Canola Straw Biochar Properties Affect its Seed Characteristics for Struvite Crystallization

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Background

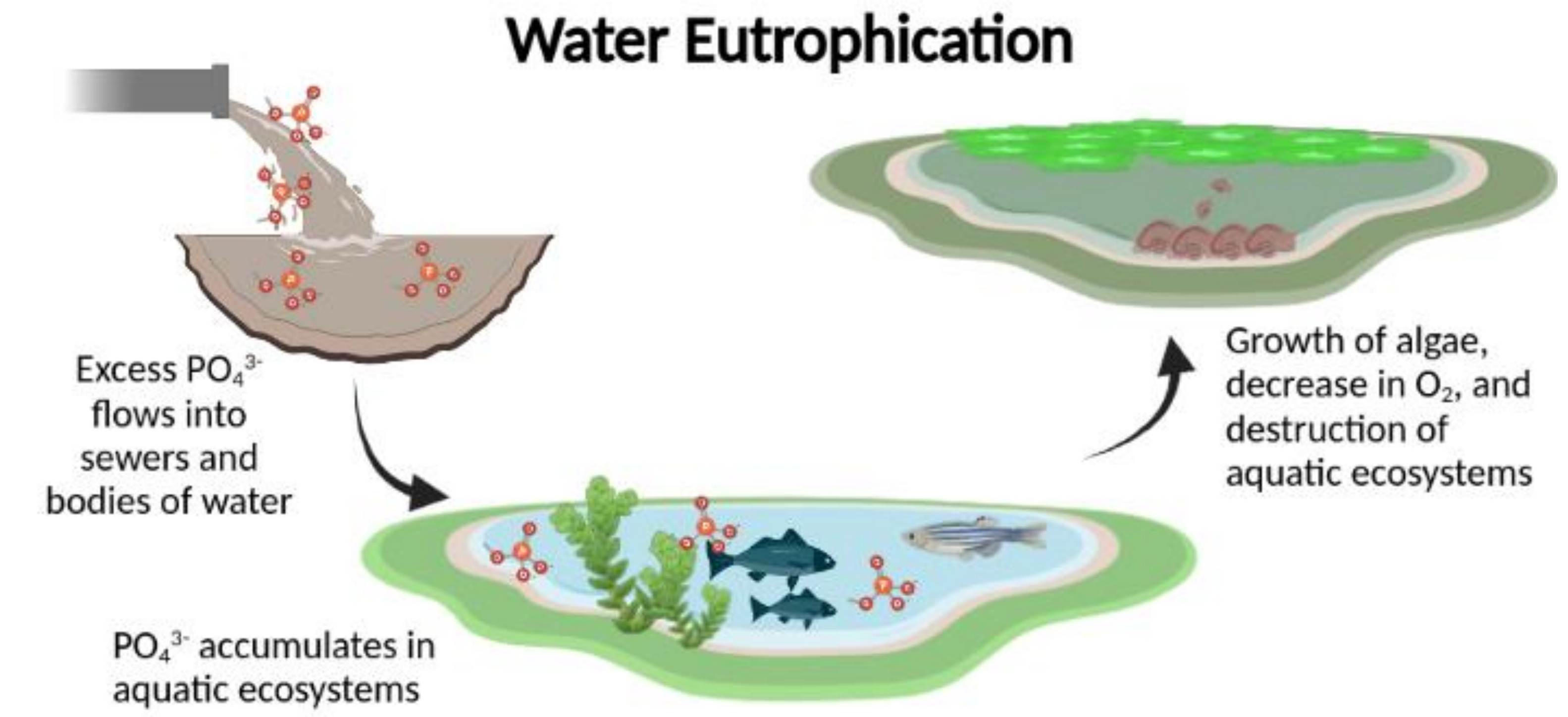

Figure 1: Causes of nutrient deposition in natural aquatic systems.

