



Root Herbivory has More Influence on *Arabidopsis thaliana* Survival Rates than Leaf Herbivory

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Hypothesis:

We hypothesize that the hypocotyl length, leaves number and survival rate will be greater in plants with cut leaves than cut roots.

Background:

Plants rely on root absorption and leaf photosynthesis to grow. Roots not only absorb nutrition from soil but also function in nutrient storage and reproduction.

We exposed *Arabidopsis thaliana* to three different treatments: cutting leaves, cutting roots and a control group. We observed their growth, morphology and the survival rate.

Treatment:

3 Treatments:

	A	B	C
1	Leaves	Roots	Normal
2	Leaves	Roots	Normal
3	Leaves	Roots	Normal
4	Leaves	Roots	Normal
5	Leaves	Roots	Normal
6	Leaves	Roots	Normal
7	Leaves	Roots	Normal
8	Leaves	Roots	Normal
9	Leaves	Roots	Normal

Figure 1. Three treatments, cutting leaves(A), cutting roots(B), control group(C).

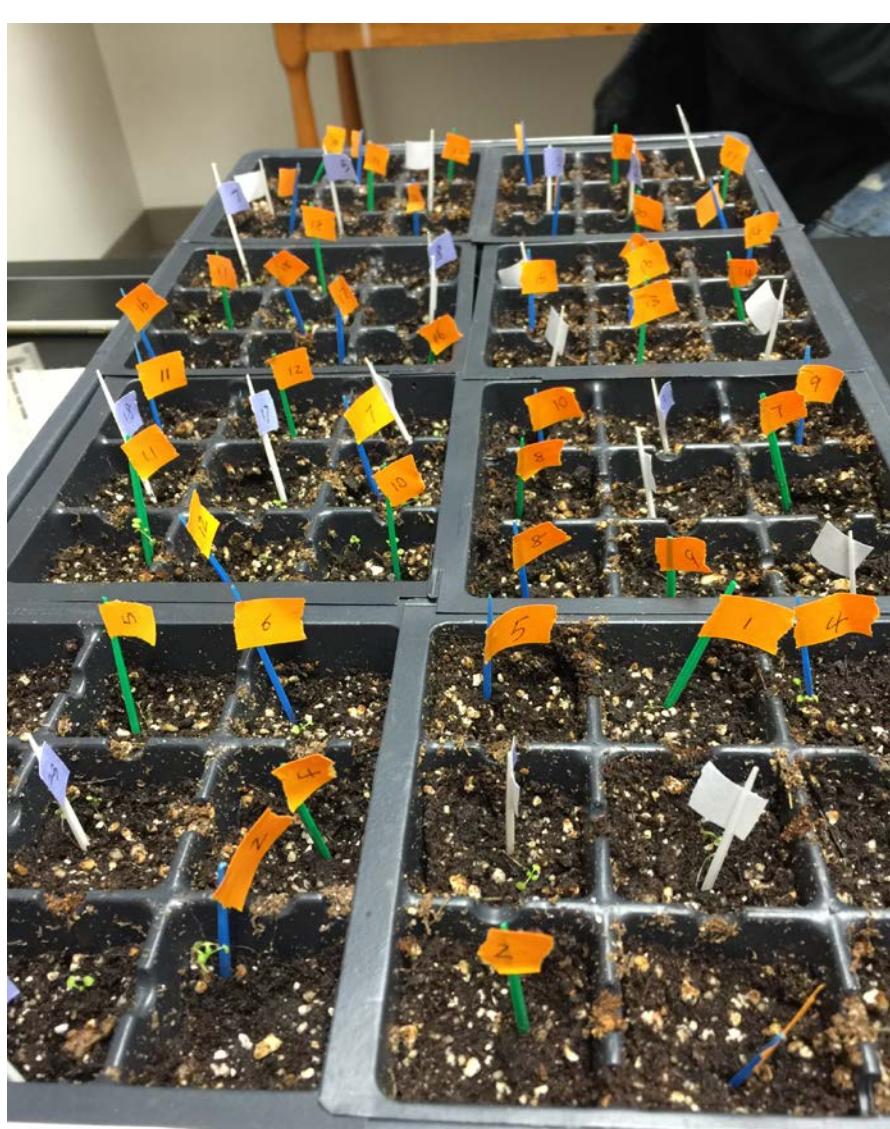


Figure 2. Mark each treatment, which contain 27 plants. Green toothpick(A), Blue toothpick (B), White toothpick(C)

Acknowledgements:

Thanks to the University of Bridgeport Biology department for giving us this research opportunity. Also, special thanks to Dr. Engelmann for her support and supplying us with the materials to making this experiment possible.

