The Influence of Compost Origin on Chemical and Biological Properties of Compost Extracts and Pak-choi Yield

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OVERVIEW

- **Background**

- **Hypothesis & Objectives**

- **Materials & Methods**

- **Results**

- **Summary & Conclusion**

BACKGROUND

- Compost extract is an aqueous extract prepared by mixing compost and water for a defined period of time.

- Substantial work has been done from the perspective of disease control with compost extract.

BACKGROUND

- Our previous work confirmed the impact of vermicompost extract on yield and nutritive quality of pak choi.
  (**J Sci Food Agric 89:2383-2392).**

- Compost quality generally plays a major role in extract quality.

- Little work has been done to evaluate the effect of compost sources on extract quality and subsequent plant response.

HYPOTHESES

- Chemical and biological properties of compost extracts varies with compost sources.

- Soluble mineral nutrients present in compost extract, particularly N, play a strong role in yield effect.

OBJECTIVES

- Identify chemical and biological properties of extracts produced from different types of composts.

- Determine their effects on plant growth.

MATERIALS AND METHODS

Five different compost sources

1. Aged chicken manure vermicompost (ACV)

2. Fresh chicken manure vermicompost (FCV)

3. Food waste vermicompost (FWV)

4. Chicken manure thermophilic (CT) compost

5. Green waste thermophilic (GWT) compost

MATERIALS AND METHODS

- Extracts were prepared mixing 1:10 ratio (vol:vol) of compost and water with continue aeration for 15 hrs.

- Analysis of humic acid, indole-3 acetic acid (IAA), active microbial population and mineral nutrient concentration of composts and their extracts.

MATERIALS AND METHODS

- Weekly application of each extract on pak-choi (for 4wks).

- Plant fresh and dry weight, root biomass and total root length were measured at 5th week.

RESULTS

- N content in all compost extract was negatively correlated with C:N ratio of compost.

- IAA was detected only in vermicomposts.

$y = -0.024x + 16.005$
$R^2 = 0.6188$

Fig 1. N concentration in extract relative to C:N ratio of compost
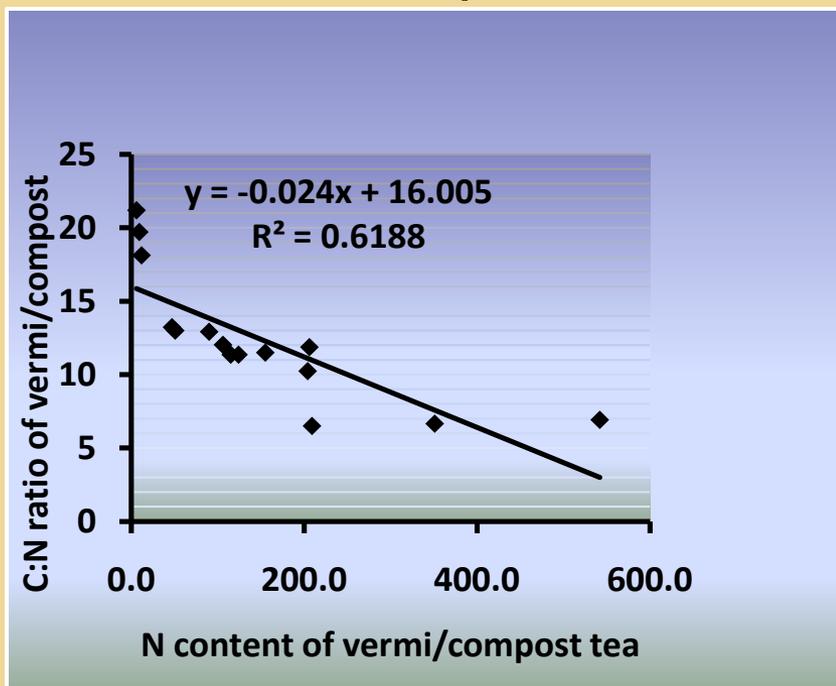
Compost type	IAA (µg/kg)
FCV	257.69
ACV	110.23
FWV	238.82
CT	ND
GWT	ND

RESULTS

R_t 3.2 min.

