Plant Growth Promotion with Compost Extracts

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Compost benefits

- Contains most plant nutrients.

- Can improve soil:
  - Structure
  - Moisture holding capacity
  - Nutrient mineralization & retention
  - pH buffering

- Can also suppress some diseases
  - General suppression
  - Antagonism

Compost challenges

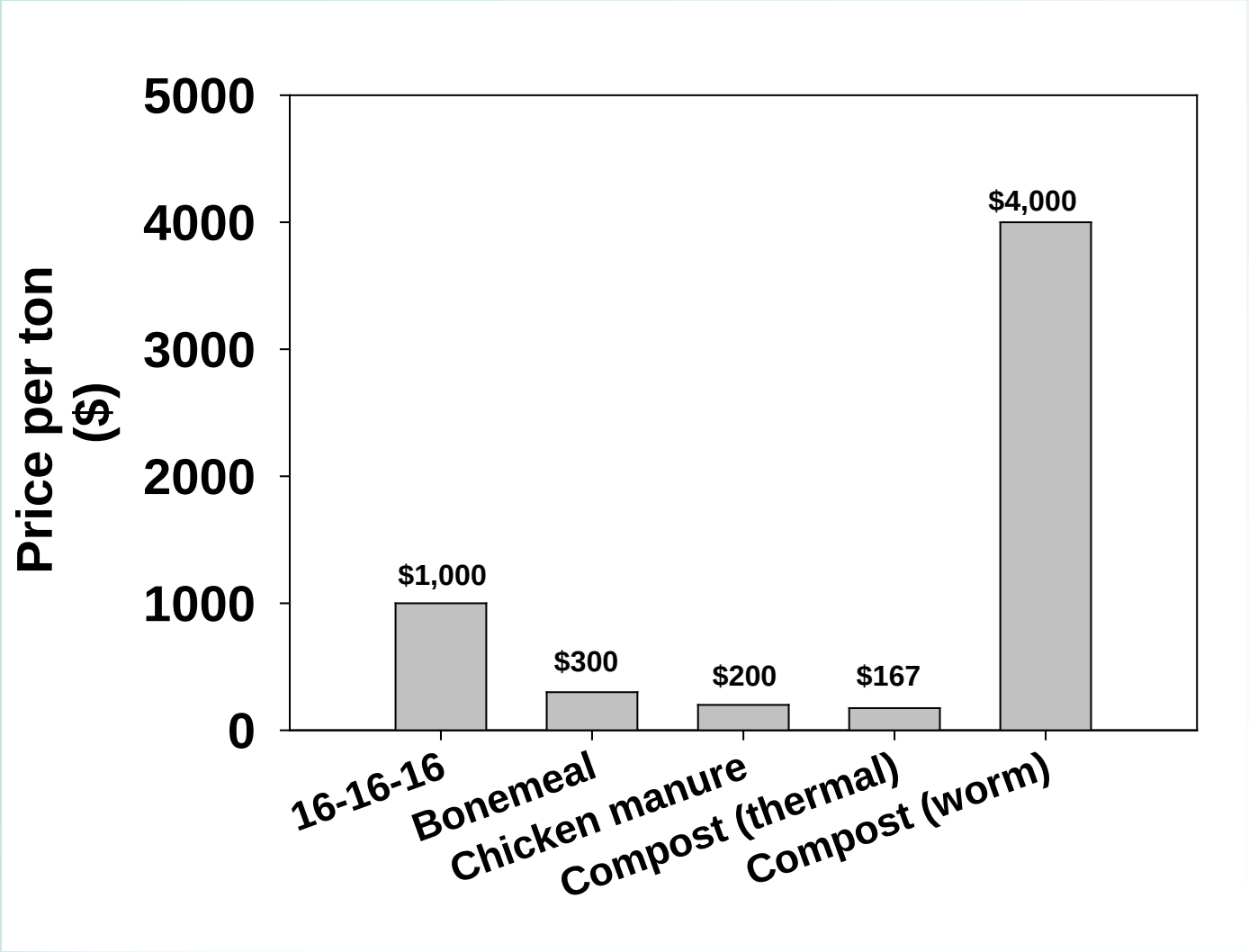
- **Transportation costs $$**
- **Quality can be highly variable**
- **Management for high quality increases costs.**
- **High rates for short term impact.**

Table 1. Some quality characteristics of composts produced in Hawaii. Values are means±standard deviation.

