

Biochar application effects on soil properties and lettuce yield



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OVERVIEW

- Application of biochar (a carbon-rich material created from pyrolysis of waste biomass) to soils has been used to promote soil fertility and plant yield, aggregate stability and associated soil structure, porosity, and water-holding in agricultural soil, in addition to increasing soil carbon (C) content and in alleviation of non-point source pollution to aquatic systems.
- However, variable results have been documented in the effectiveness and outcomes resulting from biochar application. Importantly, variability in plant and crop yield has been noted, where different studies have shown significant increases, decreases, or no change in plant yield following biochar application.
- In collaboration with West Virginia Conservation Districts, we implemented a demonstration trial to assess the growth response of a lettuce grown with either compost alone, 10%, 20%, or 40% biochar, relative to a control with no amendments added.
- Lettuce growth and soil parameters related to fertility were measured during the 2023 growing season.

HYPOTHESES

Increasing amounts of biochar will result in improved lettuce yield and associated soil fertility metrics, above compost alone and control.

METHODS

- Five plots (5 x 10 ft each) at the WVU Organic Farm were established.
- Plots were treated with either nothing, a compost material alone or three increasing amounts of a biochar/compost mixture (GrowChar™, Metzler Forest Products, Reedsville, PA; material analysis attached) and then tilled to incorporate.
- Lettuce (*Lactuca sativa*, Chalupa variety) seedlings were planted in May 2023 and irrigated.
- Lettuce height was measured in June and soil samples were collected in August 2023.
- Soil parameters included soil moisture contents, pH, organic matter, and nitrate content.



Control – no amendment

Visible differences in plant health at end of growing season, August 2023. Note yellowing and brown margins in plants grown under control (above) relative to greener, fuller plants grown with 40% biochar added (below).