77.5μg

O

OH

N
H

3-Indoleacetic acid
(MW: 175.18)

62μg

42.5μg

31μg

15.5μg

A_{280}

0.024
0.020
0.016
0.012
0.008
0.004
0.000

2.00   4.00   Min.   6.00   8.00   10.00

y = 2024.x
R² = 0.999

Area of integration

140000
120000
100000
80000
60000
40000
20000
0

0   20   40   60   80
IAA Concentration

A_{280}

A_{280}

IAA Std

IAA Std

0.0   3.0   6.0   0.0   3.0   6.0
                 Min.   Min.
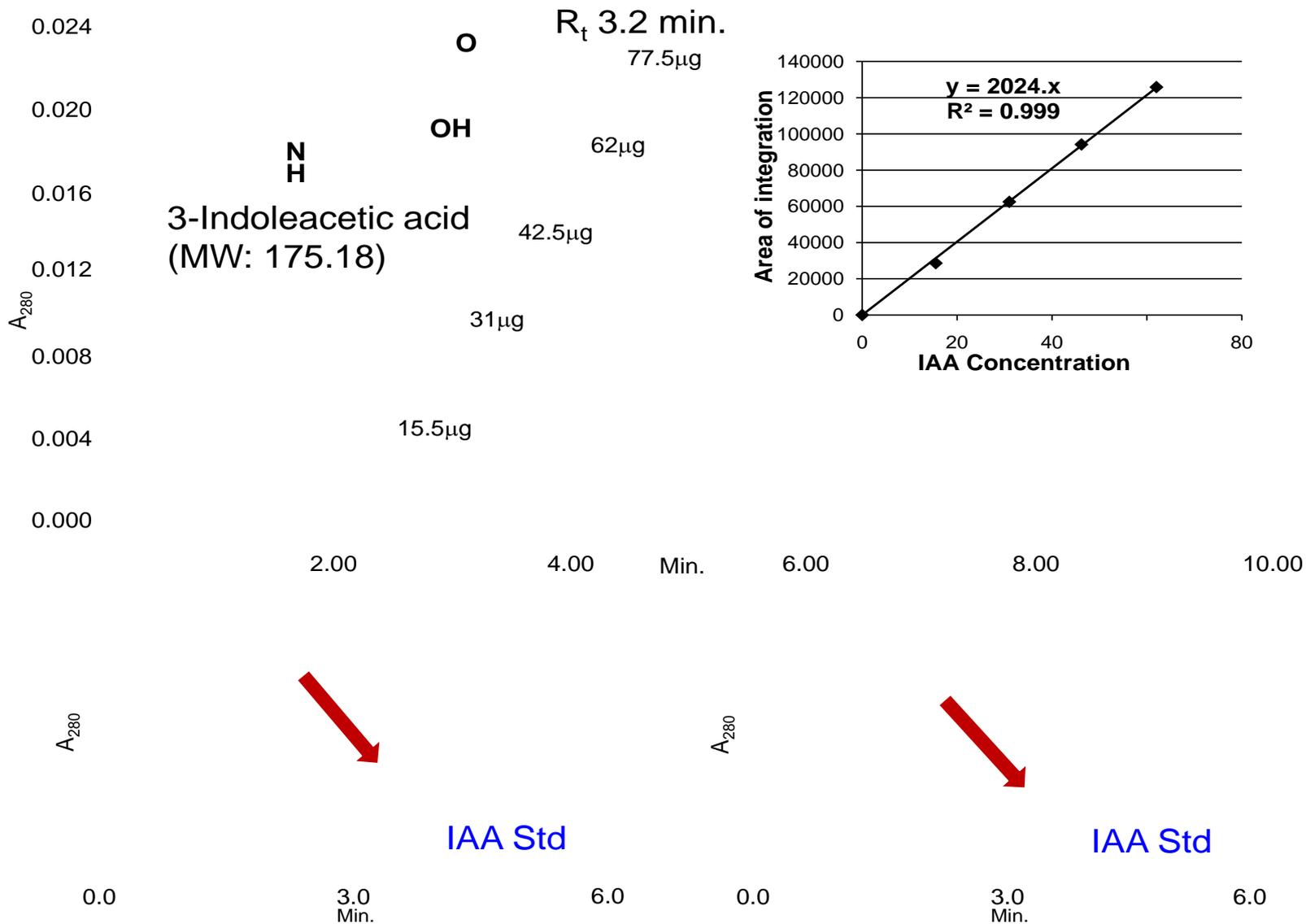
Fig. 2 Chromatograms of IAA analysis using HPLC

