



Ben-Gurion University
of the Negev



BIDR
The Jacob Blaustein
Institutes for
Desert Research



ZIWR
The Zuckerberg Institute for
Water Research

Adsorption of ammonium from AnMBR effluent using activated hydrochar as a potential fertilizer

Angesom A Geberetsadkan, Yonas Zeslase Belete, Amit Gross, Roy Bernstein



Introduction

WWTP



Sludge



<https://www.pt.endress.com/en/endress-hauser-group/Case-studies-application-notes/whitepaper-orthophosphate-measurement>

Sludge cause impacts such as :

- The risk of nutrient leaching to water bodies
- Impacts soil biodiversity
- Greenhouse gas emissions

Valorization of wet organic sludge

Conventional methods: Anaerobic digestion, composting, incineration, landfilling etc.

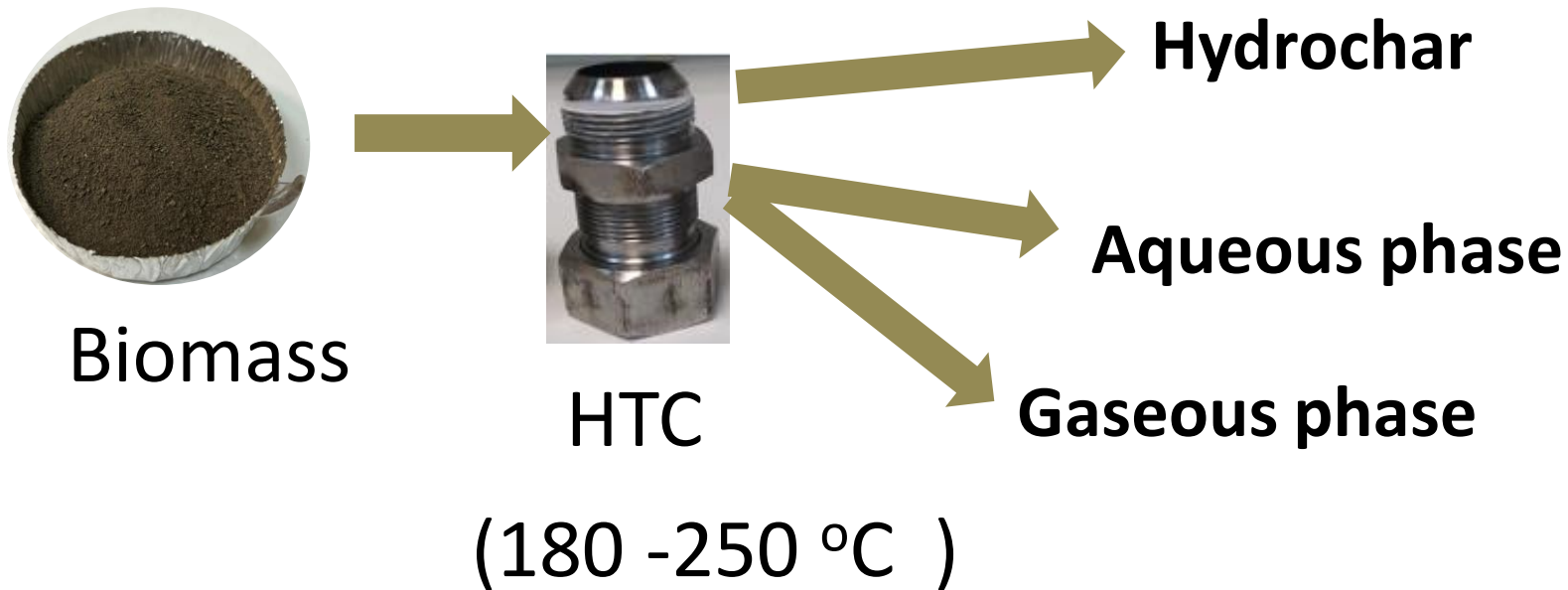
Limitations

- Produce product with pathogens.
- Environmental issues such as odor and smell.
- Greenhouse gas emission
- Land consumption.

Thermochemical process

Hydrothermal carbonization (HTC)

- Thermochemical conversion of wet biomass into coal like material (hydrochar).

