

Root grazing by *Oreochromis niloticus* in Raft Aquaponic Systems

Problem

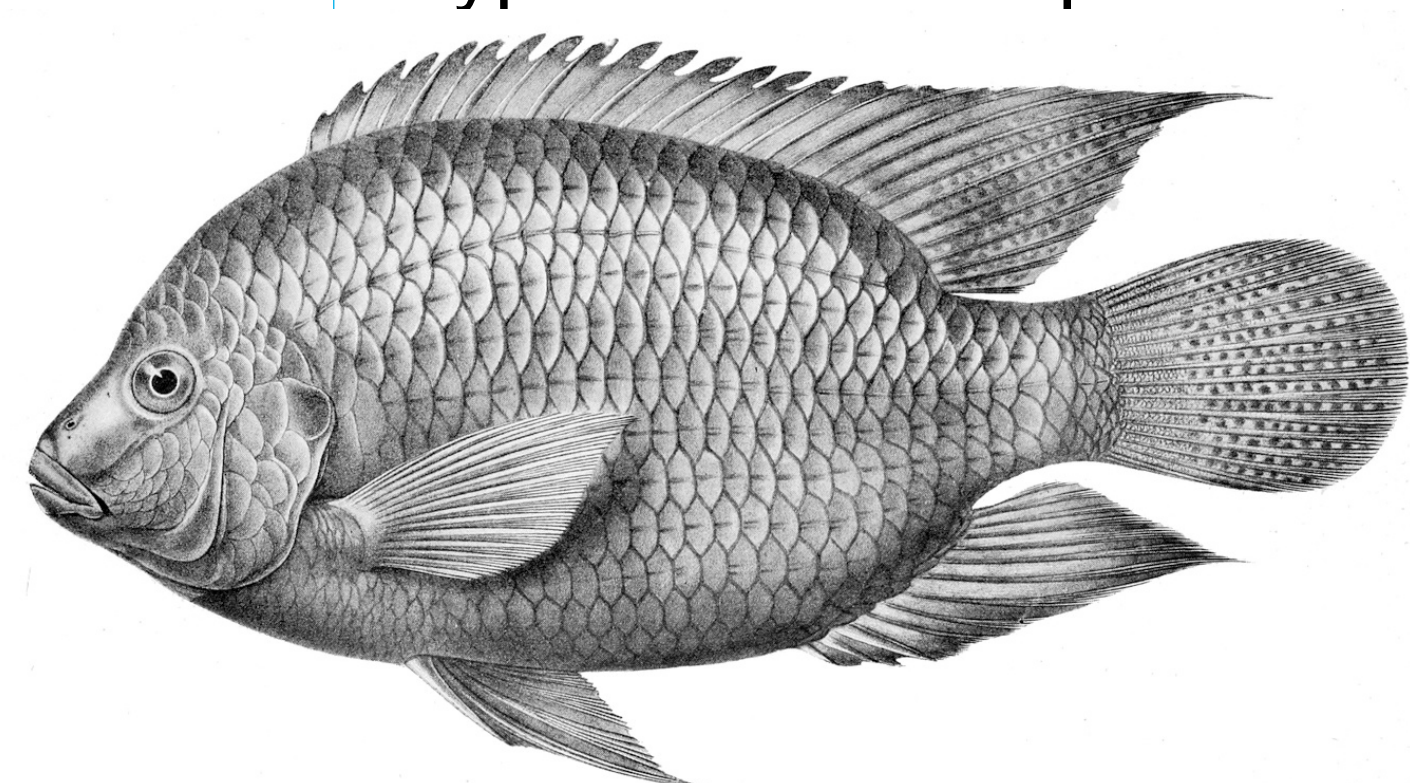
1. Tilapia, *Oreochromis niloticus*, eat roots in aquaponic systems, but does it significantly impact yields?
2. Are there certain traits or cultivars that tilapia do not actively consume?