Type/ Source/ Primary feedstocks	# of Samples	Total Carbon %	Total Nitrogen %	C:N	NO_3^- ppm	NH_4^+ ppm
Vermicompost						
Hawai'i commercial						
Chicken manure	21	20±3	1.6±0.4	13:1	1,748±636	29±18
Rabbit manure	9	21±3	1.8±0.3	12:1	2,391±882	59±50
Pig manure	6	25±1	2.0±0.1	13:1	2,924±1,542	61±67
Horse Manure	6	25±1	2.0±0.2	13:1	4,000±1,045	18±18
UH experimental						
Food waste	33	26±5	1.8±0.3	13:1	1,212±1,230	122±252
Mainland commercial						
Steer manure	6	16±1	1.1±0.1	15:1	629±231	118±50
Green waste	6	19±2	1.2±0.1	16:1	1,348±49	28±6
Other compost						
Hawai'i commercial						
Steer manure/ greenwaste	6	18±1	1.1±0.2	16:1	103±77	58±34
Greenwaste	7	21±3	0.7±0.5	30:1	118±80	183±24
Hawai'i farmer produced						
Chicken manure/greenwaste	6	8±1	0.7±0.0	11:1	593±39	23±4
Chicken manure/mortalities	6	21±0	2.9±0.1	7:1	1,748±553	--

Commercial green-waste compost **Food-waste vermicompost**

Material cost per ton (12/1/2008)



Compost “Tea”

- **Uses air and water to extract:**
  - **Nutrients**
  - **Organic acids**
  - **Microbes**
- **Ratio of water to compost ranges 10:1-100:1**
- **Water is not circulated, only air**
- **12-24 hrs**