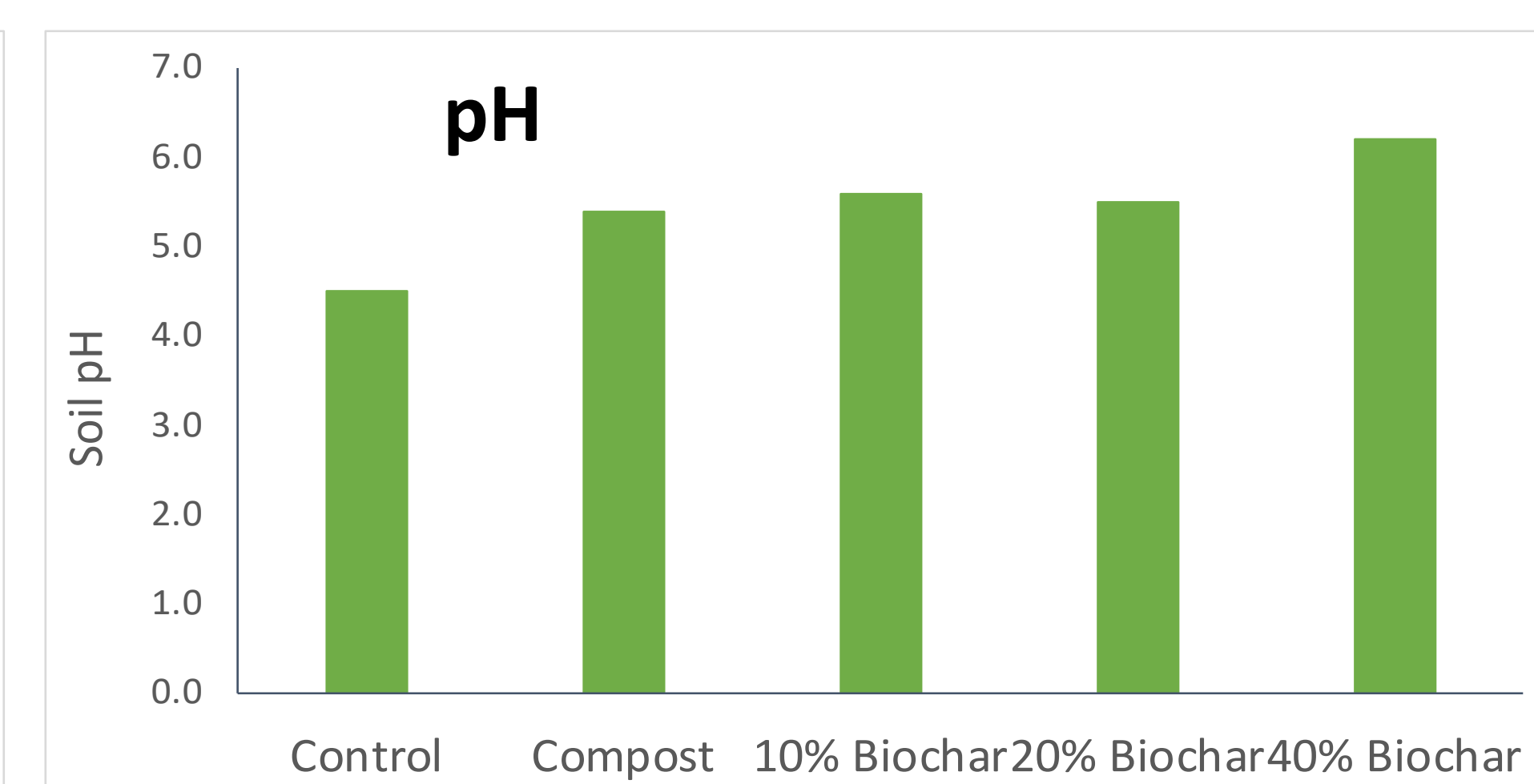