Background

- Raft and tilapia systems are one of the most abundant aquaponics setups world wide
 - One survey found that of 145 commercial producers, 69% use a raft system either alone or in combination, and 69% also used tilapia¹
- Previous anecdotal evidence suggest dill was avoided when grown in a raft system
- Dill is part of the family Apiaceae, plants known for aromatics and phytochemicals production

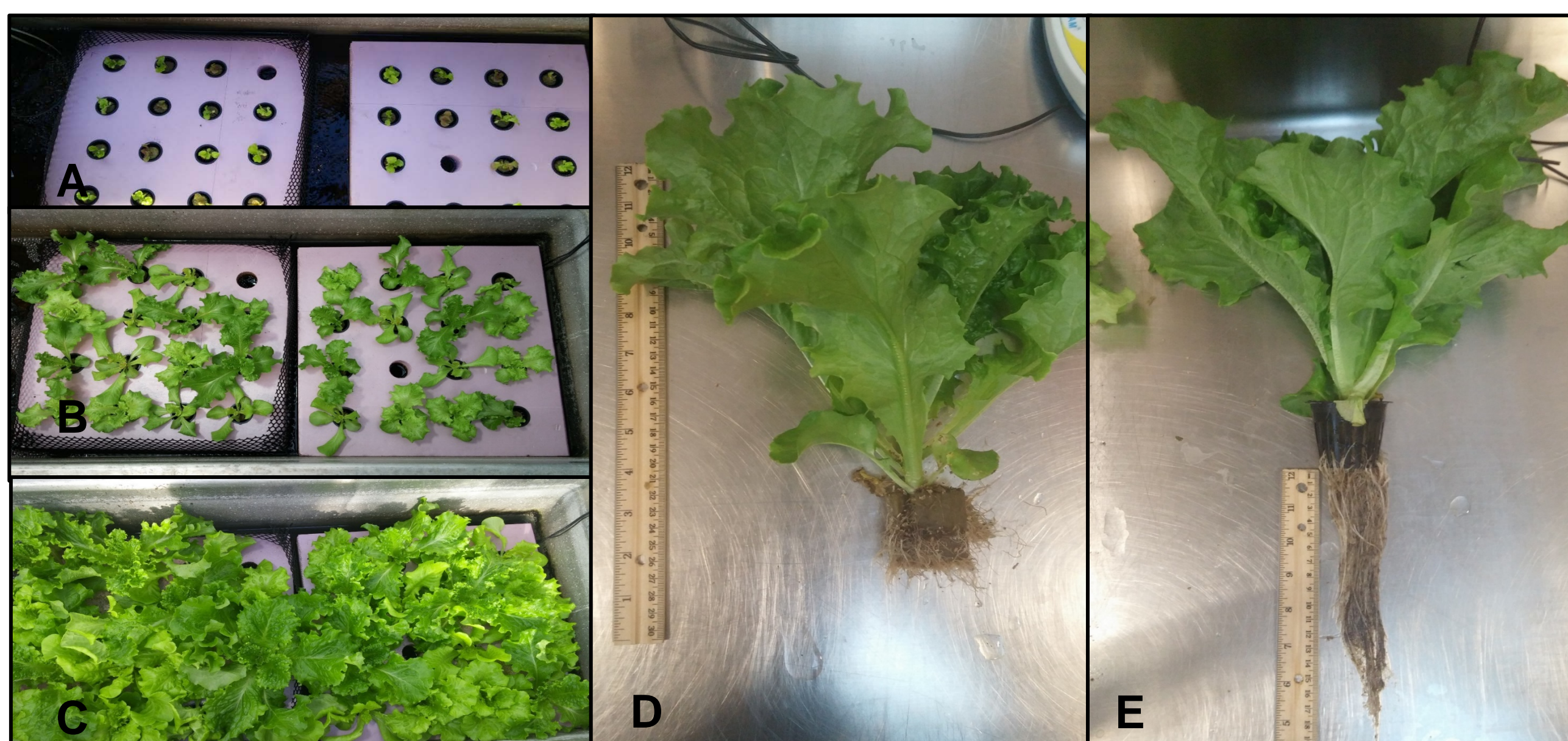
Seeds/cultivars used for each experiment

Impact on Yields	Root selectivity
Leaf Lettuce – Green Star MT0 OG-pellet	Broccoli RAAB
Summer Crisp Lettuce – Mair pelleted MT0 OG	Dill – Goldkrone OG
Butterhead Lettuce – Skyphos MT0 OG-pellet	Cilantro - Santo
	Parsley – Paravert



