METHODS

Biochar production and characterization

Drying at 75°C

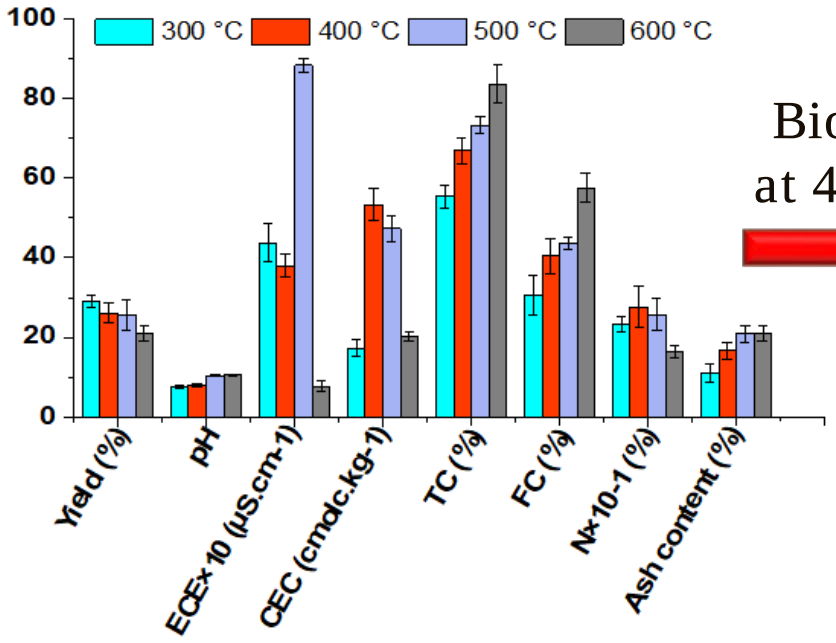
Pyrolysis at 300-600 °C

Grounded Biochar

Biochar characterization

Application

RESULTS AND DISCUSSION



Biochar properties at different pyrolysis temperature

Biochar at 400 °C

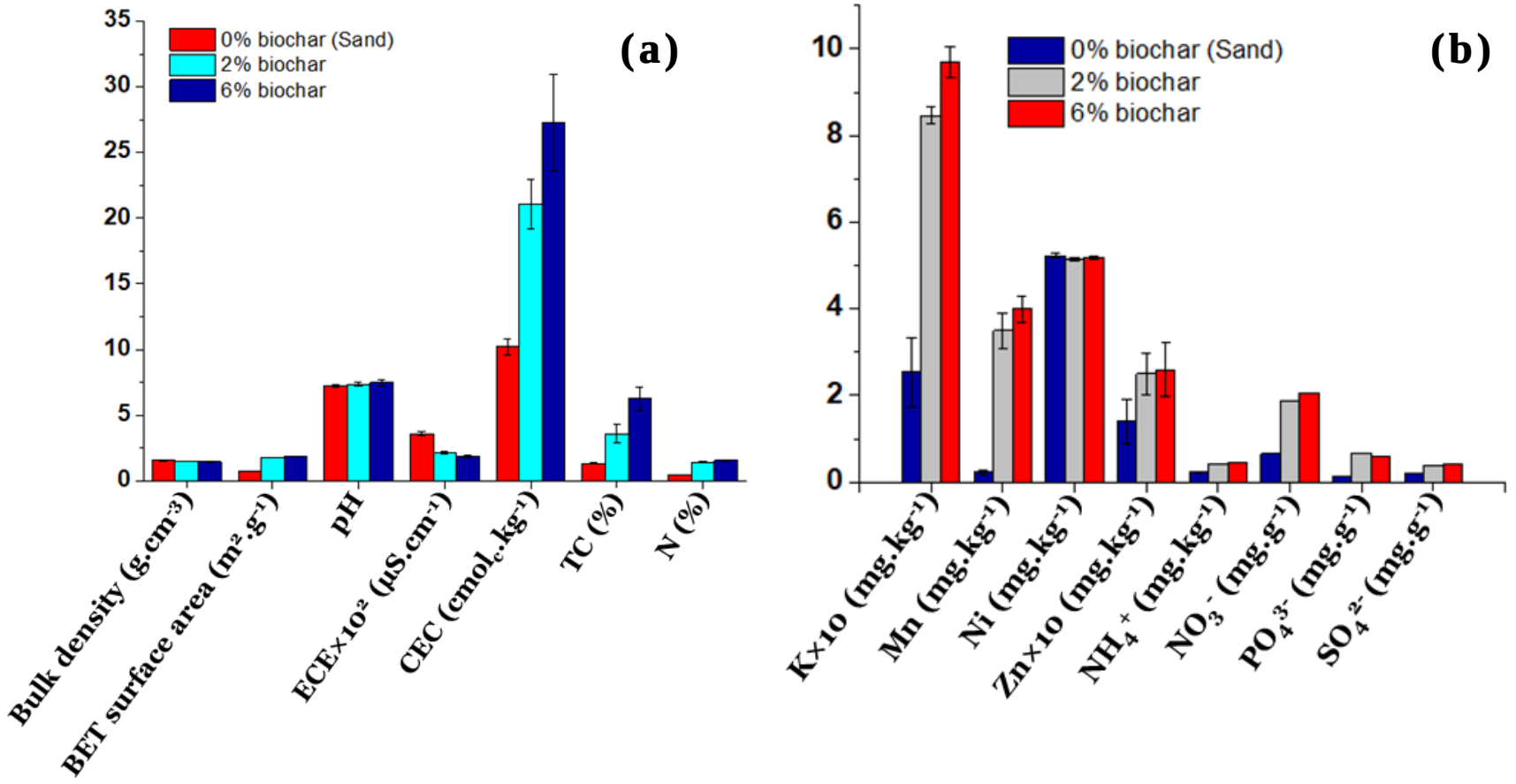
(0%) (2%) (6%)