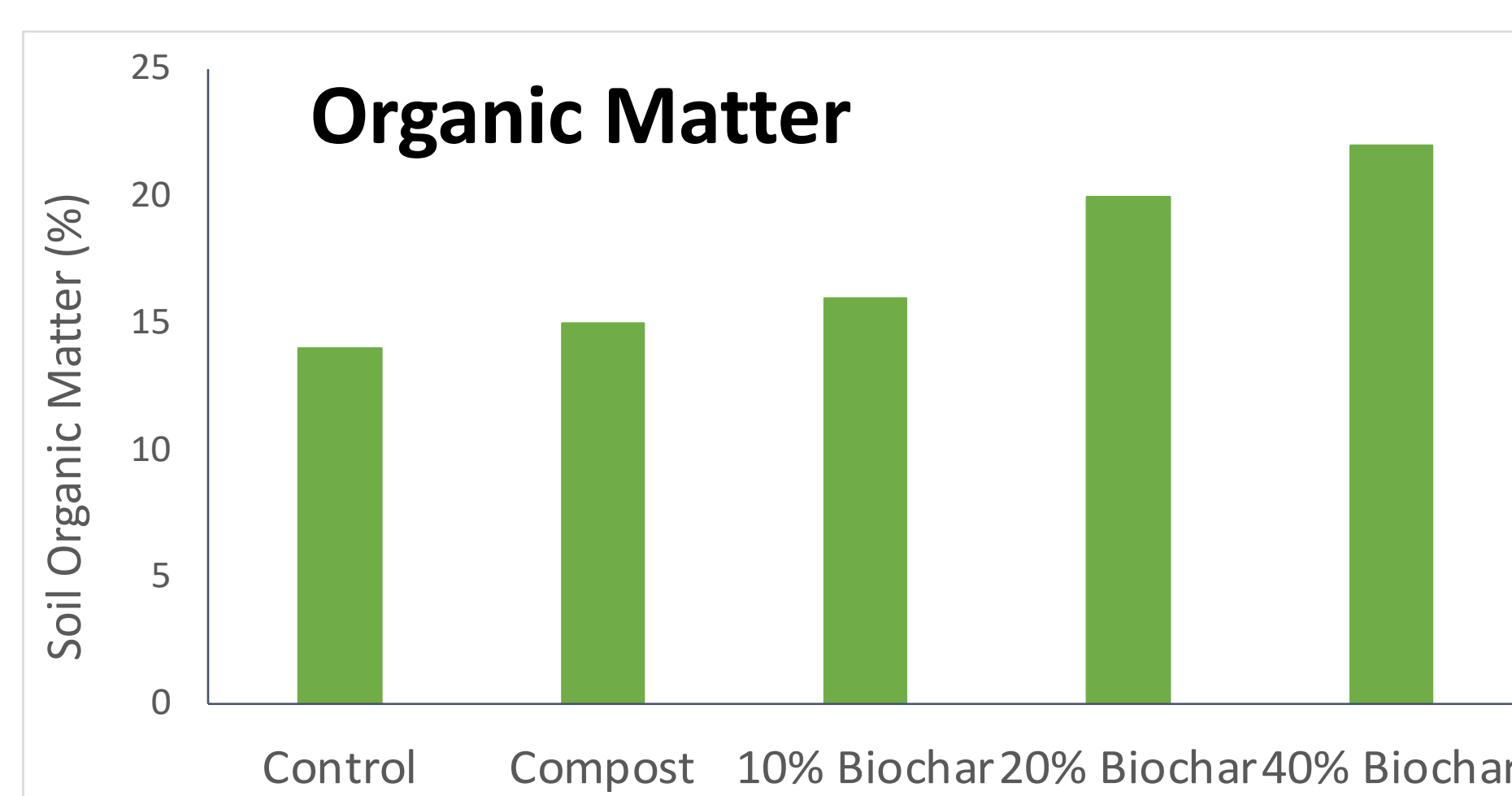
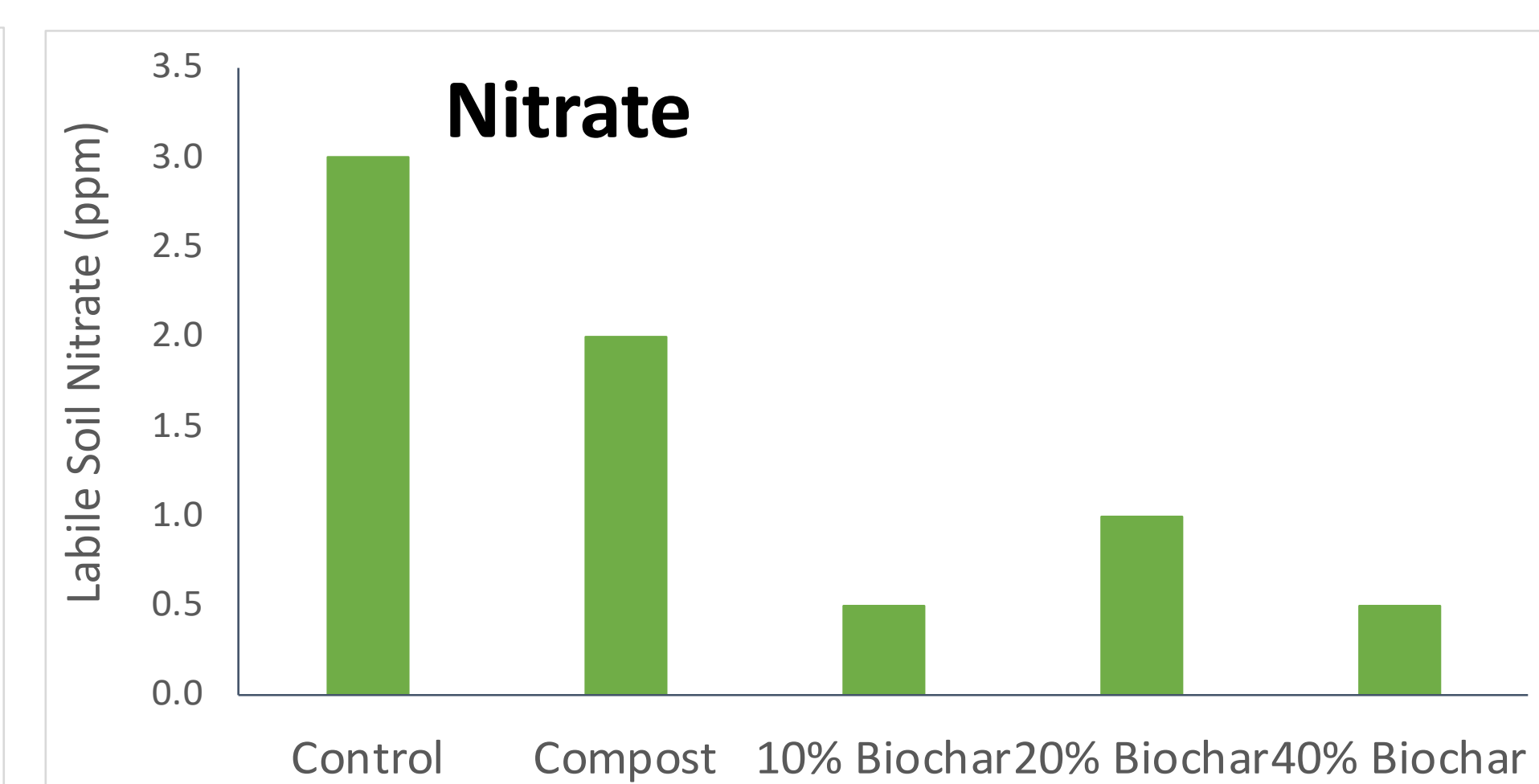