Impact on Yields

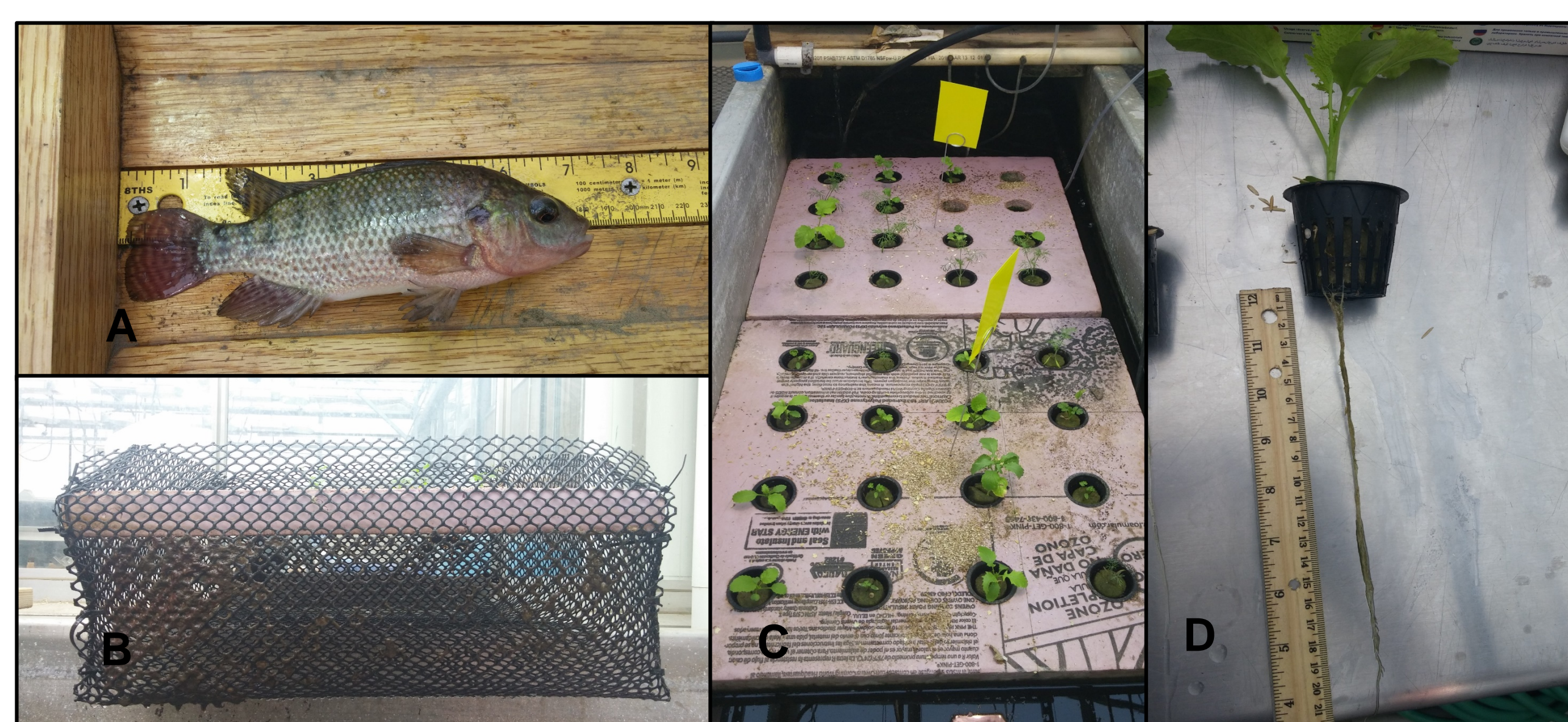
- Three cultivars of lettuce were grown for 26 days and then transferred to Rockwool plugs
- Each plant was measured and then assigned a raft either protected (mesh basket) or unprotected in an aquaponics raft setup with an estimated stocking density of 0.11 lb tilapia/gallon
- After three weeks the final root length, leaf and root biomass were measured
- The samples were then dried for five days and massed



A. Lettuce growth immediately after transplanting, day 1. B. Lettuce growth at 13 days. C. Lettuce growth at 21 days (day of harvest). D. Final growth for an L strain unprotected. E. Final Growth for an L strain protected with basket.