Methods:

- Strain = Mt-0
- Germination until 75% of them have 4 leaves. Then start the treatment to cut the leaves and roots for four weeks.
- Normal potting soil
- Watering every 3 days
- Clockwise moving container every 2 days.
- Count leaf number and hypocotyl length every week and number of weeks plants survived.



Figure 3. Cutting leaves during the treatment.



Figure 4. Measuring hypocotyl length for each plant.

Results:

Oneway Analysis of W2 Hypocotyl length By Treatment

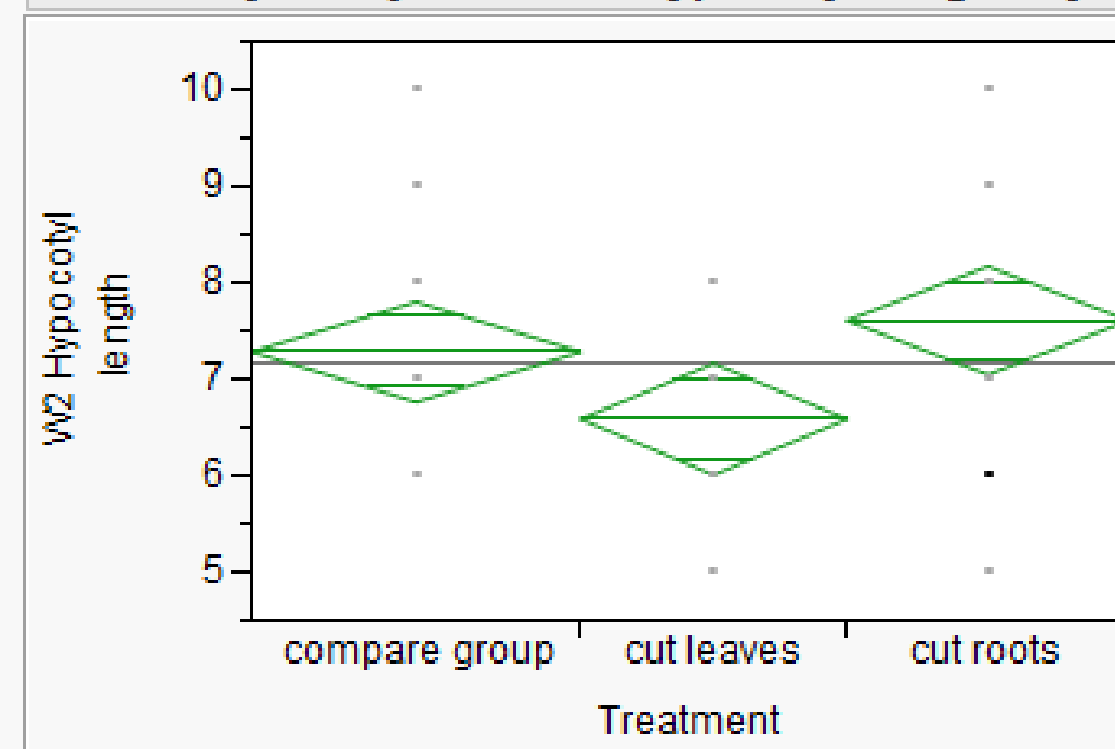


Figure 5. After the second week, hypocotyl length by each treatment: cutting leaves, cutting roots and compare group. $P > 0.0414$