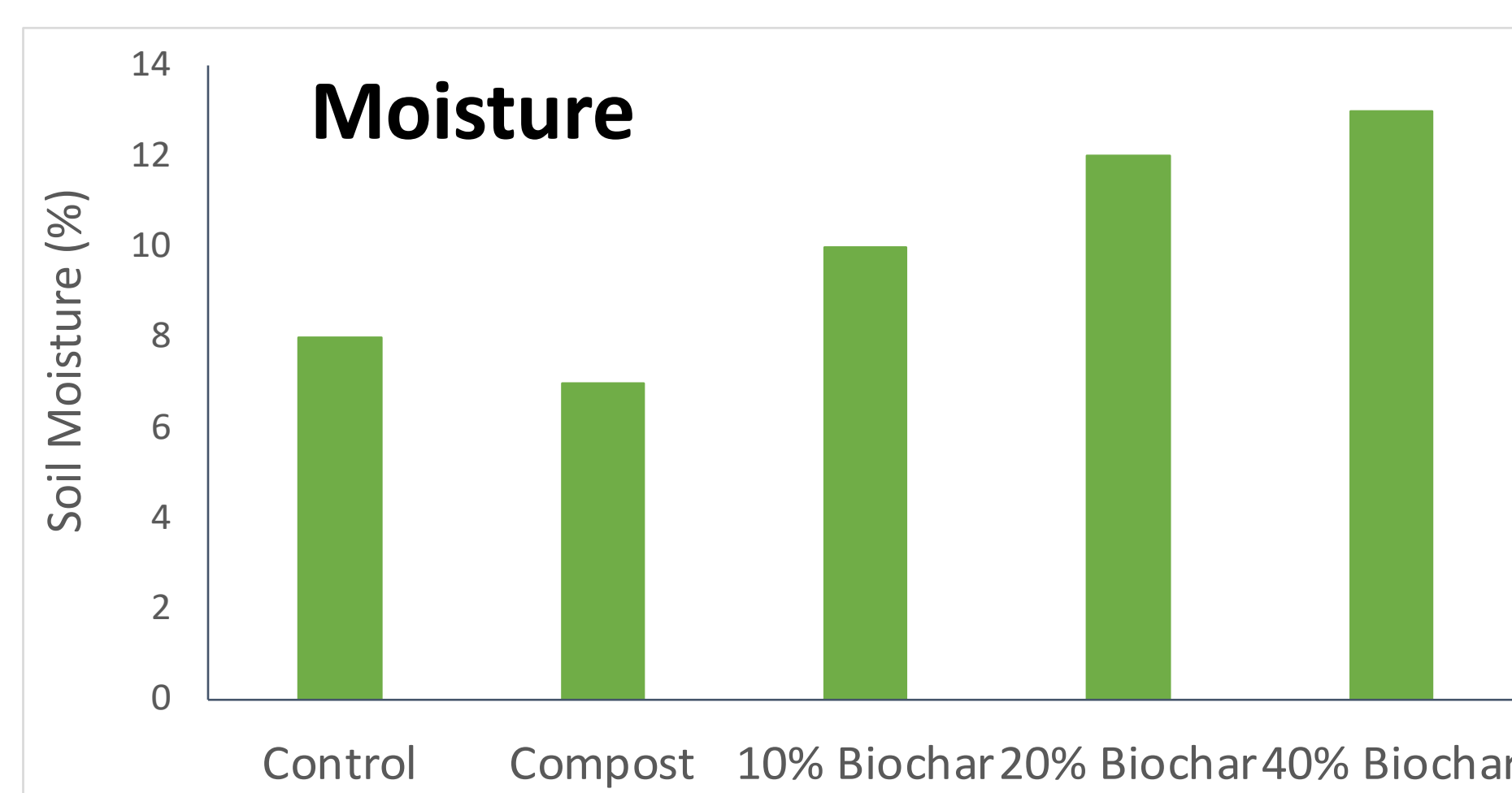
40% Biochar



