

A decorative graphic on the left side of the slide features several green circles of varying sizes and three detailed images of green leaves with visible veins. The largest leaf is positioned in the upper right, while two smaller ones are below it. The circles are scattered around these leaf images.

The Effects of Different Soil Types on *Brassica Rapa* Growth

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What is Soil?

Upland Soil:

- lack N
- tends to clump (Angers, 1989)

Alluvial Soil:

- composed of the soils that are upstream the river
- normally consists of **low K**

Potting Soil:

- contains optimal amounts of N, K, and P for plant growth (Tripathi, 2014)





Upland Farming

Alluvial Farming



What is Fertility?

Organic Concentration

- Binds soil particles and improves the water holding capacity
- Affects chemical and physical properties

pH Level

- Fertile soil has a pH between 5.5-7
- Lower pH makes lower levels of inorganic C
- Higher pH lowers plant intake of heavy metals

Particle Size

- Effectively holds water and nutrients
- Smaller particle size have more holding capacity, but less drainage



Brassica rapa



Research Questions

How do **alluvial** and **upland** soils differ from each other in physical & chemical characteristics?

&

What are the effects of **alluvial** and **upland** soil on plant growth?



Methods



Physical

1. Collect **5** samples of each soil from Farmville area:
 - Upland soil
 - Alluvial soil
 - Potted soil (Control)
2. Measure:
 - Organic Matter**
 - pH**
 - Particle Size**

Chemical

1. Take **16** samples of each soil from original samples:
 - Upland soil
 - Alluvial soil
 - Potted soil (Control)
2. Grow **16** *Brassica rapa* plants in the each of the three soil samples.
 - 12** styrofoam cell quads, **4** seeds in each
 - Grow for **3** weeks
 - Water weekly.
3. Record which soil had the most plant growth