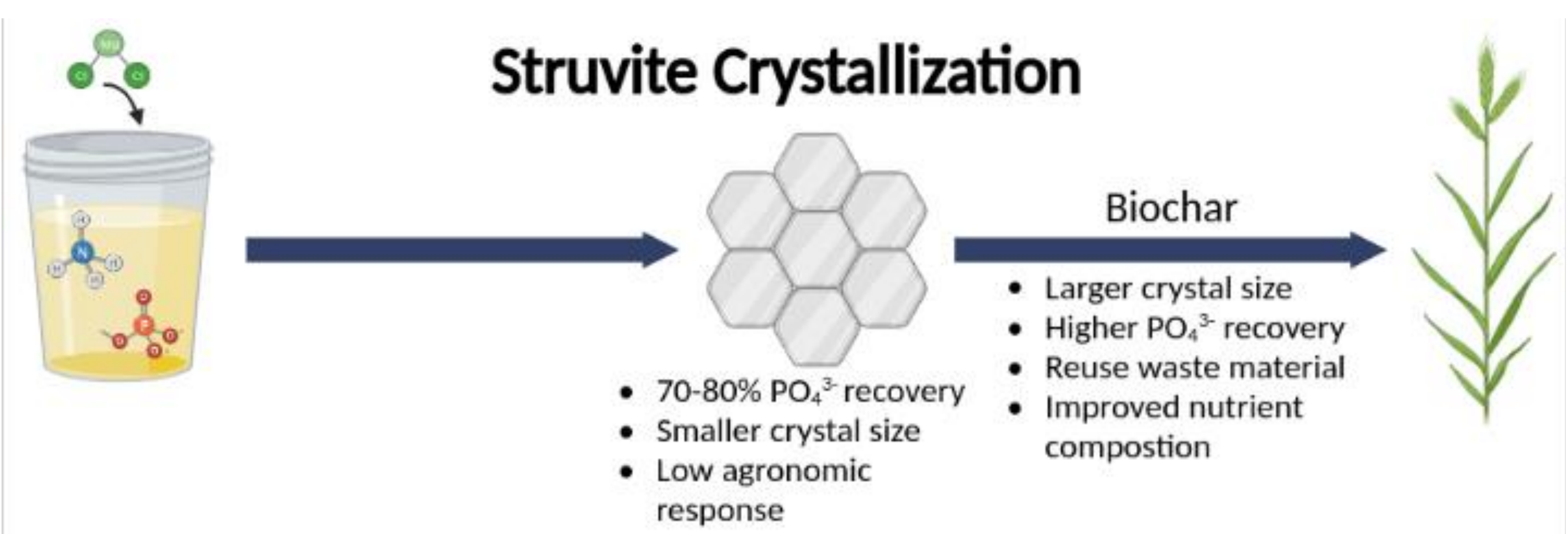

Figure 2: Graphical abstract for the proposed work.

- Global demand for PO_4^{3-} is increasing and supply of PO_4^{3-} rock is decreasing. As it is a non-renewable resource, we must find other ways to recover PO_4^{3-}.

Objectives

1. To determine the effect of pyrolysis temperature on the properties of Canola Straw (CS) biochar.
2. To evaluate the influence of surface and physicochemical properties of CS biochar on its seeding characteristics.