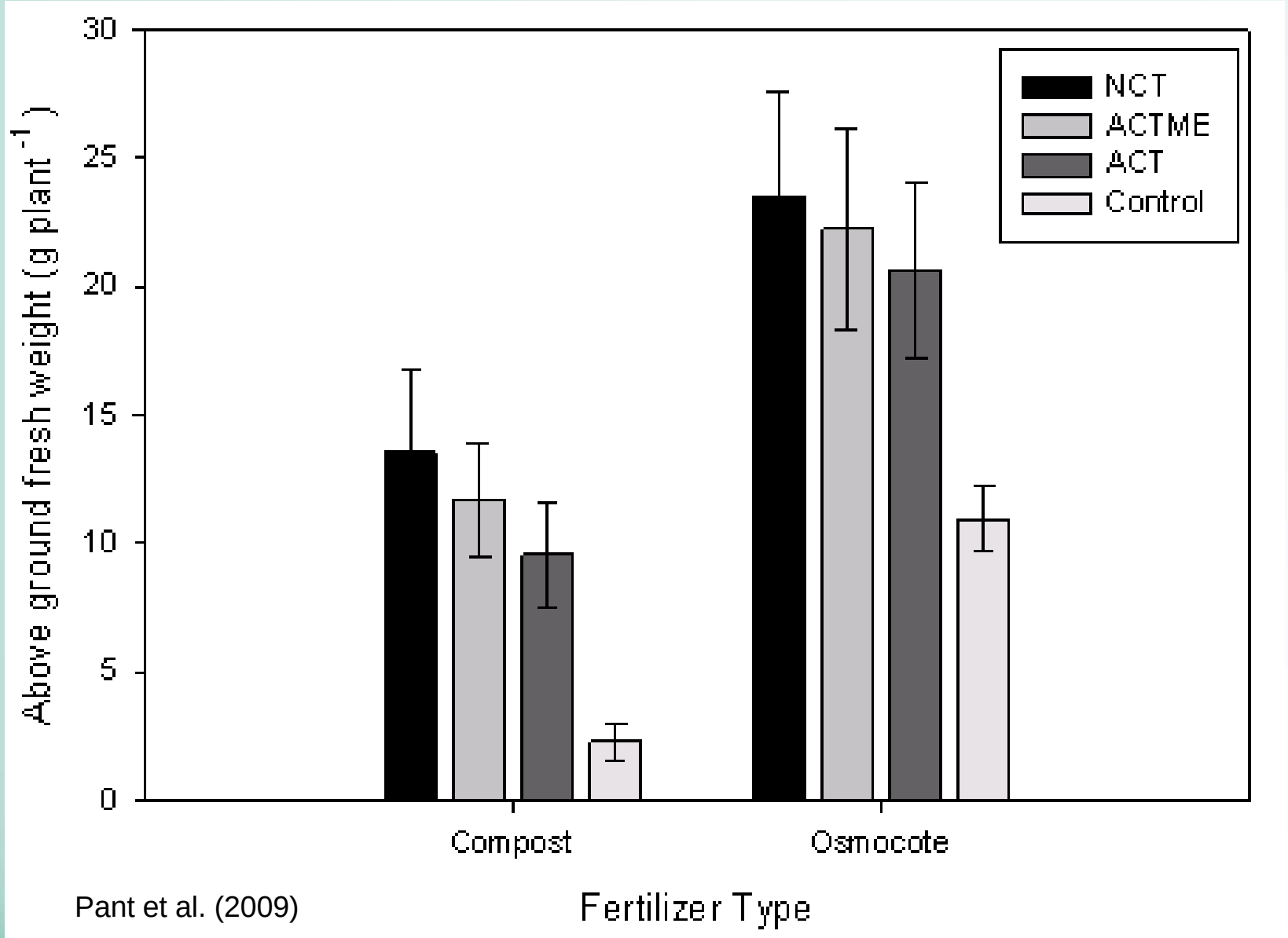

- **Many growers add microbial enhancer**
- **Some reports of aeration not neccessary**
- **Archana Pant investigates these factors**