Oneway Analysis of W4 Hypocotyl length By Treatment

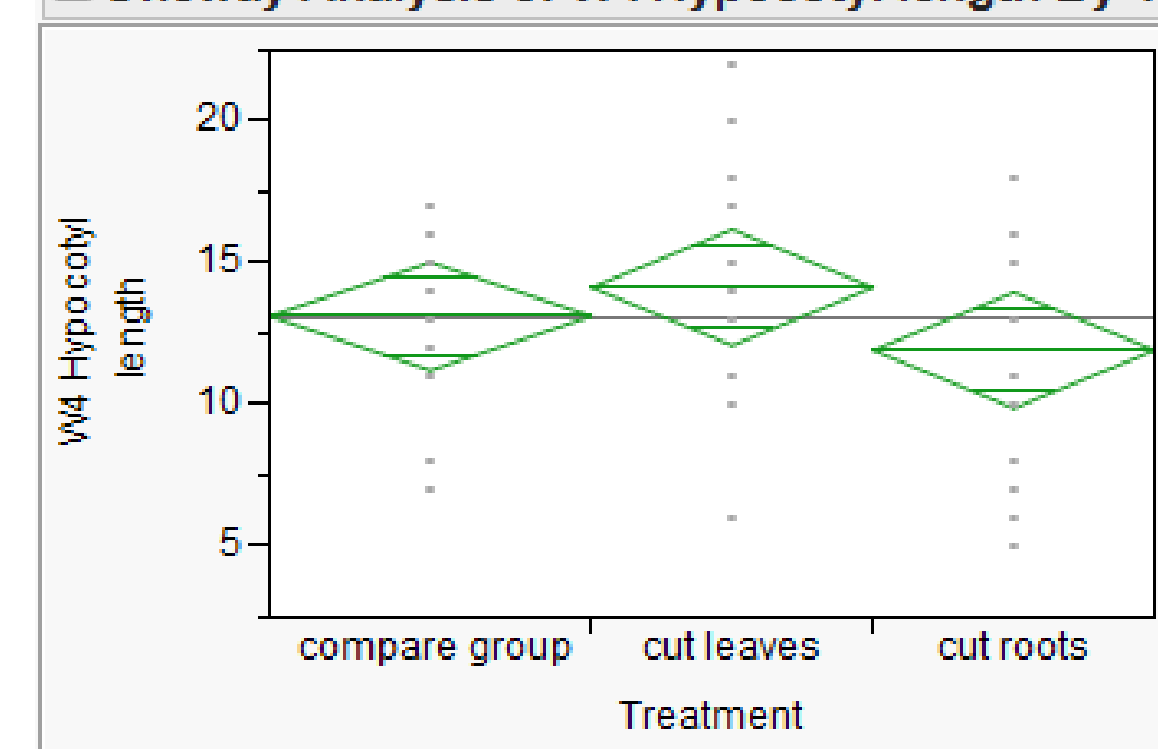


Figure 6. After the fourth week, hypocotyl length by each treatment: cutting leaves, cutting roots and compare group. $P > 0.3108$