Methods

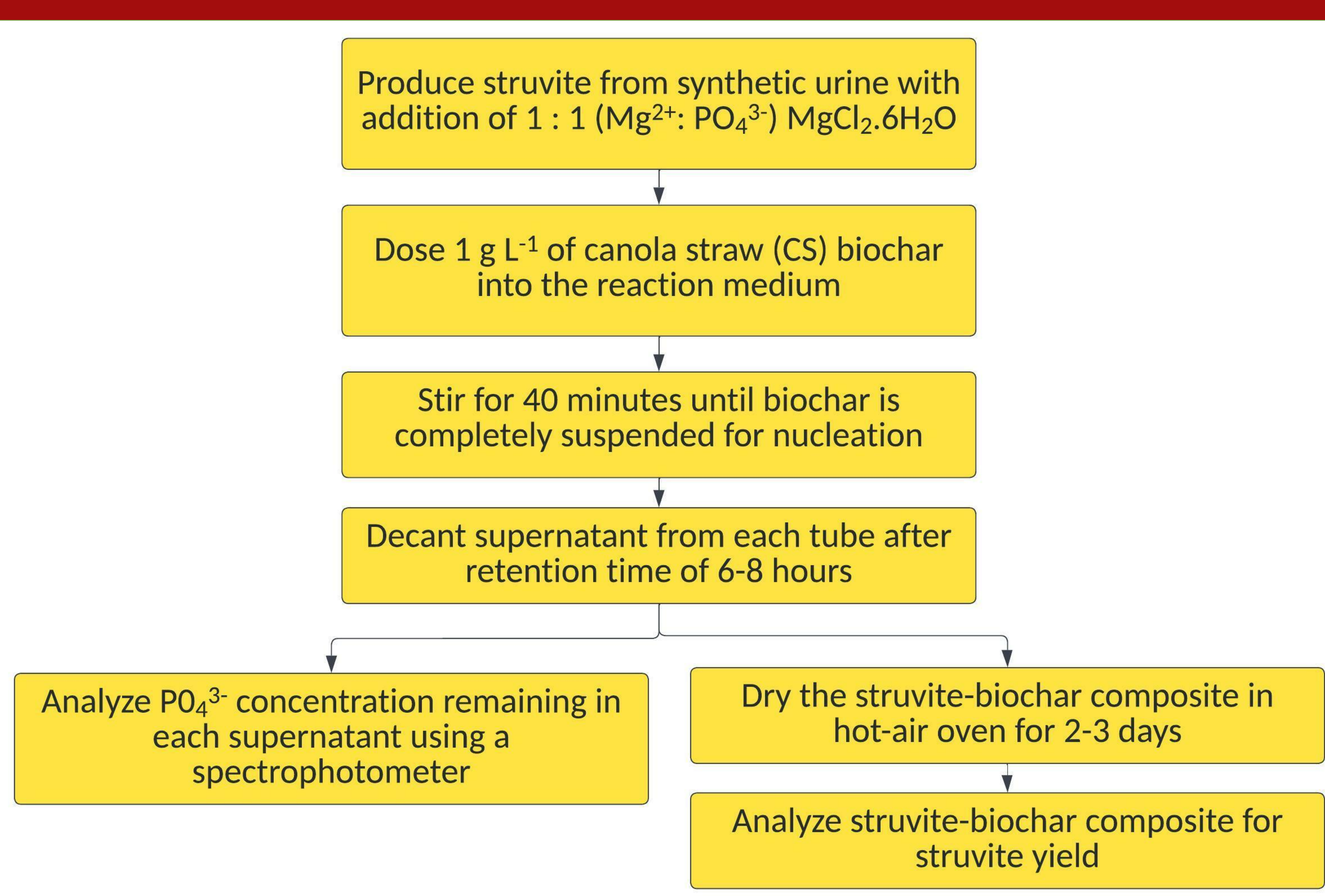

Figure 3: Flowchart showing the overall methodology of the work

Instruments Used:

a) Shaker

b) Hot-Air Oven

c) Spectrophotometer

Results

Pyrolysis Temperature (°C)	Yield (%)	pH	Electrical Conductivity (dS m^{-1})
300	41.9	8.9	4.8
400	31	9.6	4.6
500	29.8	12.1	7.2

Table 1: The effect of pyrolysis temperature on basic physicochemical properties of CS biochar.