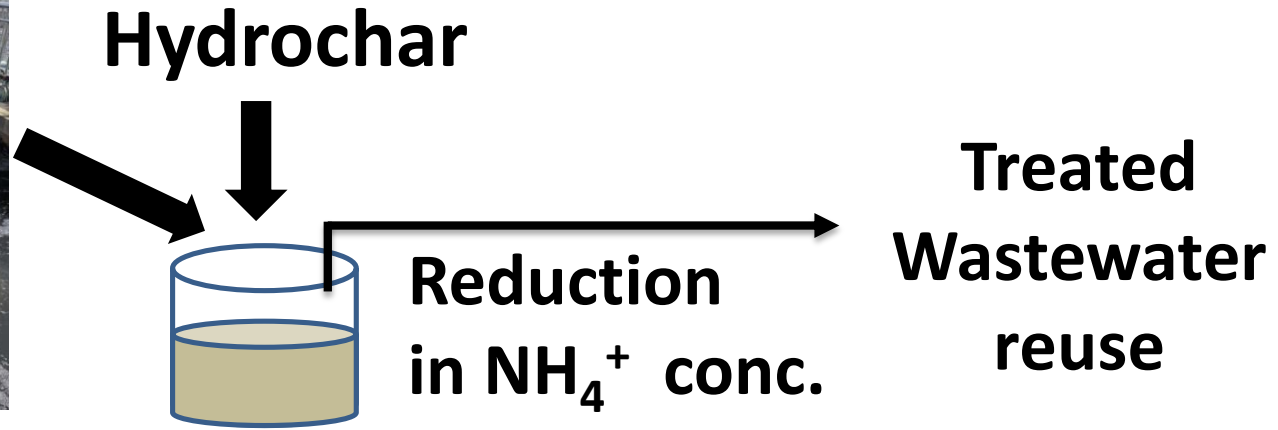


- Produce sterile product, ecofriendly, no energy intensive process.

Objectives

- Investigate the capacity of hydrochar to adsorb NH_4^+ from wastewater.
- Study potential application of hydrochar and ammonium enriched hydrochar as a soil amendment to enhance plant growth.

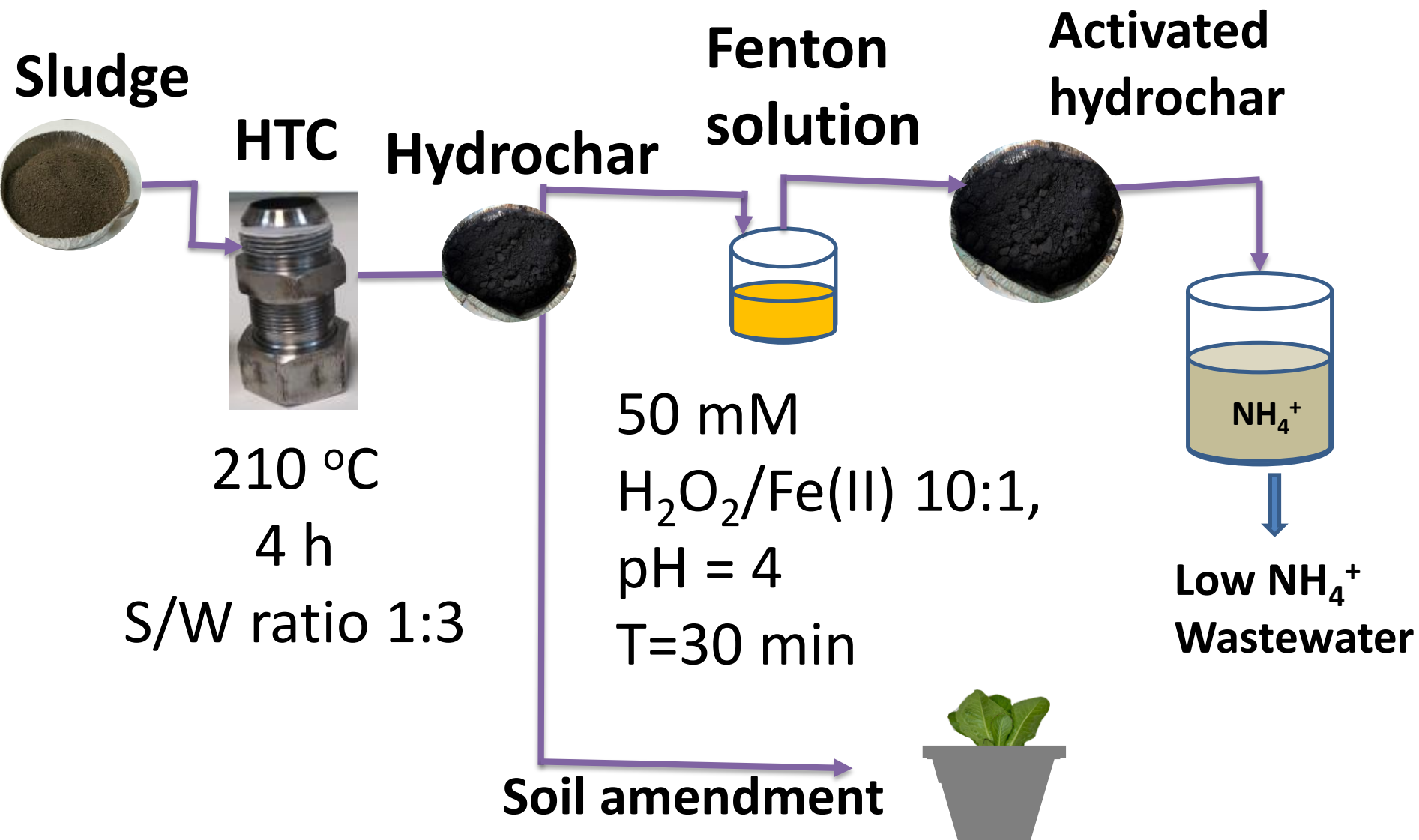
Capacity of hydrochar to adsorb NH_4^+ from wastewater