Oneway Analysis of W2 Leaf number By Treatment

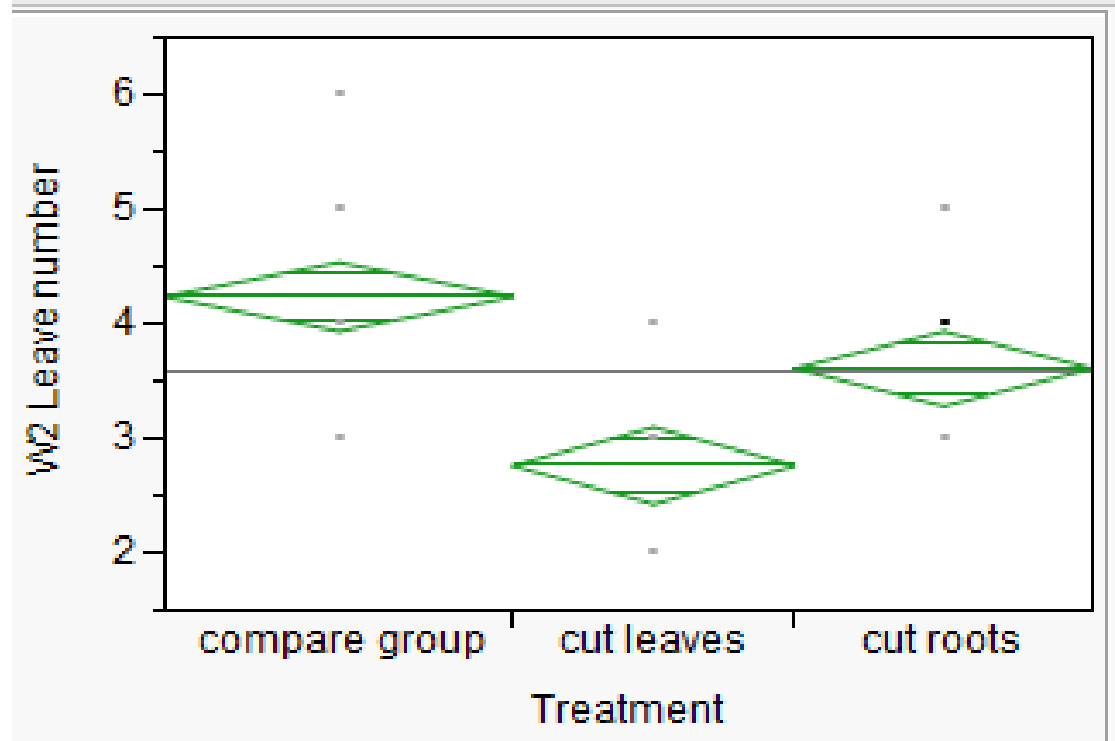


Figure 7. After the second week, leaves number by each treatment: cutting leaves, cutting roots and compare group. $P < 0.0001$