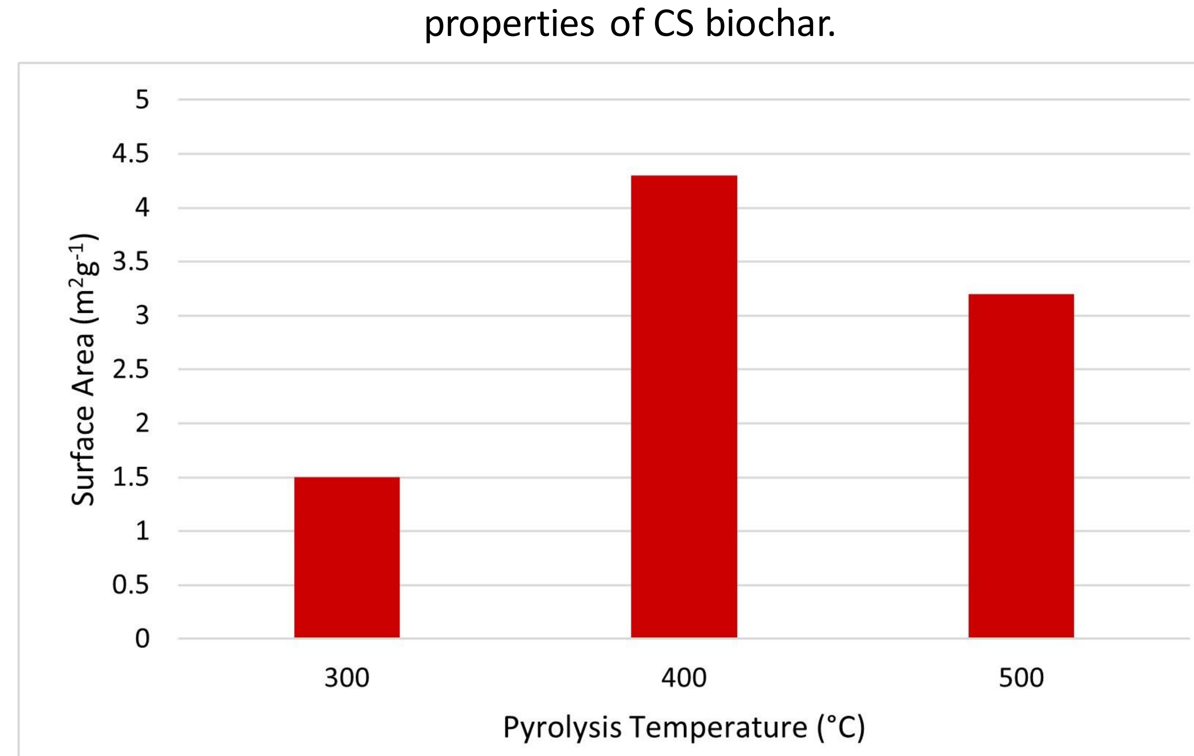

Figure 4: The effect of pyrolysis temperature on the surface area of CS biochar

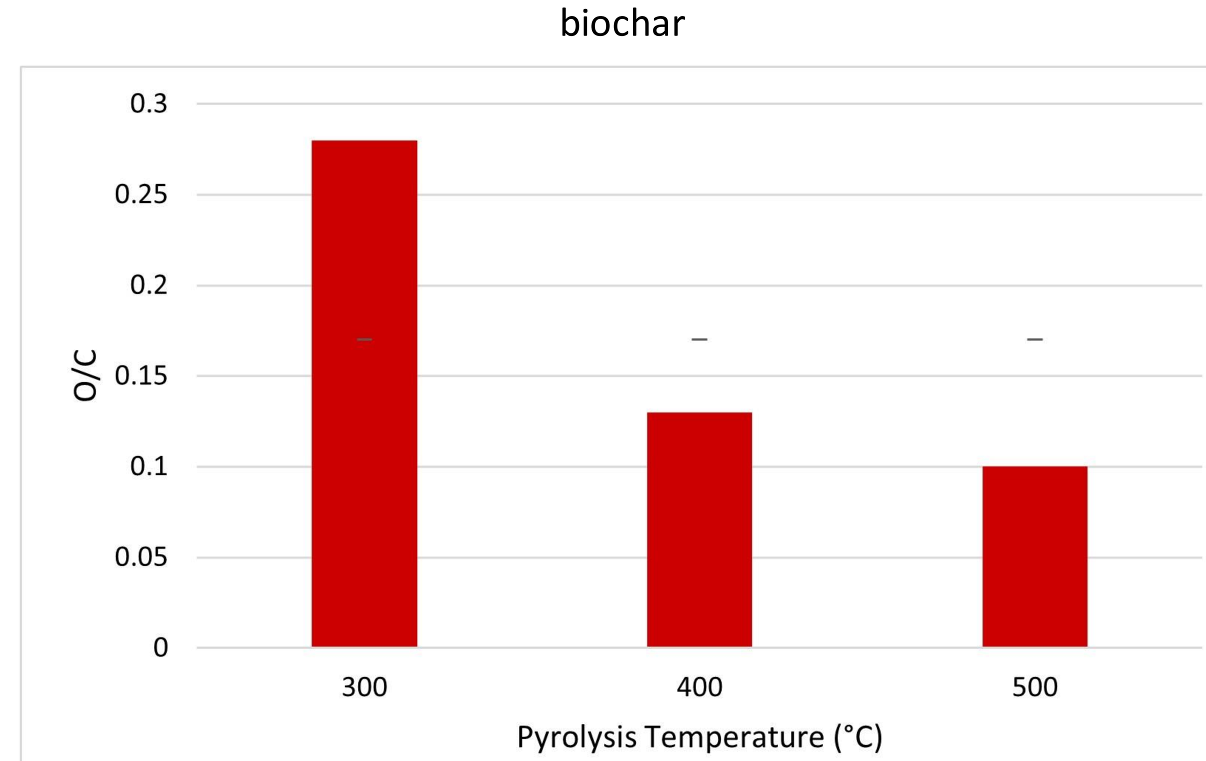

Figure 5: The effect of pyrolysis