RESULTS

Humic acid

GWT>ACV=FCV>FWV>CT
extract (550.5>...>98.6 mg/L)
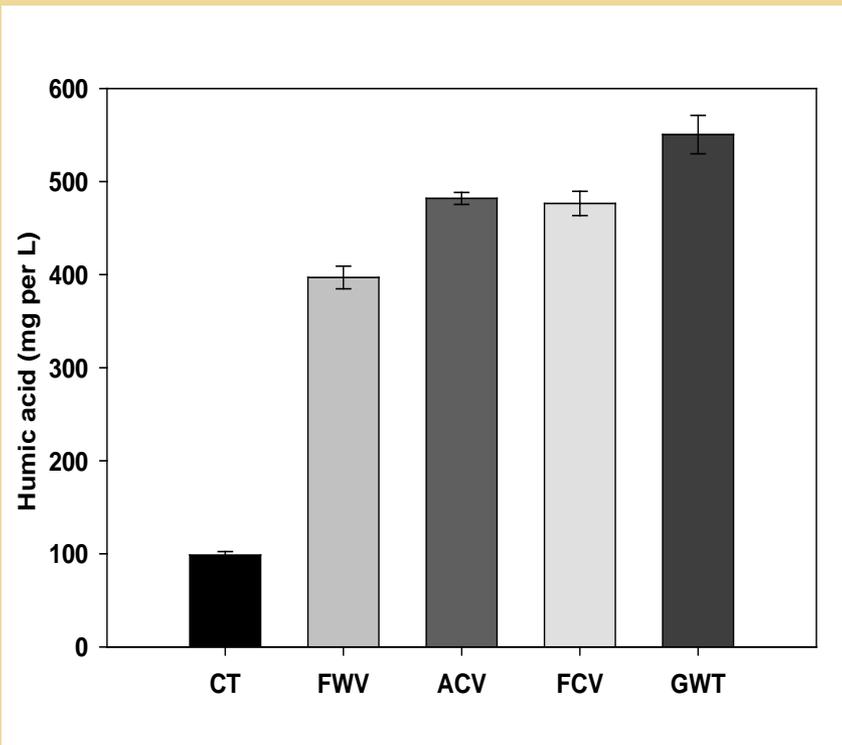
Total nitrogen

CT>ACV>FWV>FCV>GWT
extract (328>….>8.71 mg/L)
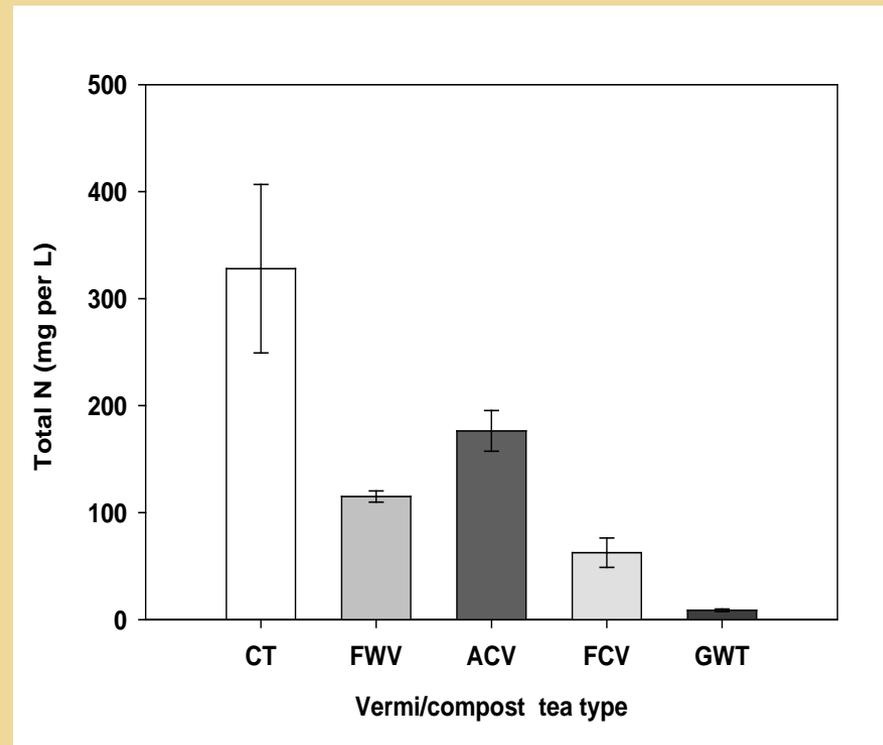
Fig 3. Selected chemical properties of compost extracts