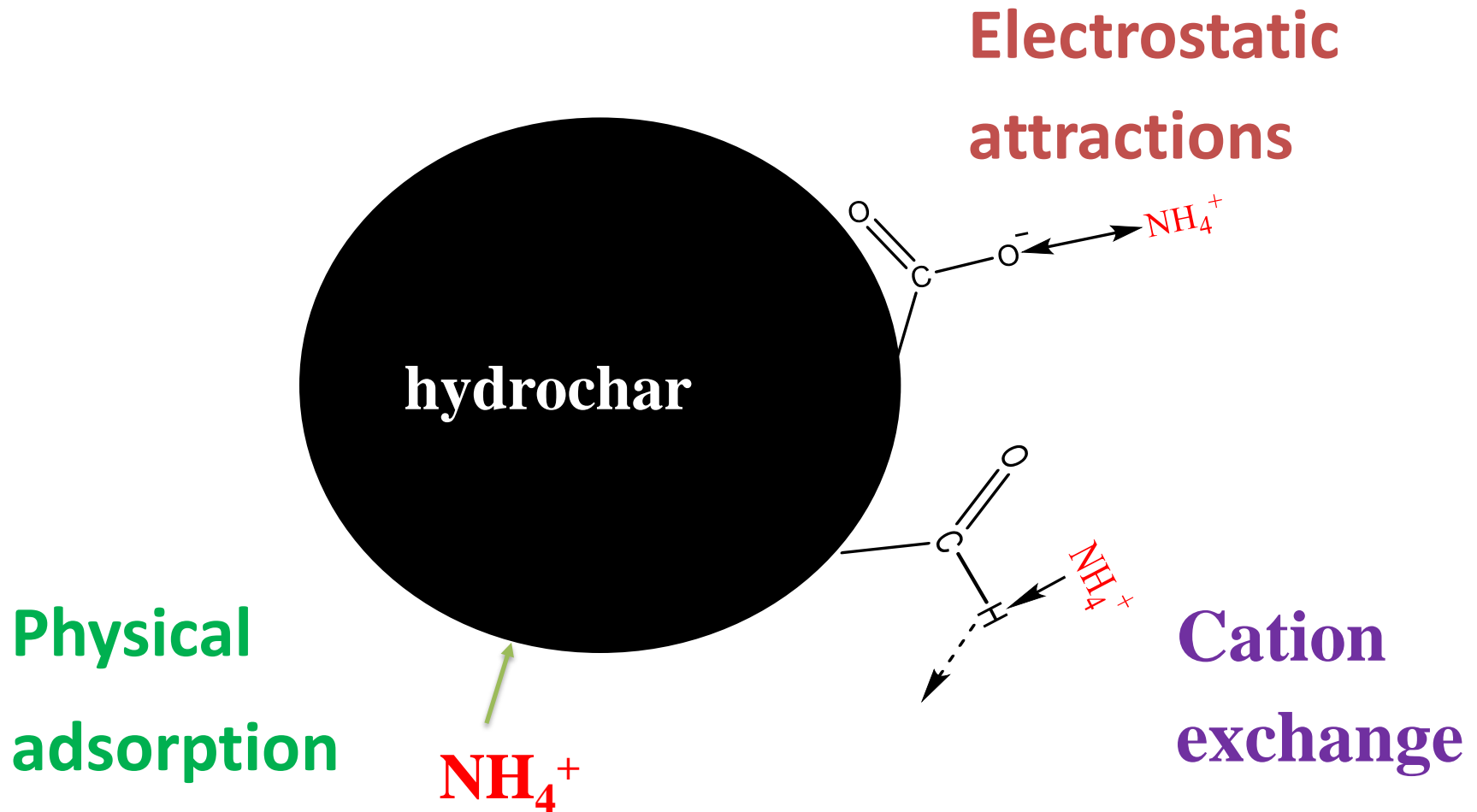
Wastewater
rich in NH_4^+

Adsorption

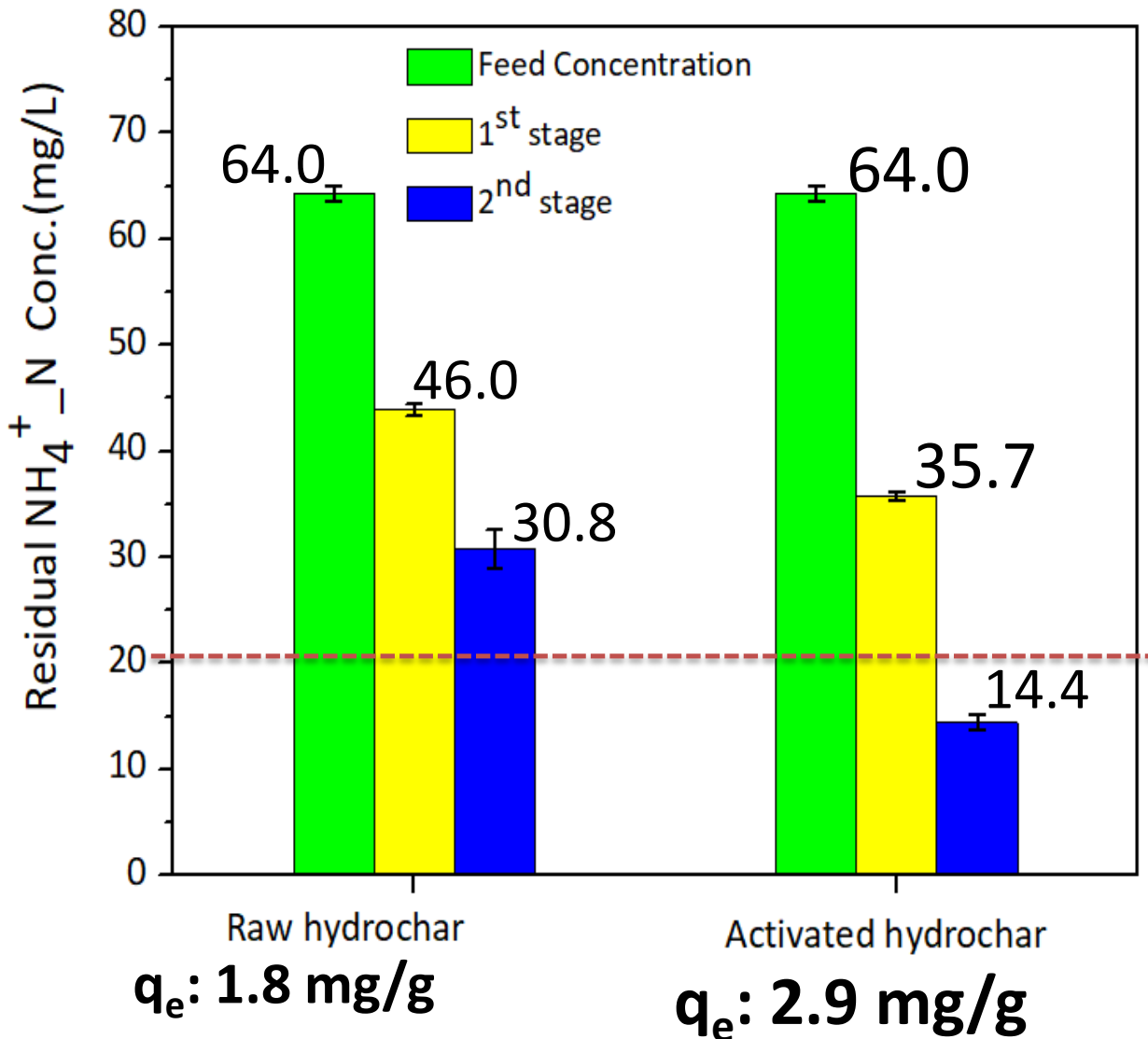
Experimental design



Mechanism of adsorption