temperature on the O/C ratio of CS biochar

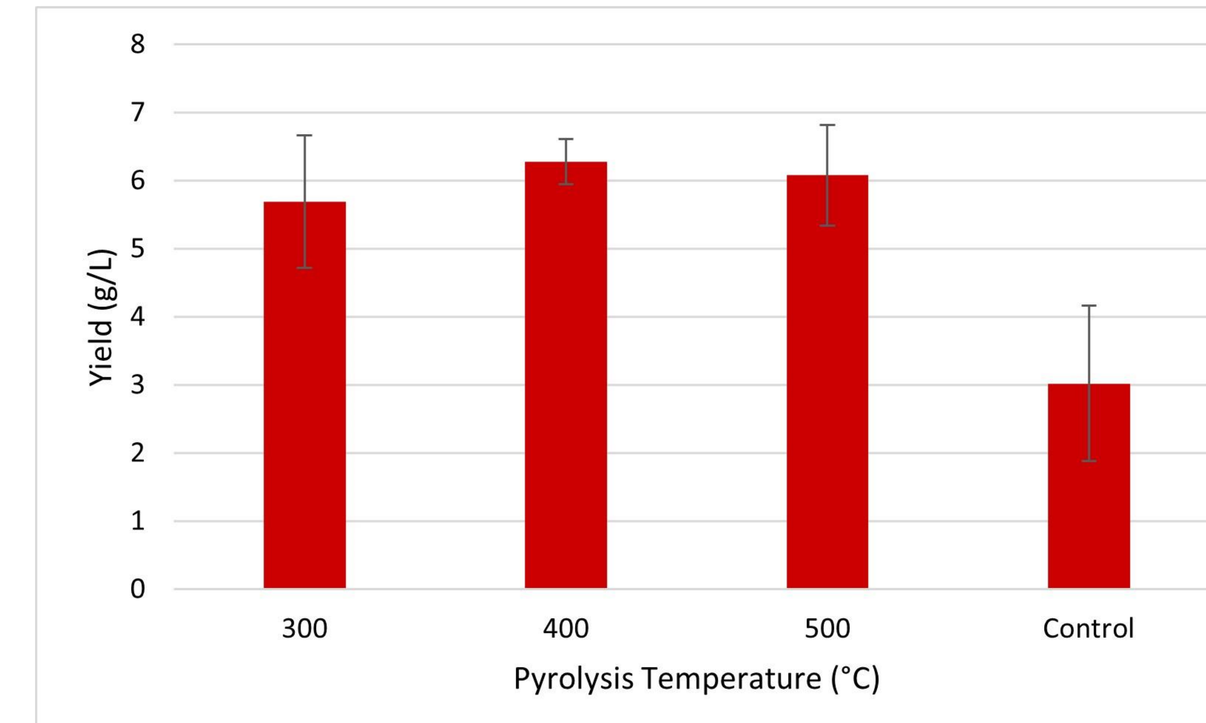

Figure 6: Struvite yield obtained with respect to seeding CS biochars produced at different pyrolysis temperatures.