Compost tea

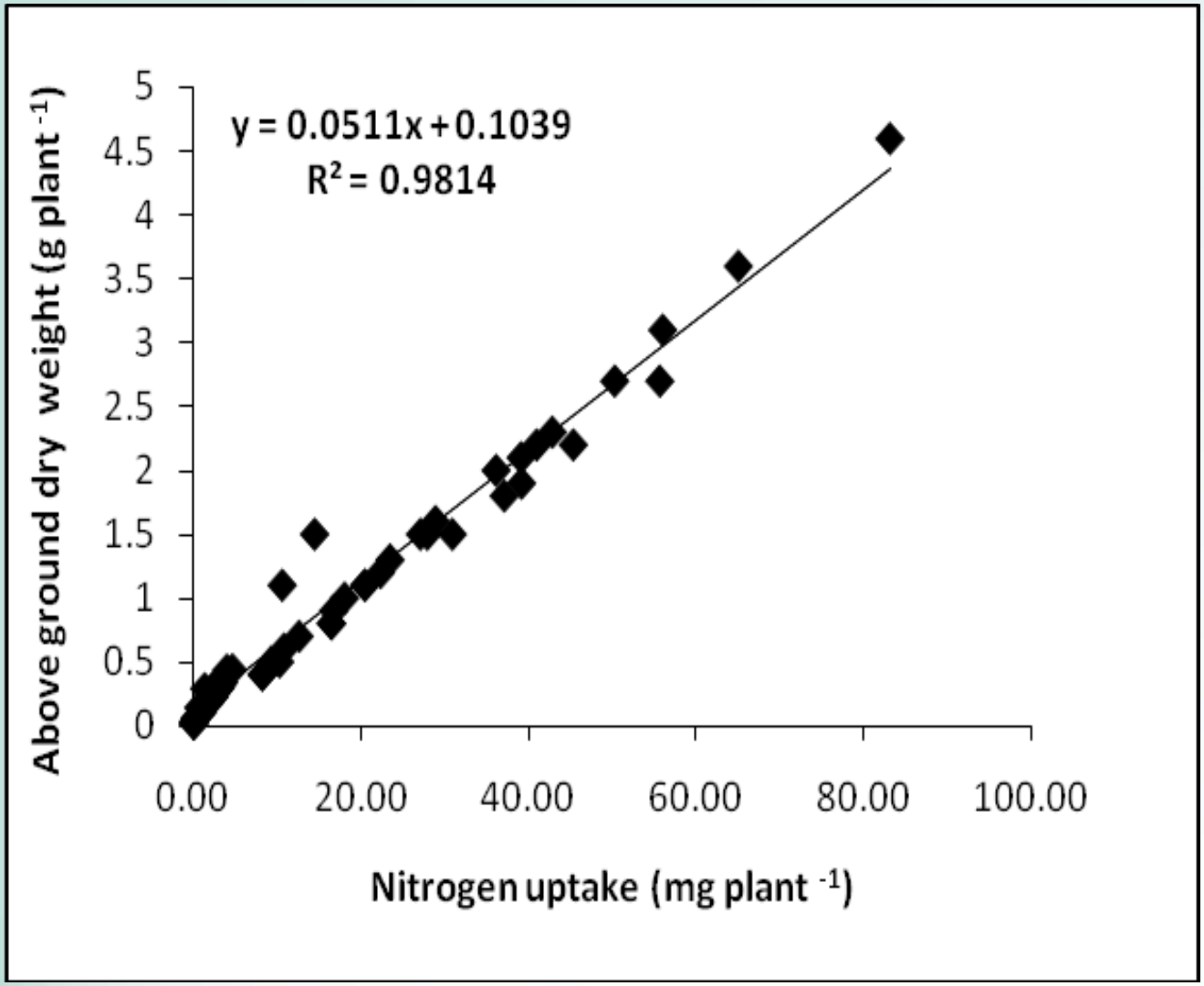
Quality of tea brewed aerobically with foods (ACTME), aerobically without foods (ACT) or passively (NCT).

Tea Type	pH			EC			DO			N			NO3-N		
Aerated plus "food" 12 hrs	**8.3**	±	0.1	**2600**	±	127	**7.4**	±	0.1	**105.55**	±	13.6	**97**	±	13
Aerated 12 hrs	**7.8**	±	0.1	**1267**	±	103	**8.3**	±	0.1	**83.93**	±	9.44	**82**	±	9.3
Passive (8 days)	**7.5**	±	0	**1273**	±	136	**7.8**	±	0	**71.70**	±	8.32	**70**	±	8.2
Water	**8.1**	±	0	**391**	±	14	**8.5**	±	0.1	**10.96**	±	1.17	**11**	±	1.2

Pant et al. (2009)



Pant et al. (2009)