Oneway Analysis of W4 Leaf number By Treatment

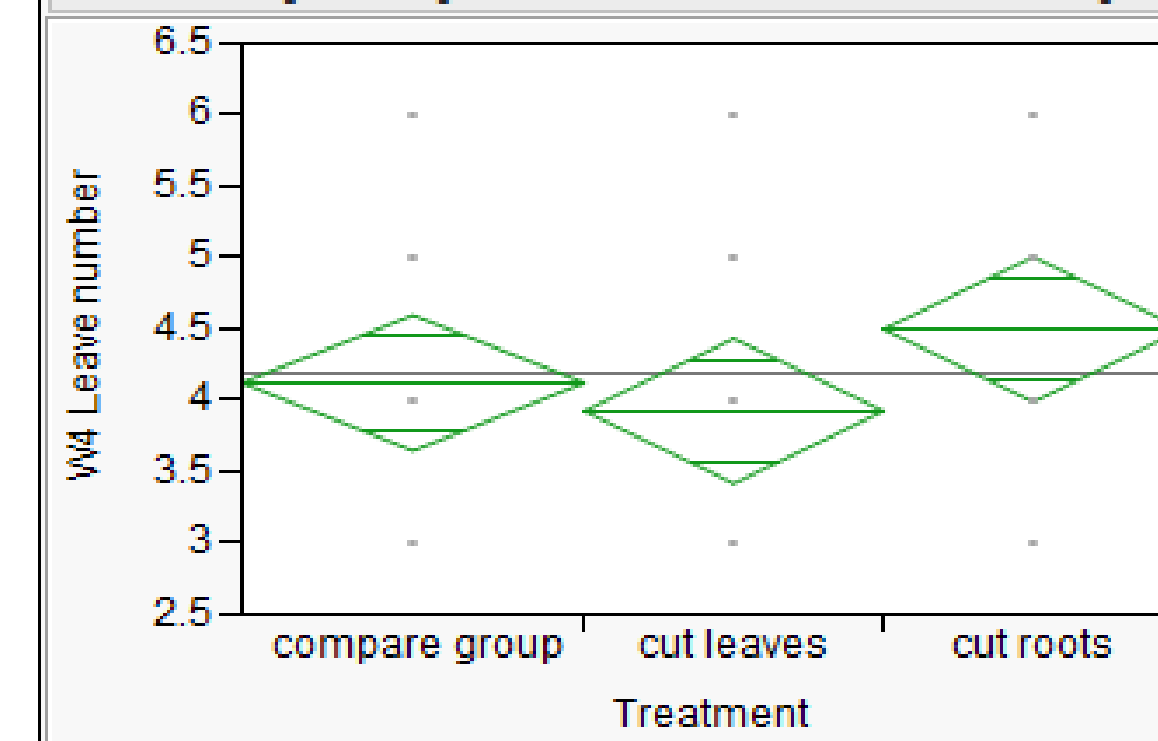


Figure 8. After the fourth week, leaves number by each treatment: cutting leaves, cutting roots and compare group. $P > 0.2728$

Oneway Analysis of Survivals until week By Treatment

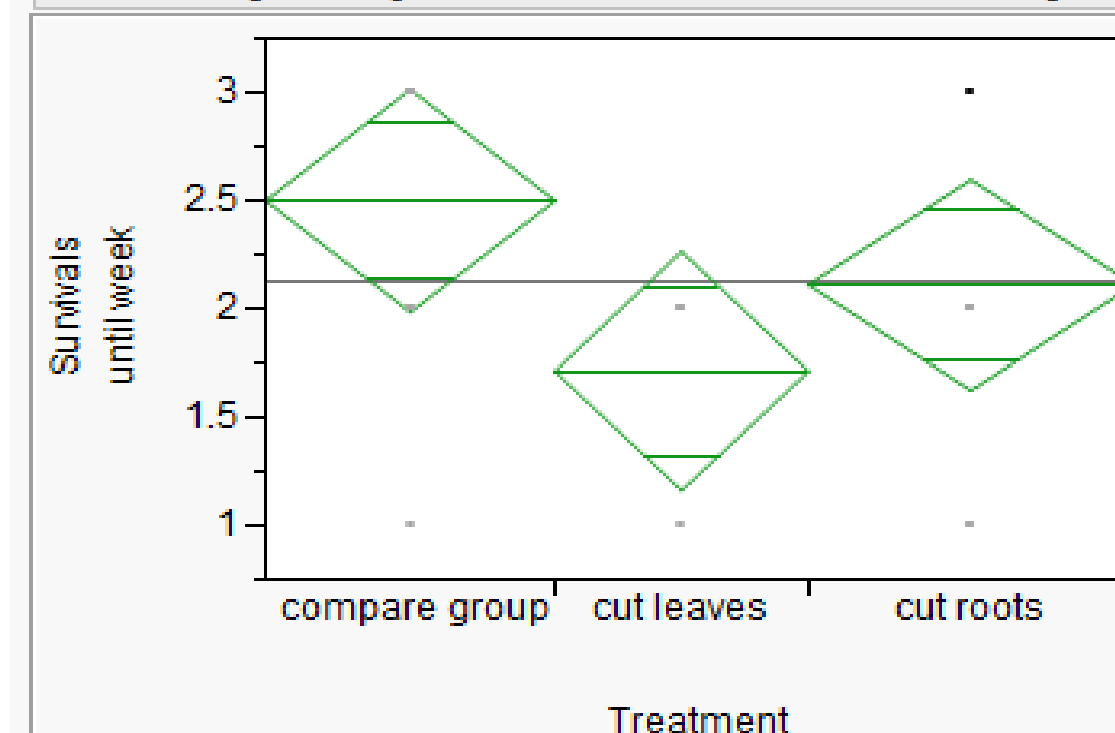


Figure 9. Survival rate of *A. thaliana* until week 2 and week 4 by each treatment: cutting leaves, cutting roots and compare group $P > 0.1201$

Conclusion:

1. No evidence to prove root herbivory has more influence on survival rate of *Arabidopsis thaliana* than leaf herbivory.
2. The impact on belowground herbivory on the growth of plants is only in the early stages, with less effect on later stages.
3. Tolerance mechanisms can help plants to reduce the negative effects of damage on fitness.