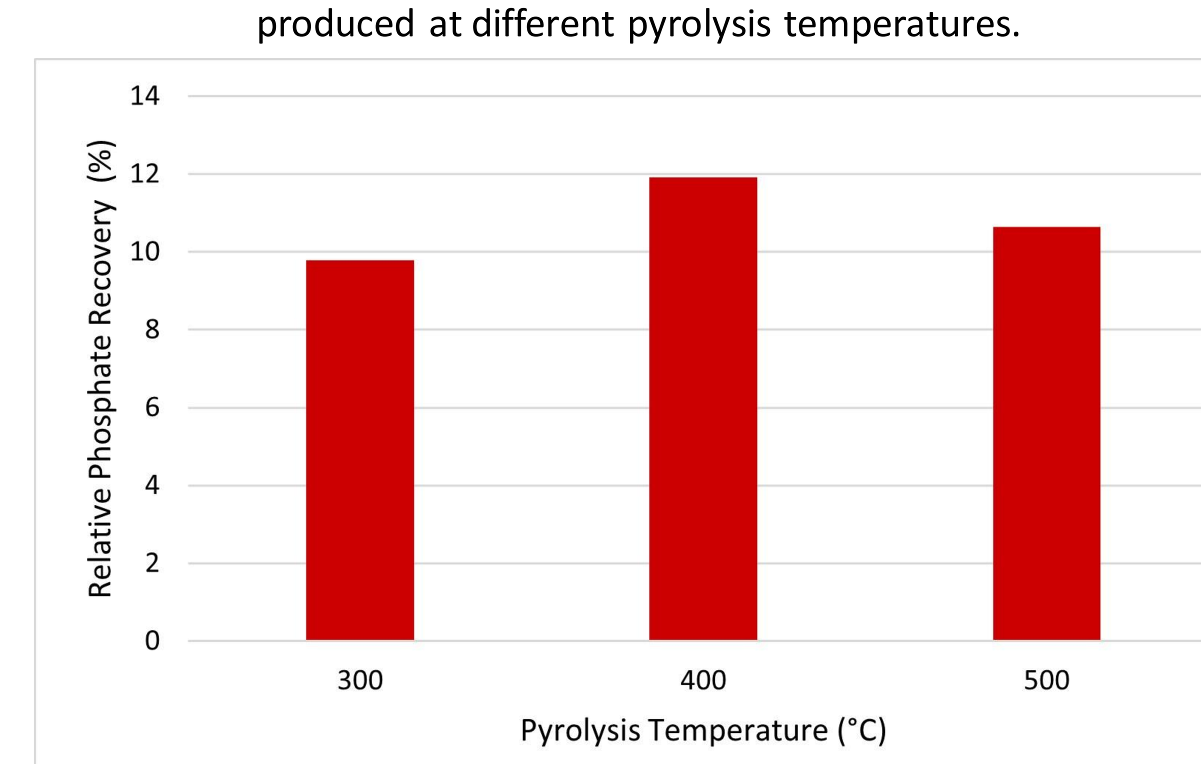

Figure 7: The relative increase in the PO_4^{3-} recovery with the addition of CS biochar seeds produced at different pyrolysis temperatures.

Conclusion

1. Biochar produced at pyrolysis temperature 400 °C performed as the best seeding material due to comparatively higher surface area, struvite yield, and PO_4^{3-} recovery.
2. The hydrophobicity of CS biochar produced at 400 °C was optimum for seeding, which correlated well with the experimental results.

References

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