RESULTS

Active bacteria
FWV>FCV=ACV>GWT>CT

Active fungi
FWV>FCV=ACV>CT=GWT
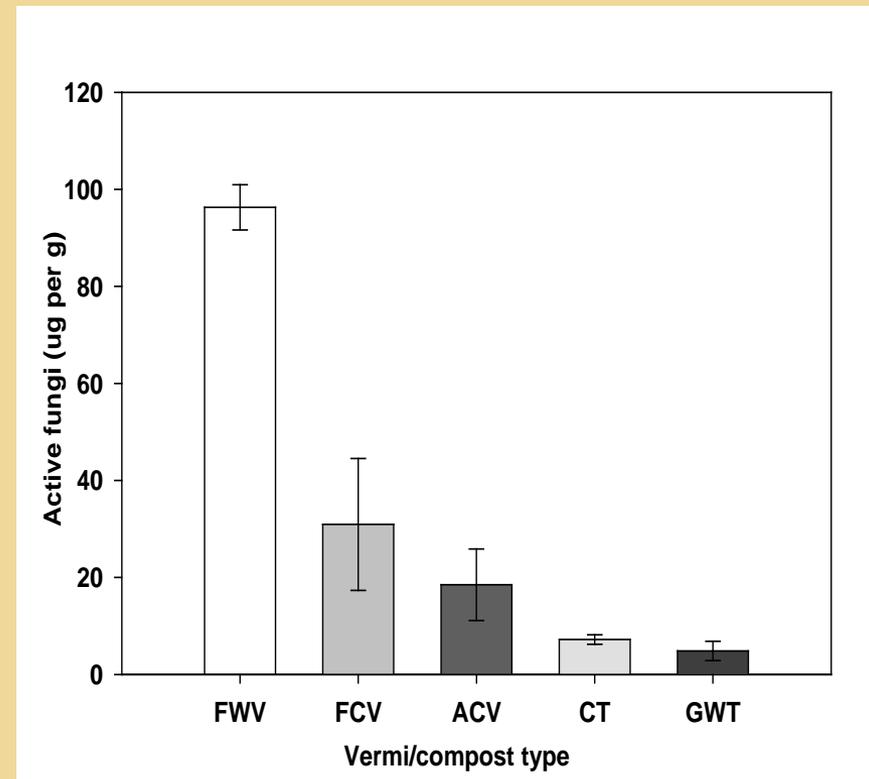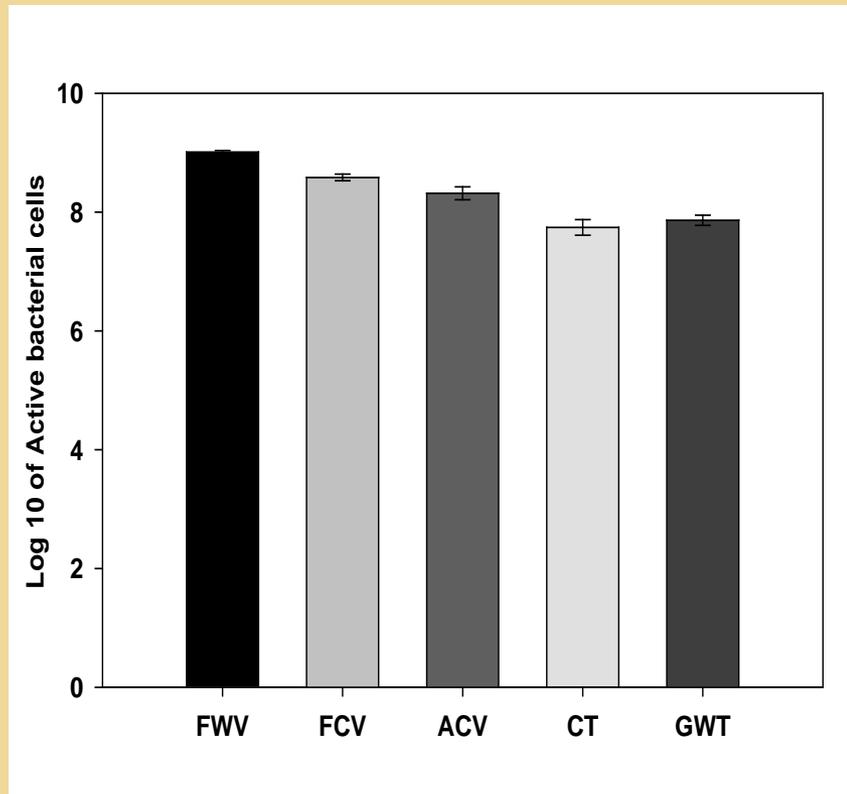
Fig 4. Selected biological properties of compost extracts