Activated hydrochar significantly reduced NH_4^+ conc. in the AnMBR effluent



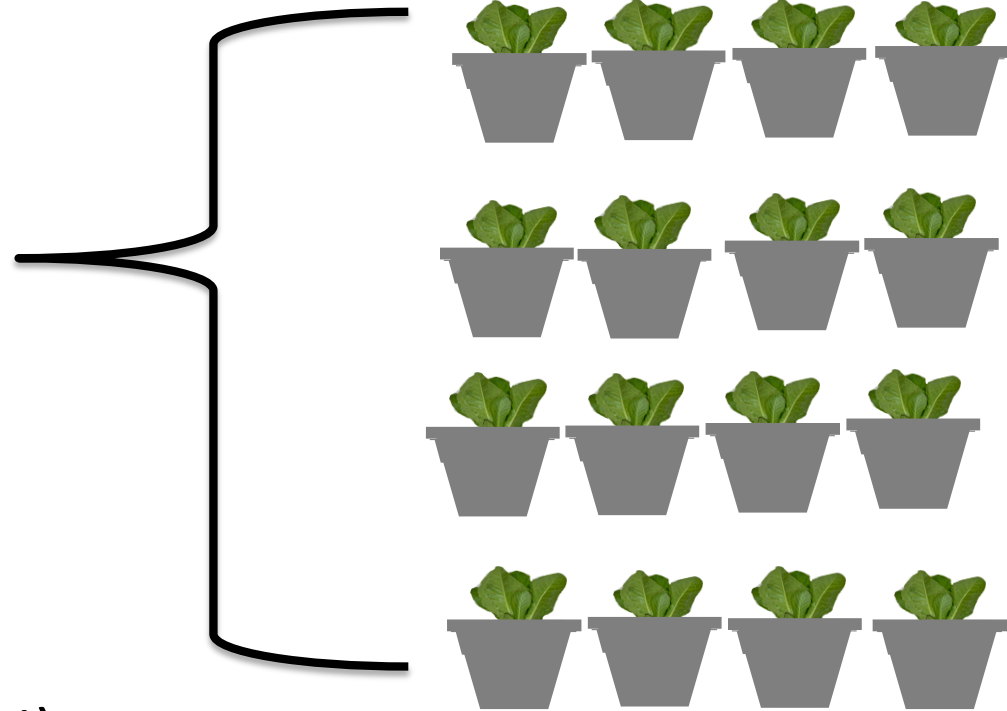
Standard for treated wastewater re-use in Israel (Inbar Y, 2007)

Hydrochar as a soil amendment planter experimental design

Treatments:

1. Sand as a (-) control + 10 mg/L N.
2. Urea as a (+) control.
3. Hydrochar (0.75 wt %).
4. Ammonium enriched hydrochar (N-AHC, 0.75 wt %).