Chickpeas

60 days of test

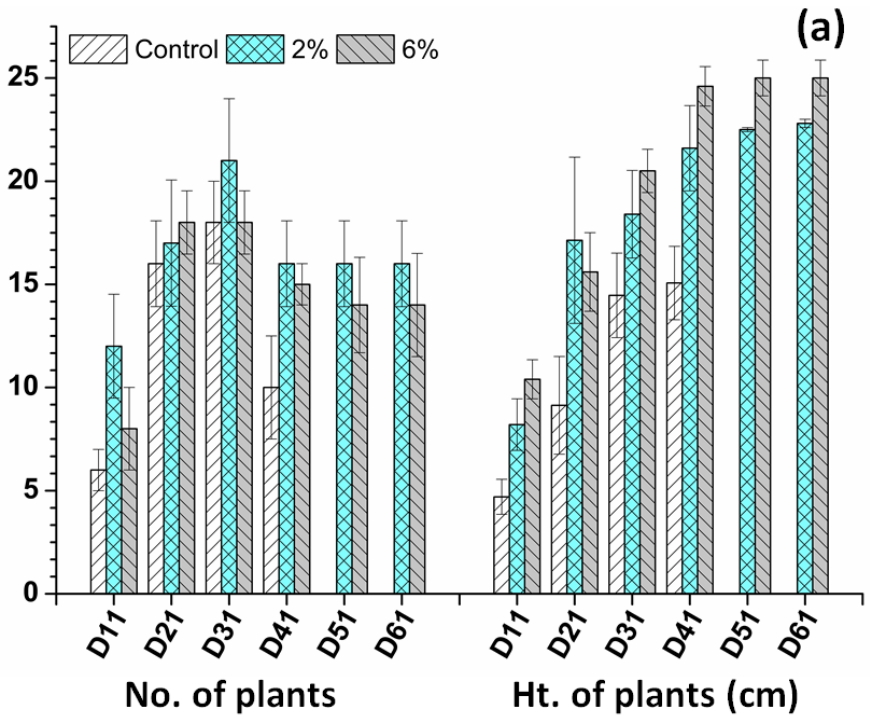
Plant growth test
&
Water retention test