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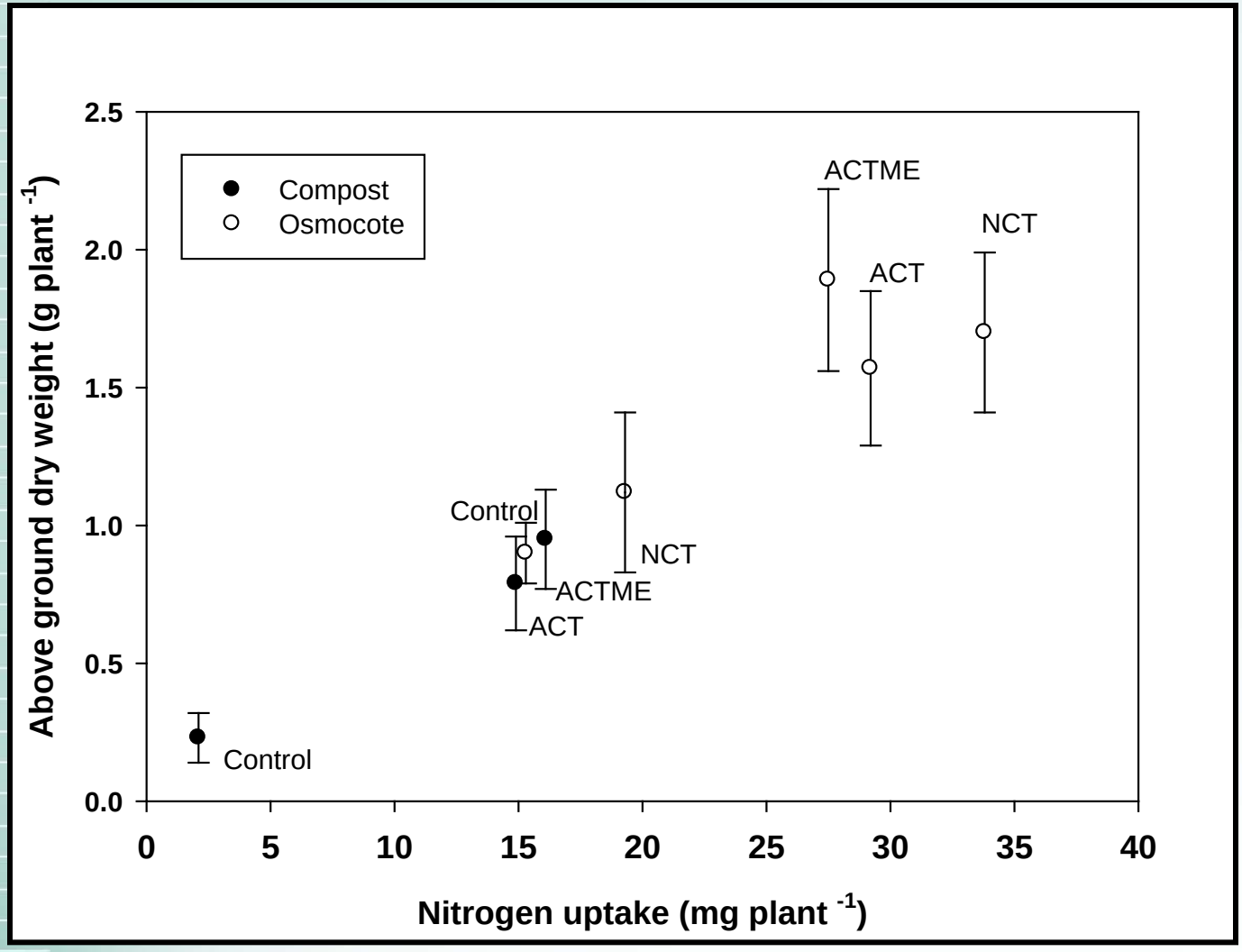


Pant et al. (2009)

Greenhouse Studies

- Yield was improved
- Largely explained by changes in nitrogen uptake
- Phytonutrients, soil biological activity and root growth also affected
- Results were confirmed:
  - in multiple soils
  - with different composts
- 100 ml tea = 10ml compost = 5 g compost = $0.03 per plant = $840 per acre


Chicken manure thermophilic
compost extract (1:10)


Chicken manure thermophilic

Questions

- Can less compost be used?
- Can on-farm composted culls be effective?
- Is there a way to avoid spraying leaves?