Randomized block design



Lettuce (*Lactuca sativa*)

Planter experiment set up

Growth period

Day 0

Day 10

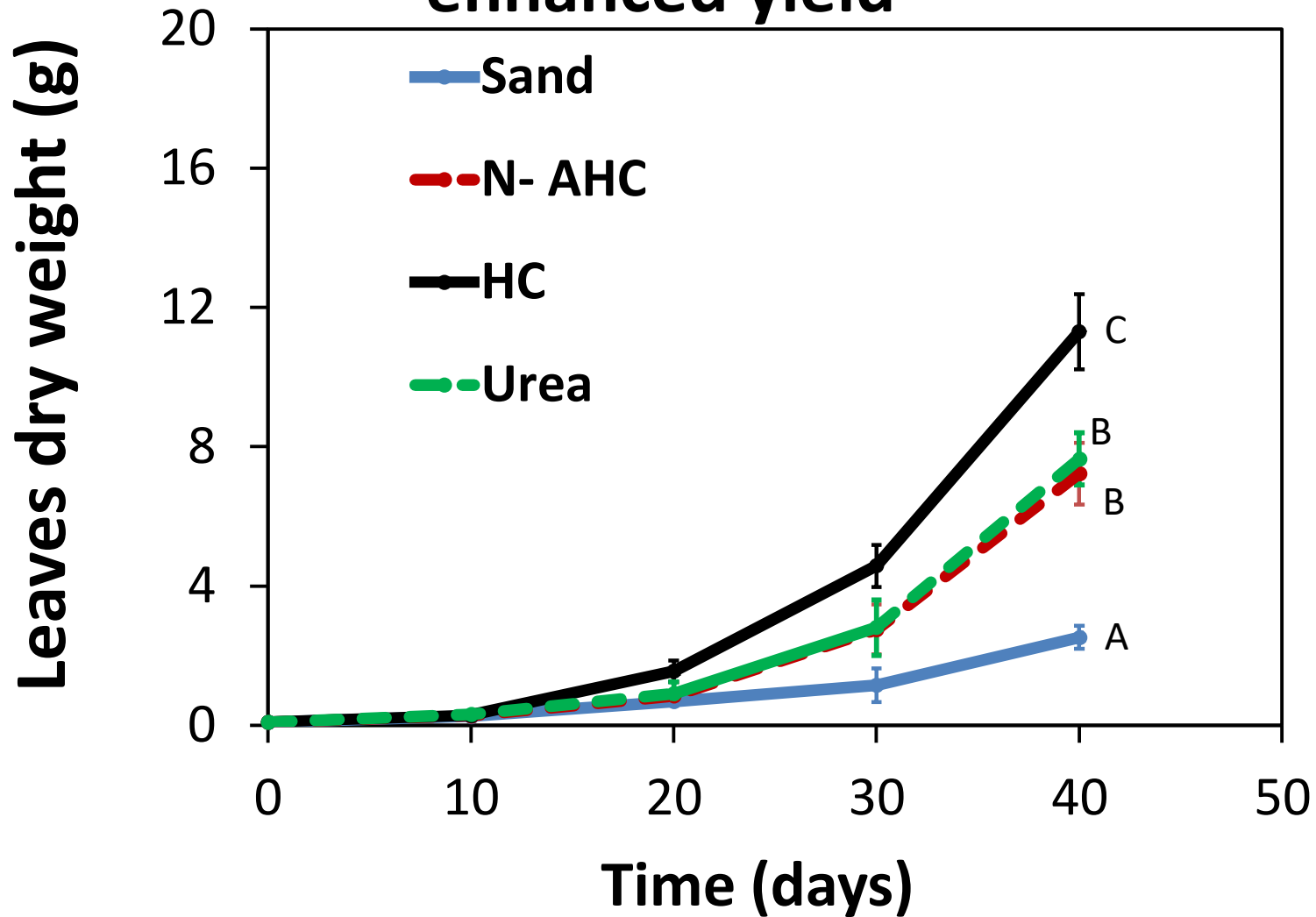
Day 20

Day 30

Day 40



Hydrochar amendment improved soil fertility & enhanced yield



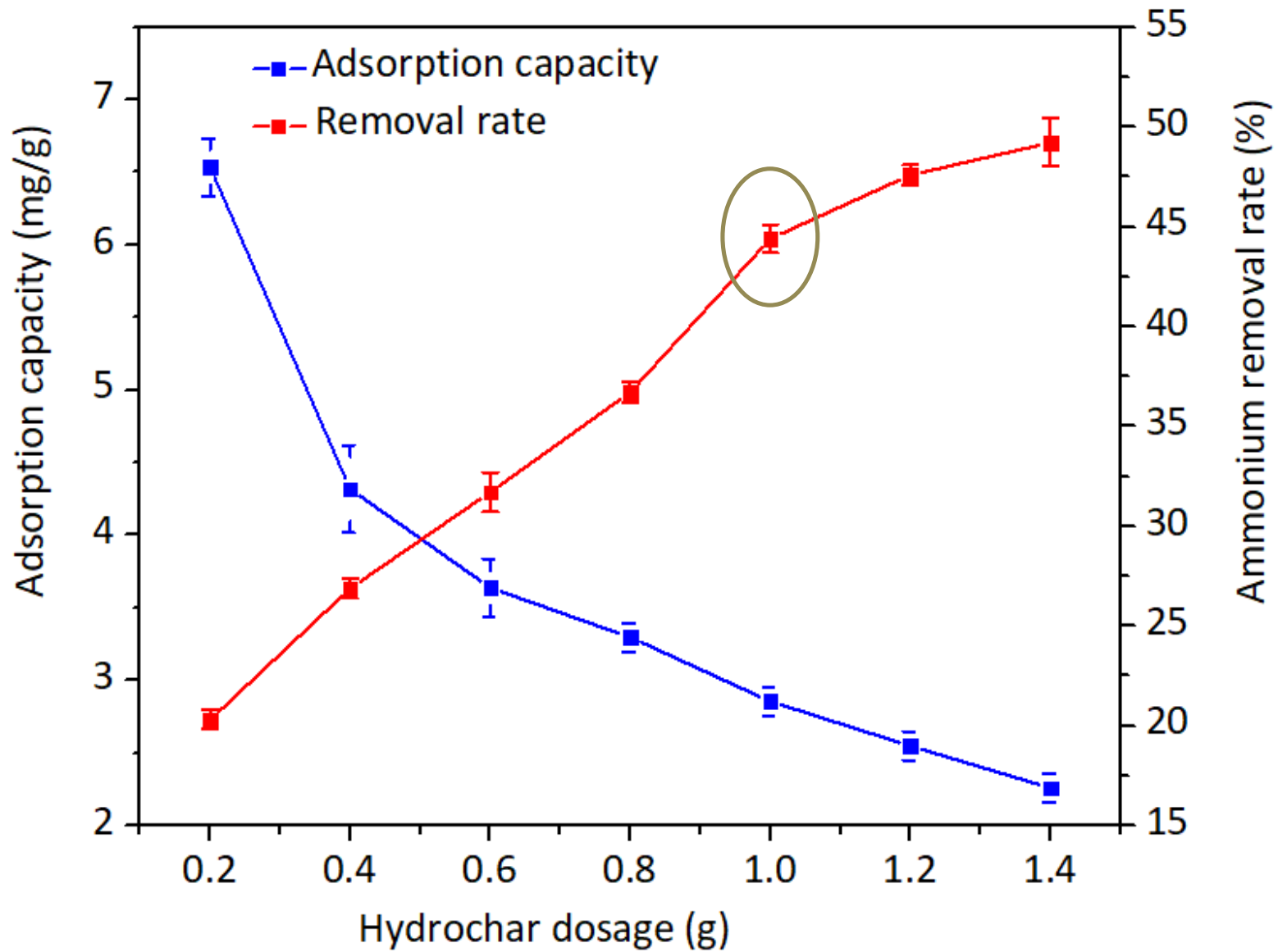
Take home message

- Activated hydrochar is a promising adsorbent for ammonium removal from wastewater.
- Hydrochar amended sand enhanced lettuce yield.

Thank you for your kind attentions !

The Zuckerberg Institute for Water Research (ZIWR)





Hydrochar adsorption from synthetic and AnMBR solution