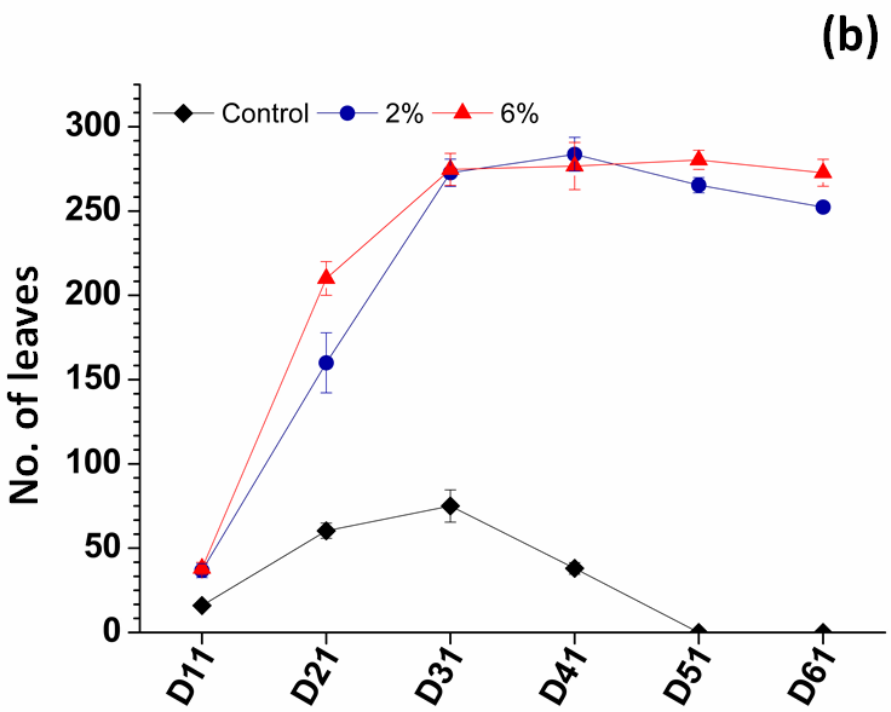
Different properties of biochar amended soil



ECE: electrical conductivity; CEC: cation exchange capacity; TC: total carbon; N: nitrogen; K: potassium; Mn: manganese; Ni: nickel; Zn: zinc