RESULTS

- Except for GWT, all the extracts enhanced plant fresh weight, dry weight and leaf area compared to control.
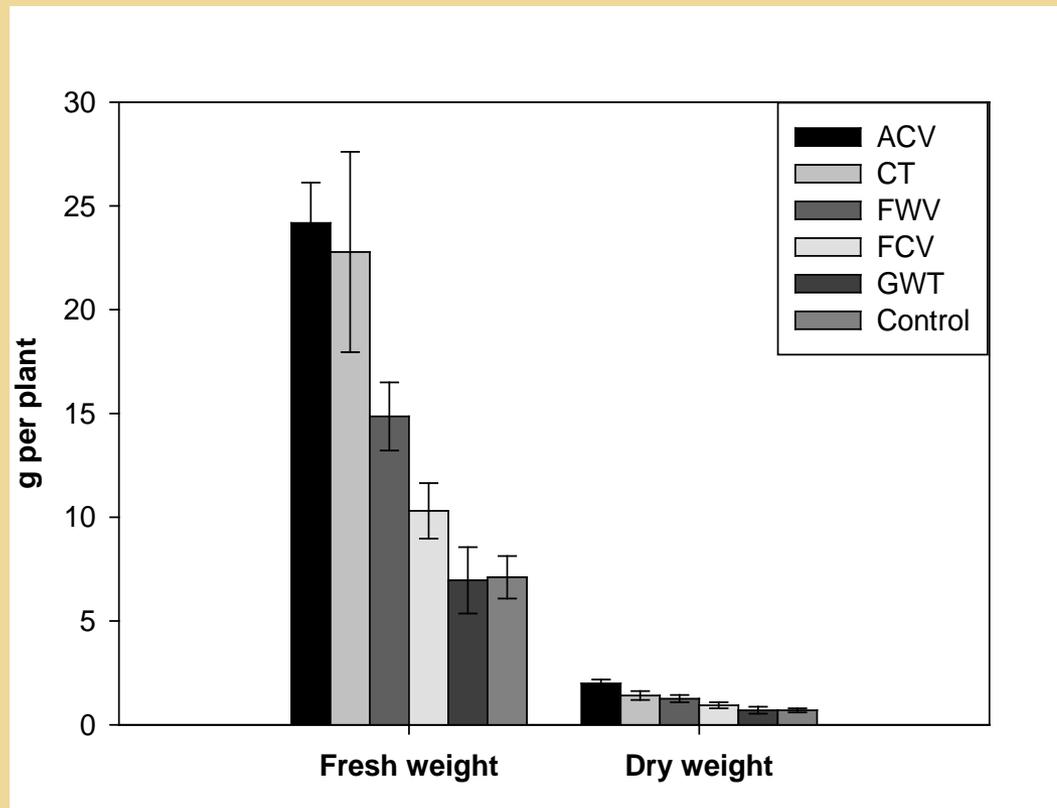
Fig 5. Treatment effects on plant growth