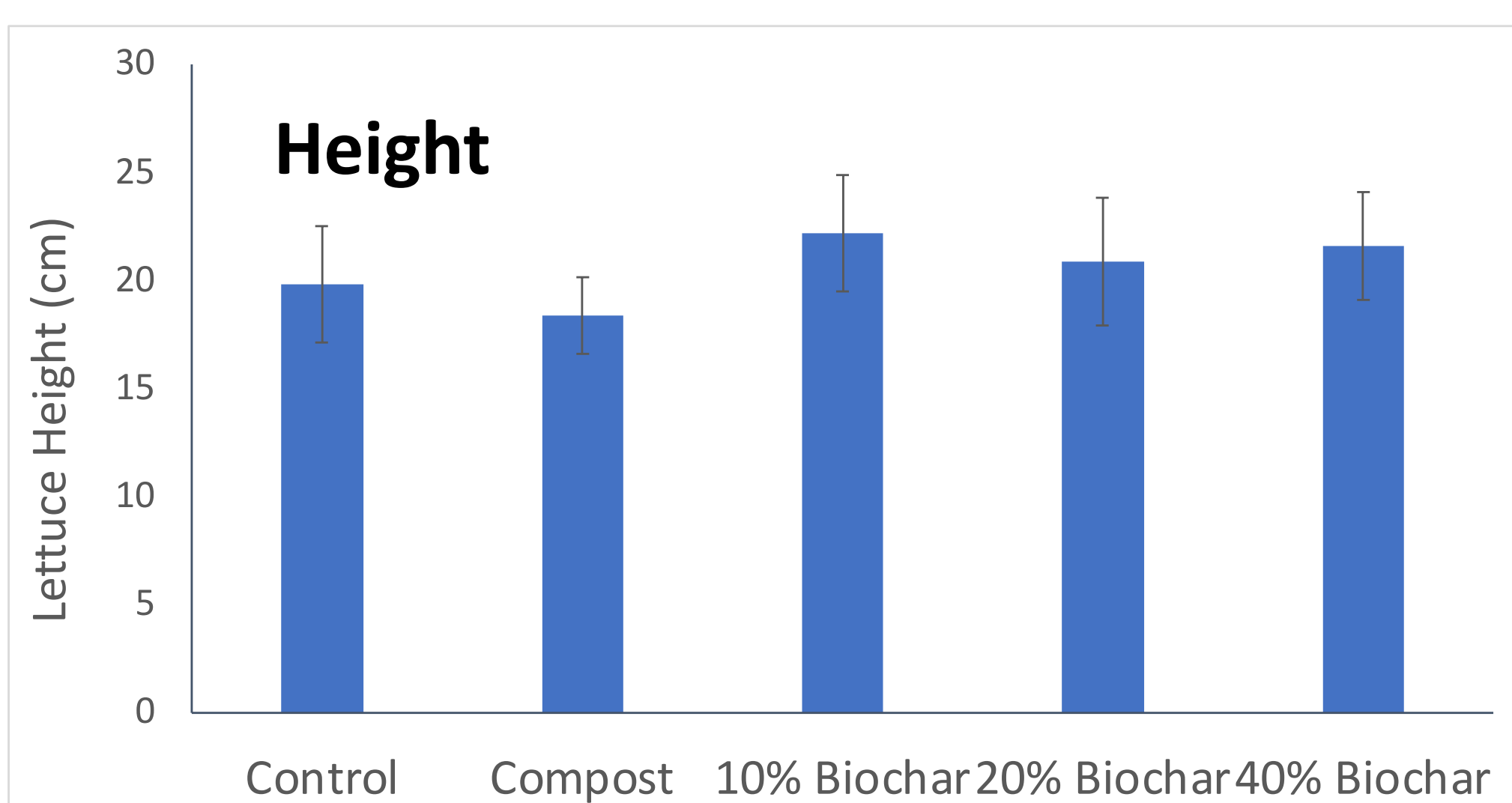
Biochar material



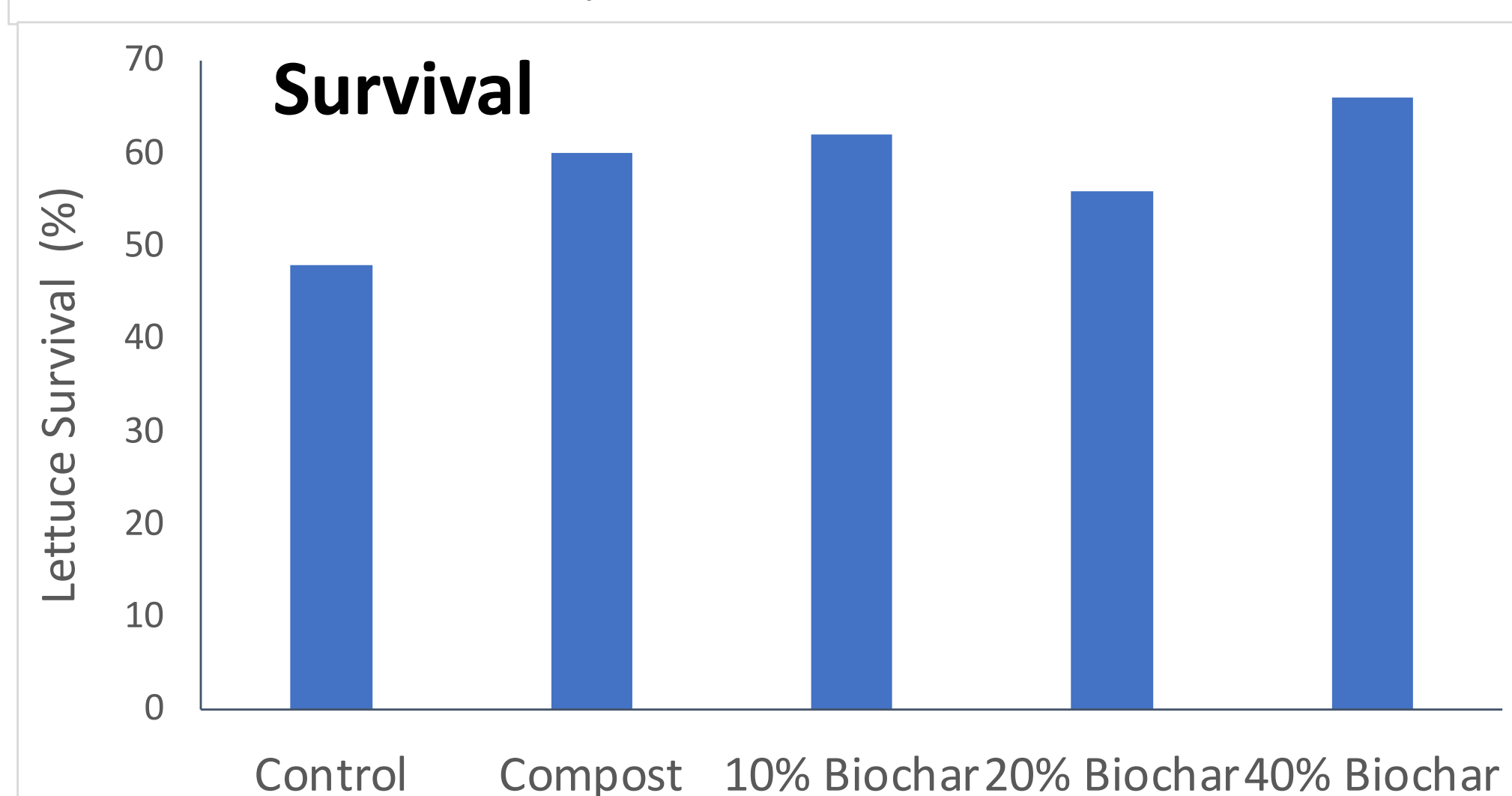
SOIL RESULTS



PLANT RESULTS



No differences in plant height occurred as measured in June 2023



Plant survival was increased by 18% over control with 40% biochar addition.

Soil fertility parameters of soil moisture, organic matter, soil pH each increased with increasing biochar, whereas leachable nitrate decreased.

CONCLUSIONS

Results suggest an improvement in each of the soil metrics measured, Though no clear improvement to plant yield occurred, plant survival and visual health was significantly improved, likely related to improved soil moisture.

ACKNOWLEDGEMENTS

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