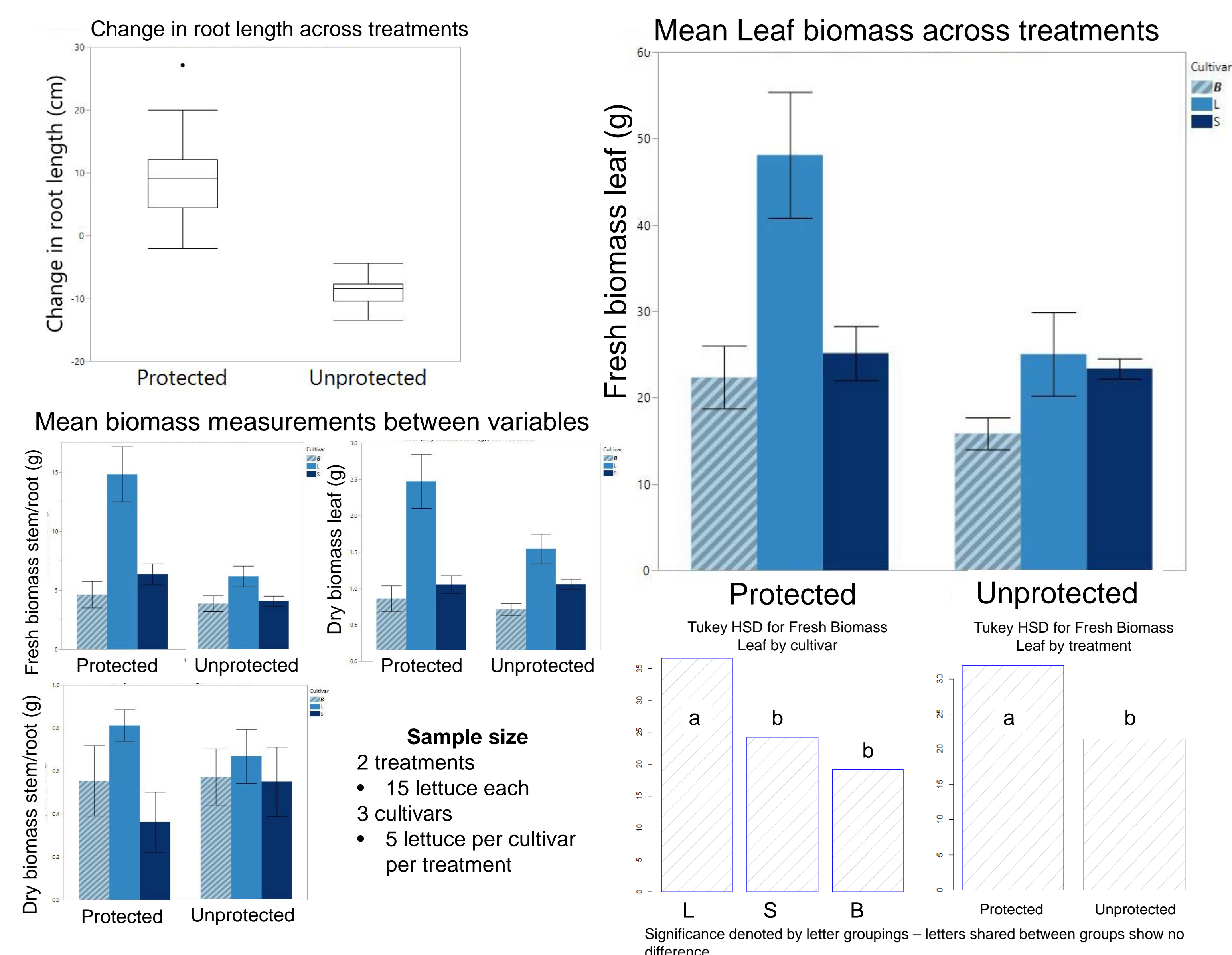
Root selectivity

- Four species of plant: broccoli, cilantro, dill, and parsley were grown. Eight plants of each species except parsley (four).
- Transferred to yellow perch raft systems for two weeks
- The maximum root length was measured and they were placed in the tilapia tank under identical parameters to the yield experiment
- After two days the final root lengths were measured and compared