Effect of biochar on chickpea growth





No.: number; Ht.: height; D: day

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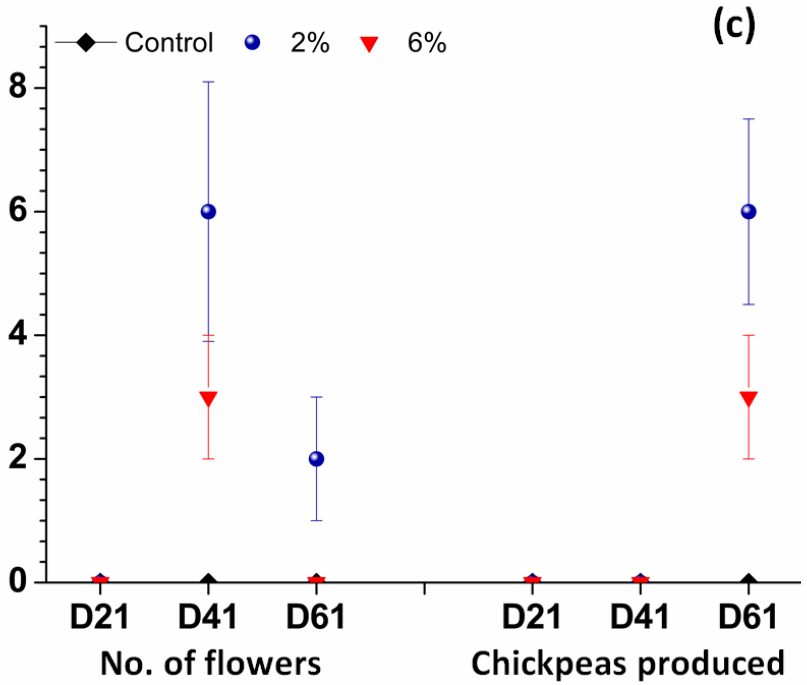
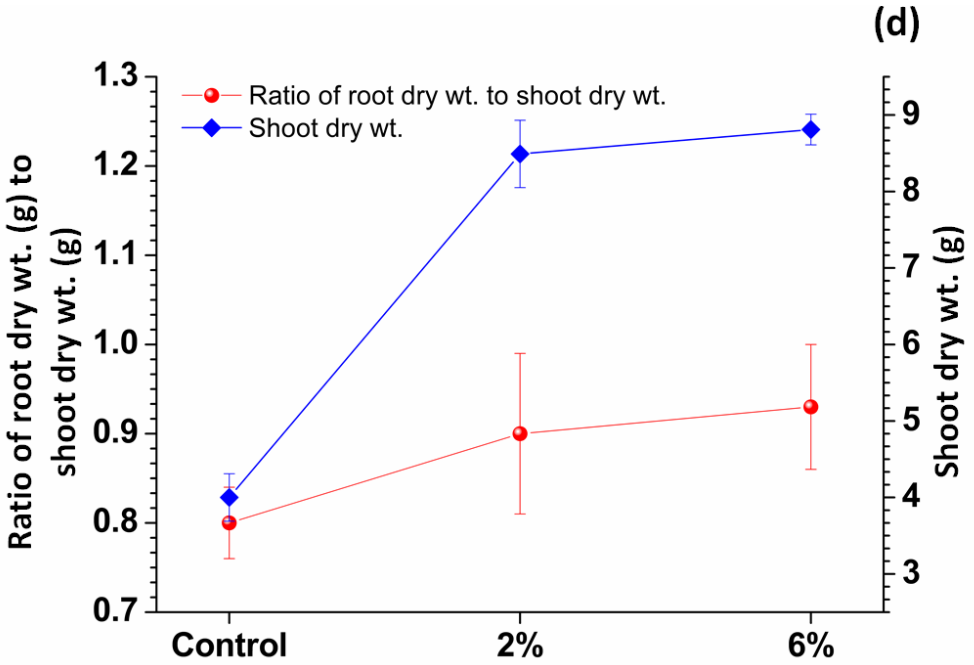
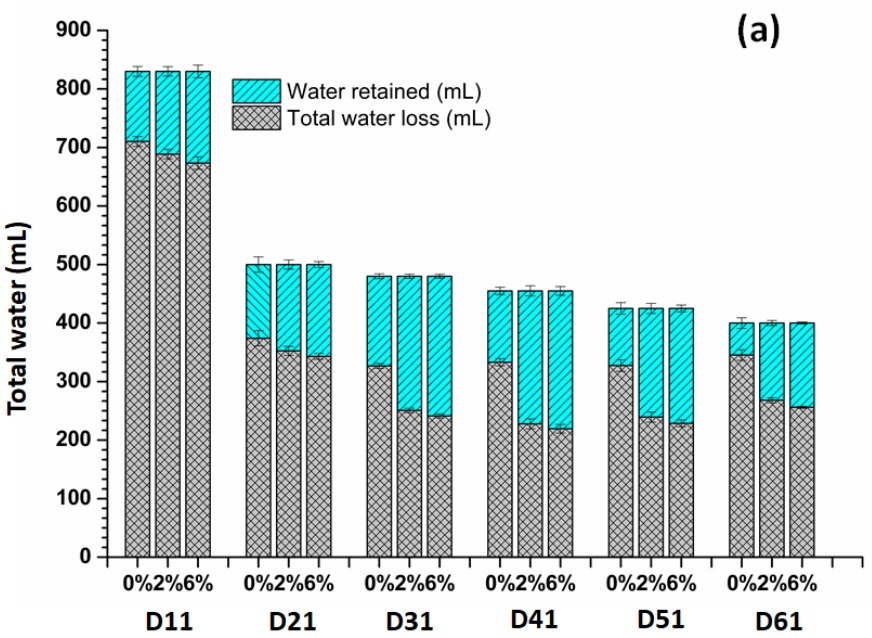