RESULTS

- Vermicompost extracts enhanced root biomass, total root length and root surface area.
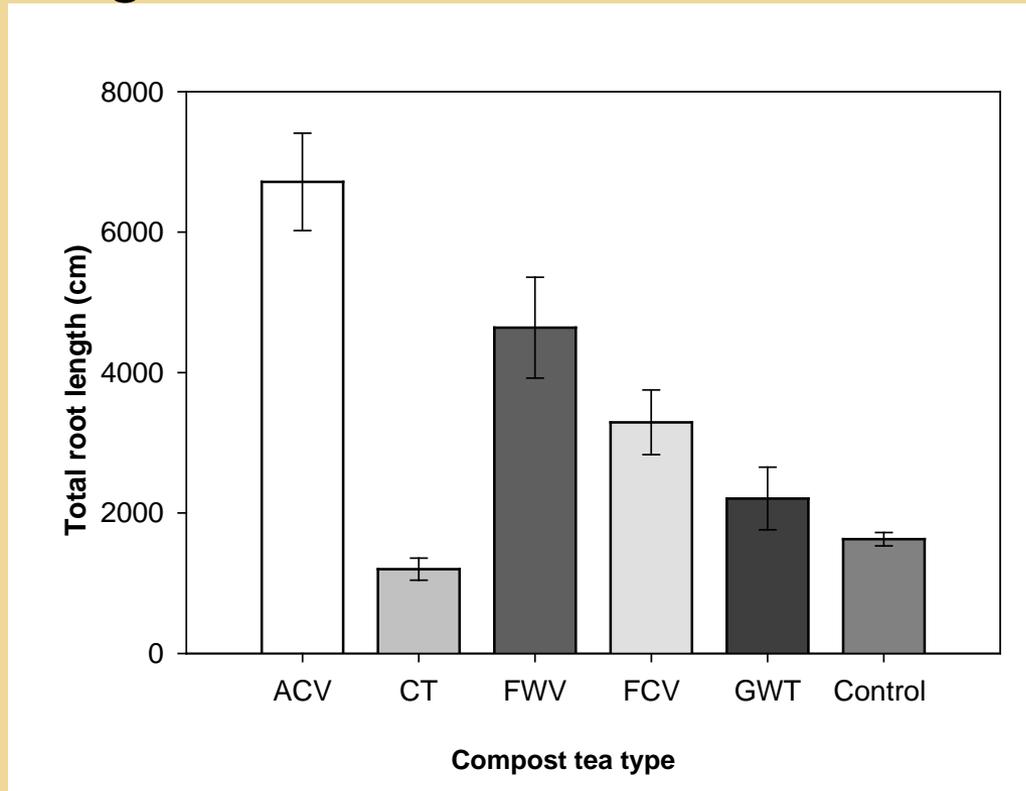