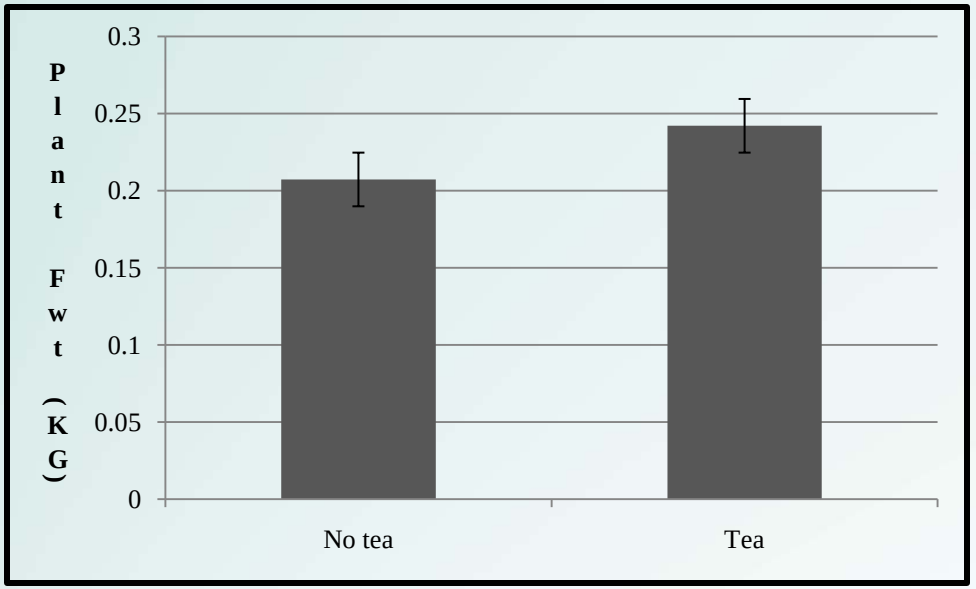
Initial trial

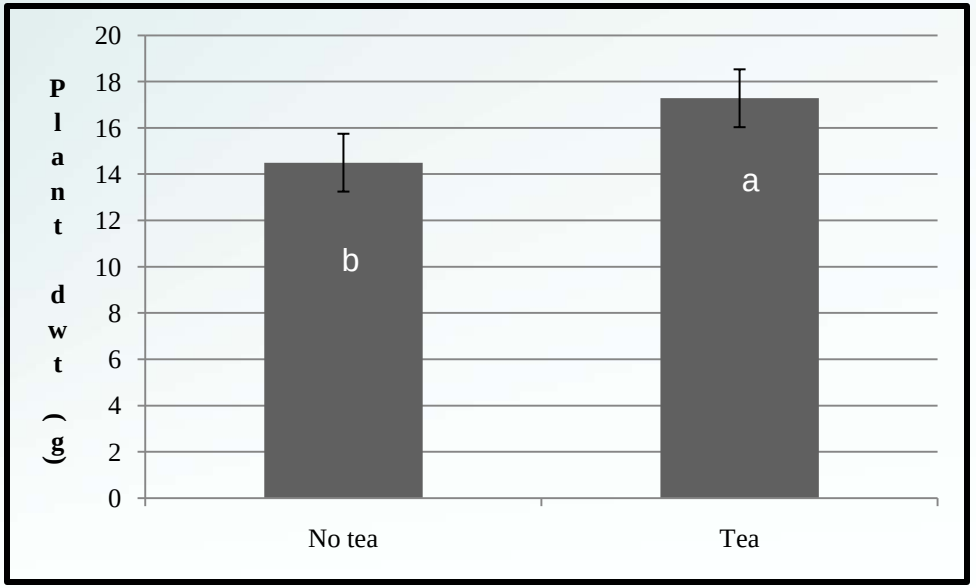
- 2 treatments: Tea; No Tea
- 5 replications
- Tea brewed from Ho farm compost
- Brewer constructed from local materials
- 0.5 gallons compost in 50 gal brewer
- Injected weekly into drip lines

Compost “Tea”

Results

- Subtle impact on plant growth
- Fresh weight yield difference 800 pounds ($400) per acre
- Compost cost $8
- Vermicompost $90





Summary

- Effect of extracts depend on:
  - Compost quality
  - Amount of compost used in extraction process
  - Nutrient status of plant

- Potential for drip injection
  - Increase quantity of compost
  - Include some vermicompost
  - Evaluate emitter flow rates

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Vermicompost