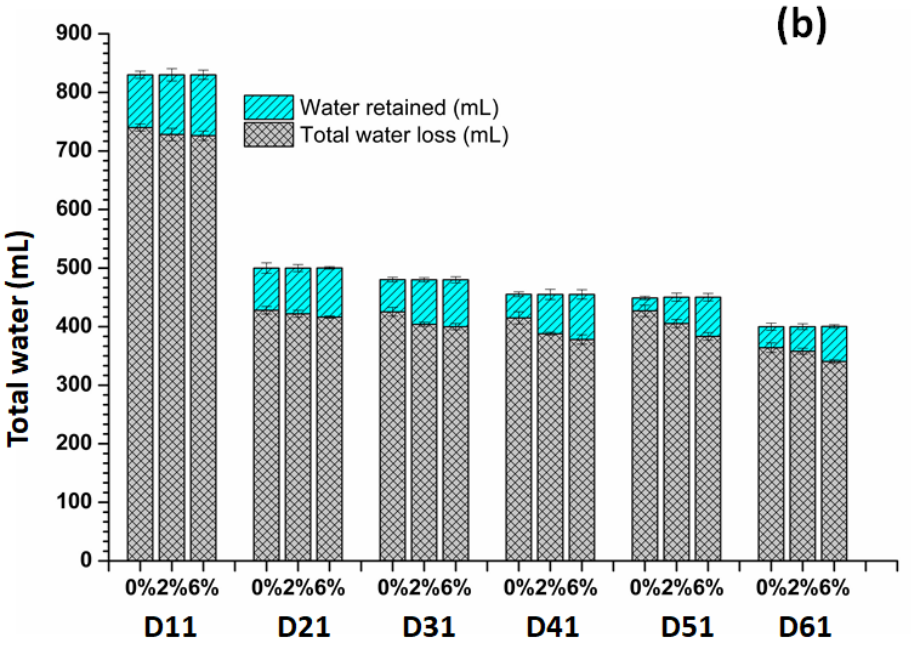


Wt.: weight; No.: number; D: day

Biochar impact on water retention capacity

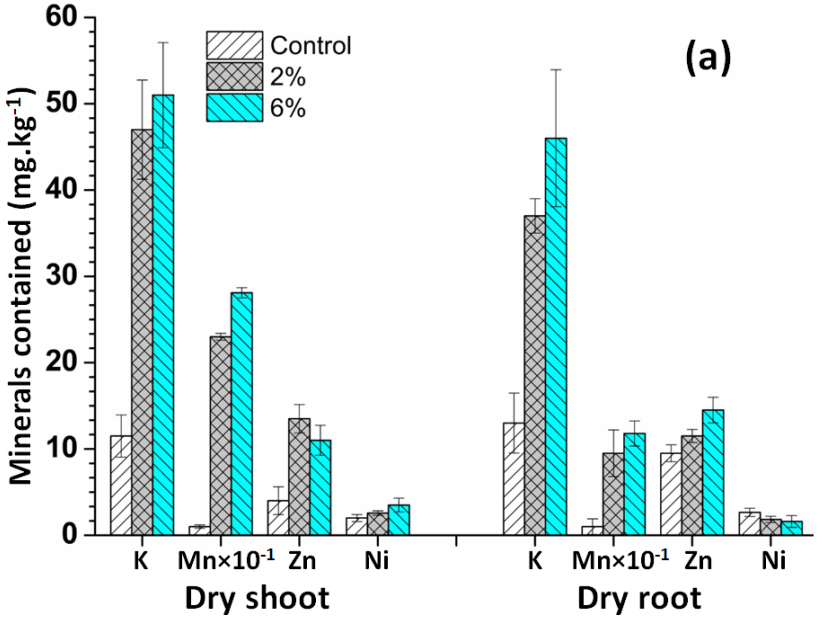


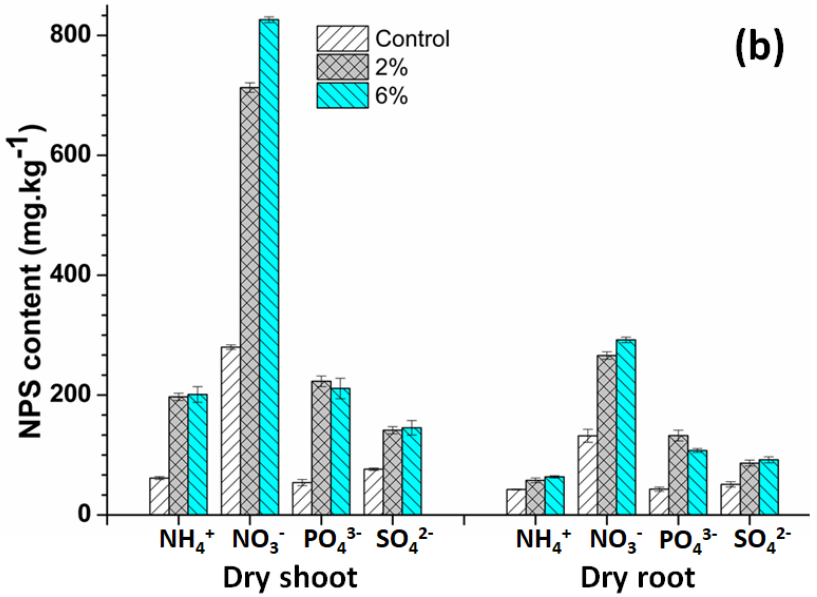
Unplanted pot



Planted pot

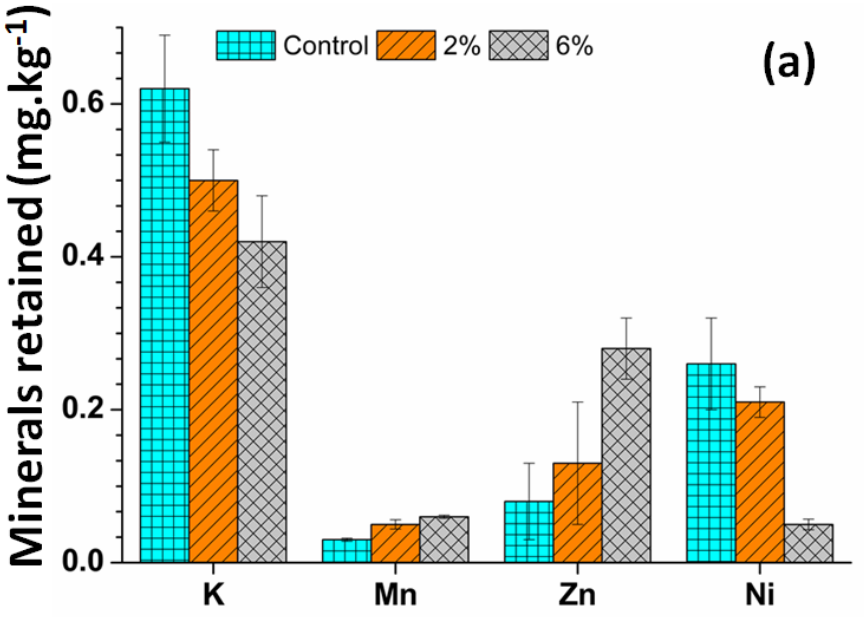
Nutrients content by plant shoots and roots

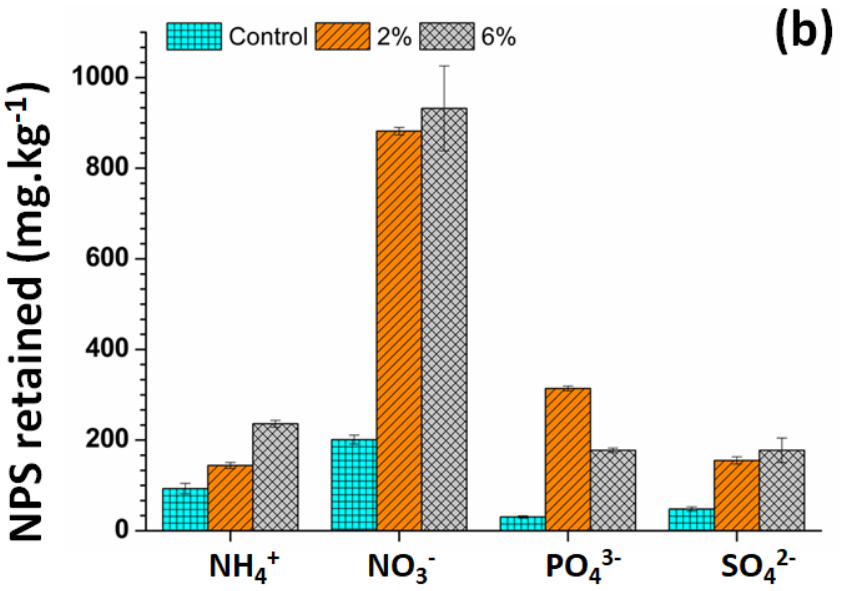




N:nitrogen; P:phosphorous; S:sulfur; K: potassium;
Mn: Manganese; Zn: zinc; Ni: nickel

Nutrients retained in soil after plant harvest





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RESULTS AND DISCUSSION

- The study demonstrates production of biochar from mixed vegetable wastes is a suitable amendment for arid agriculture land to cultivate crops like chickpea.
- 2% biochar loading maximizing plant growth and water retention capacity of soil.
- Both 2% and 6% biochar loadings increases the nutrient content of the shoot and root biomass, particularly in relation to K and NO_3^-.


Thank
you