Fig 6. Treatment effects on root length

RESULTS

- Plant height was generally higher with ACV extract during the growth period.
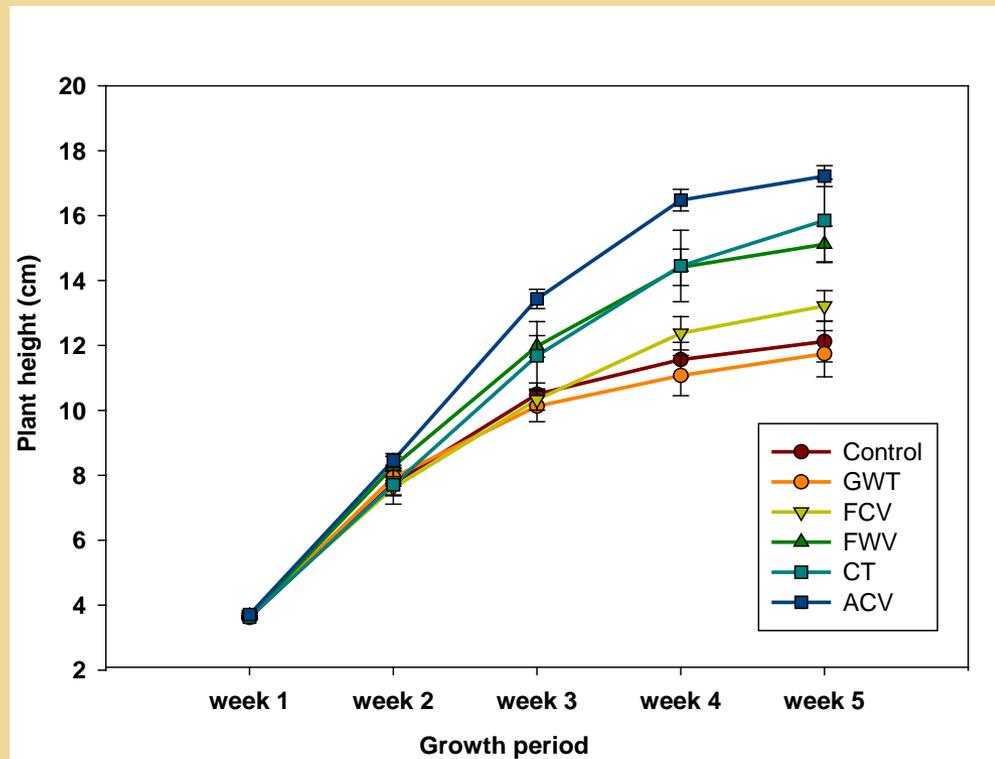

*Fig 7. Treatment effects on plant height*

RESULTS
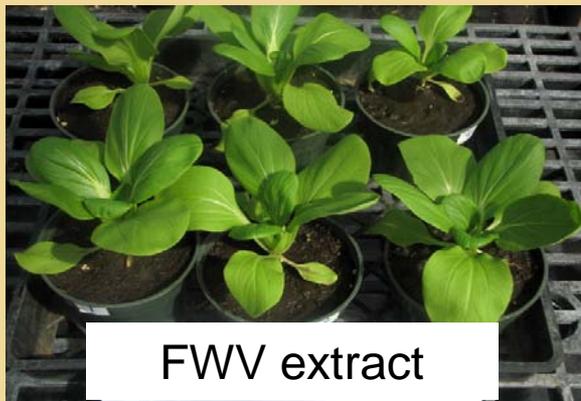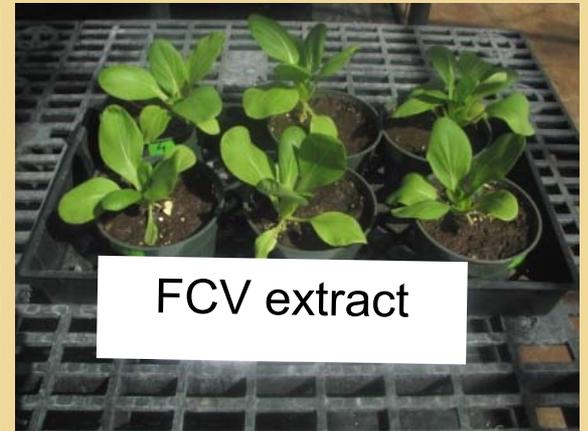
Fig 8. Treatment effect on plant growth

SUMMARY AND CONCLUSION

- Compost quality influenced extract quality and plant growth response.

- ACV extract had moderate amount of total N, humic acid, active microbial population and some IAA while CT had high N and GWT had high humic acid.

- Better plant response with ACV and CT extracts supports our previous findings that total N plays a strong role.

SUMMARY AND CONCLUSION

- Nutrient effect is unlikely to be independent of other factors, i.e. organic acids and microbial activity.

- Vermicompost extract can be a good source of supplemental nutrient in vegetable production specially in organic production system.

- Working to clarify independent and interactive roles of IAA, humic acids and biology.

ACKNOWLEGDMENTS

Dr. Travis Idol

Dr. Norman Arancon

Gita Neupane

Questions

Thank You