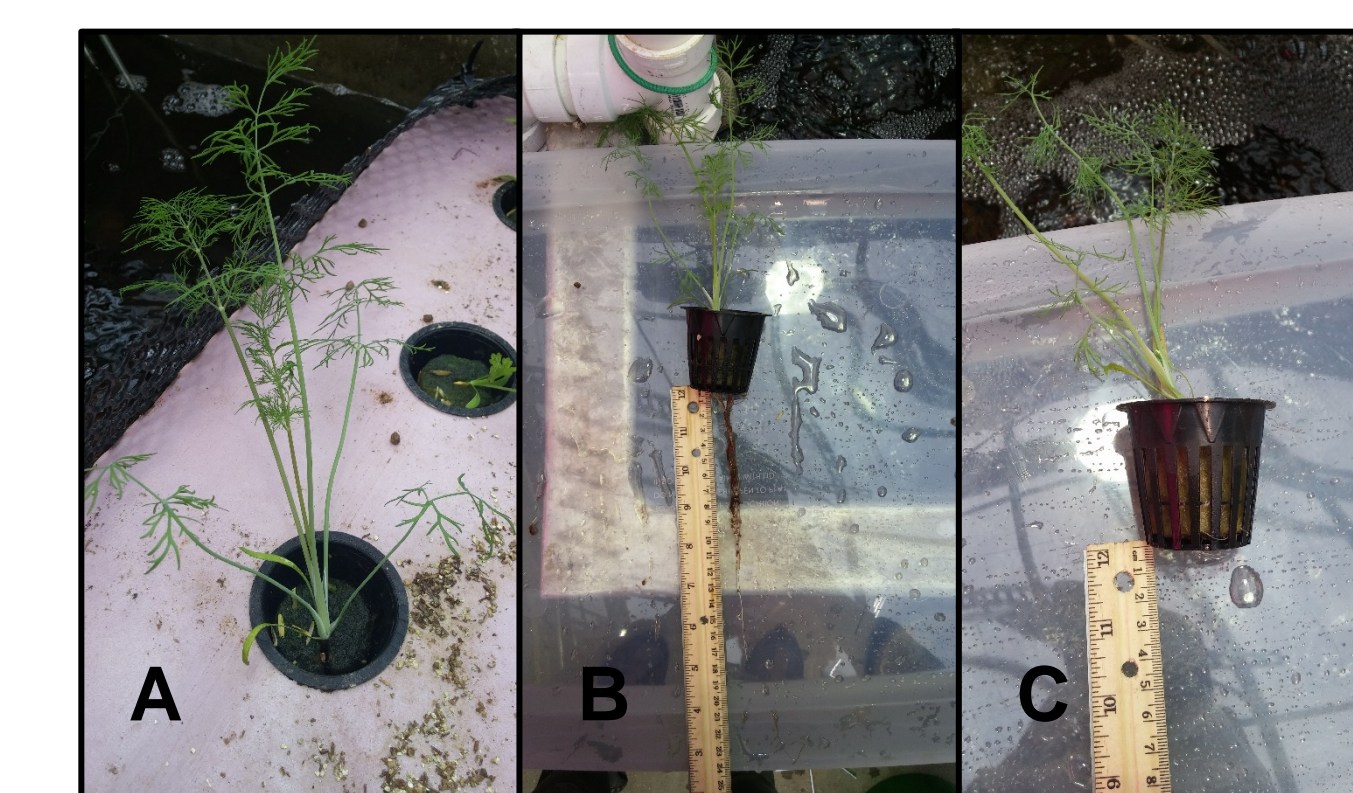
A. Tilapia B mesh basket for the raft – 23 cm deep. C. growing conditions for the plants. D. root length measurement prior to transfer

Results



Species	Consumed (Y/N)
Broccoli	Y
Dill	Y
Cilantro	Y
Parsley	Y

*All unprotected plant roots were entirely excised within 5 minutes of being placed in the tank



A. Dill. B. Protected dill root growth. C. Unprotected dill – no protruding roots remain

Conclusion

- Fresh biomass is significantly higher for both leaf and root/stem in the protected raft. Leaf lettuce yielded higher biomass than the other two cultivars which are not significantly different from each other.
- Exposed roots were clearly grazed by the tilapia all the way up to the net pot; may be influenced by feeding regime and root development/age
- **It appears to be optimal to limit interaction between tilapia and plant roots in raft setups.**