Organic Matter Results



Alluvial: 35%

Upland: 19%

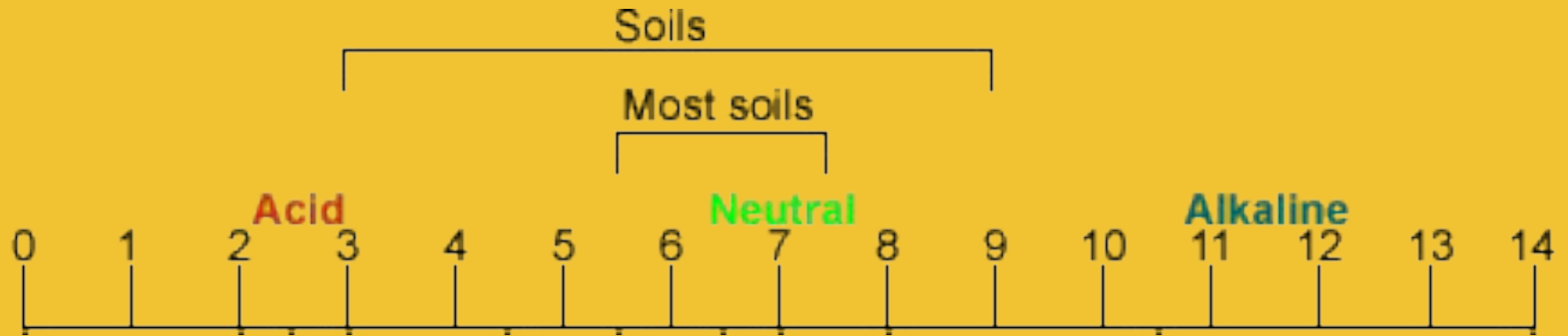
Control: 91%

Soil pH Results

Alluvial: 6.7 pH

Upland: 6.2 pH

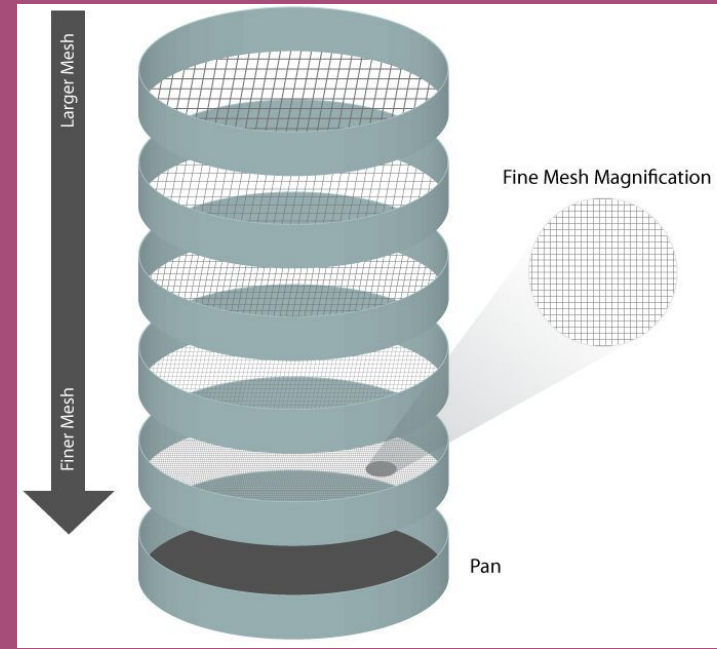
Control: 6.5 pH



Particle Size Results

	Coarse Gravel	Fine Gravel	Coarse Sand	Fine Sand	Silt and Clay
Alluvial	20%	17%	49%	11%	1%
Upland	2.64%	19.88%	73.92%	1.72%	0%
Control	15.2%	22.08%	53.4%	7.44%	0.2%

Table 1. Particle Size in Different Soils





Week 1



Potting Soil (Control)

Alluvial Soil

Upland Soil



Week 2



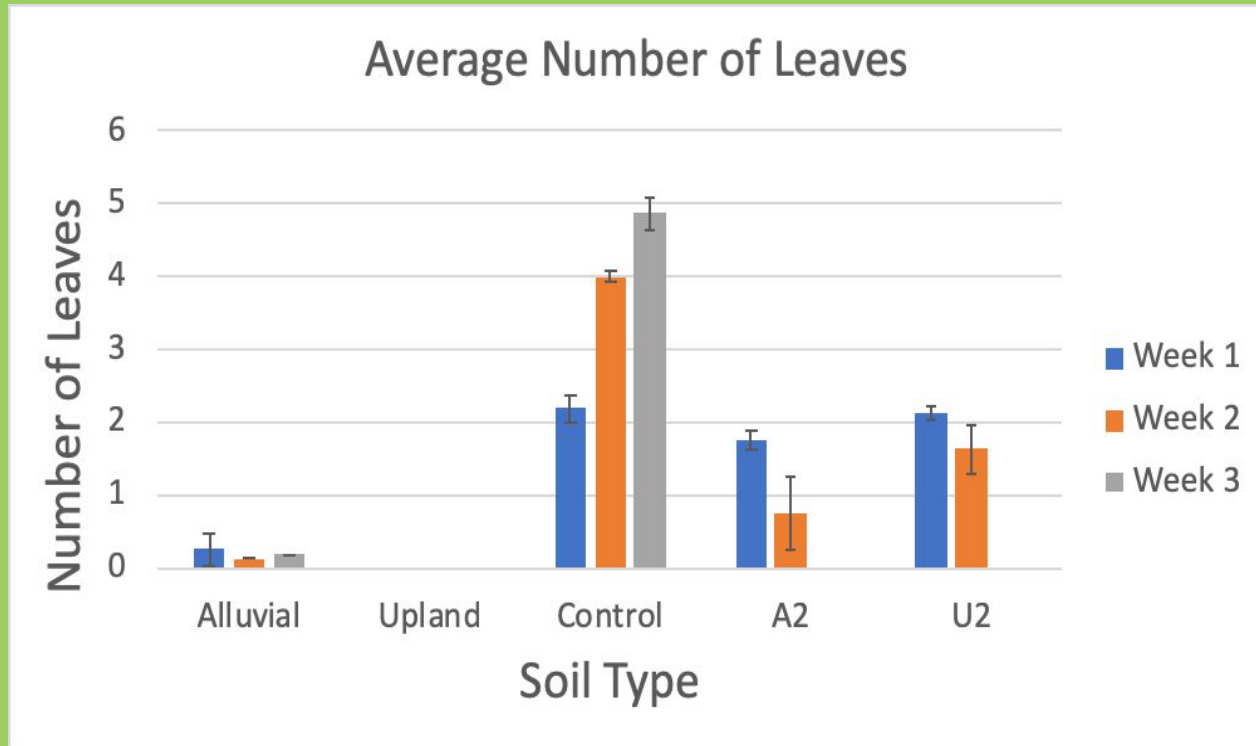
Week 1

Week 3



Week 2

Results



ANOVA

Time

F=20.66

P=<.0001

Treatment

F=373.62

P=<.0001

Time

F=0.29

P=0.6001

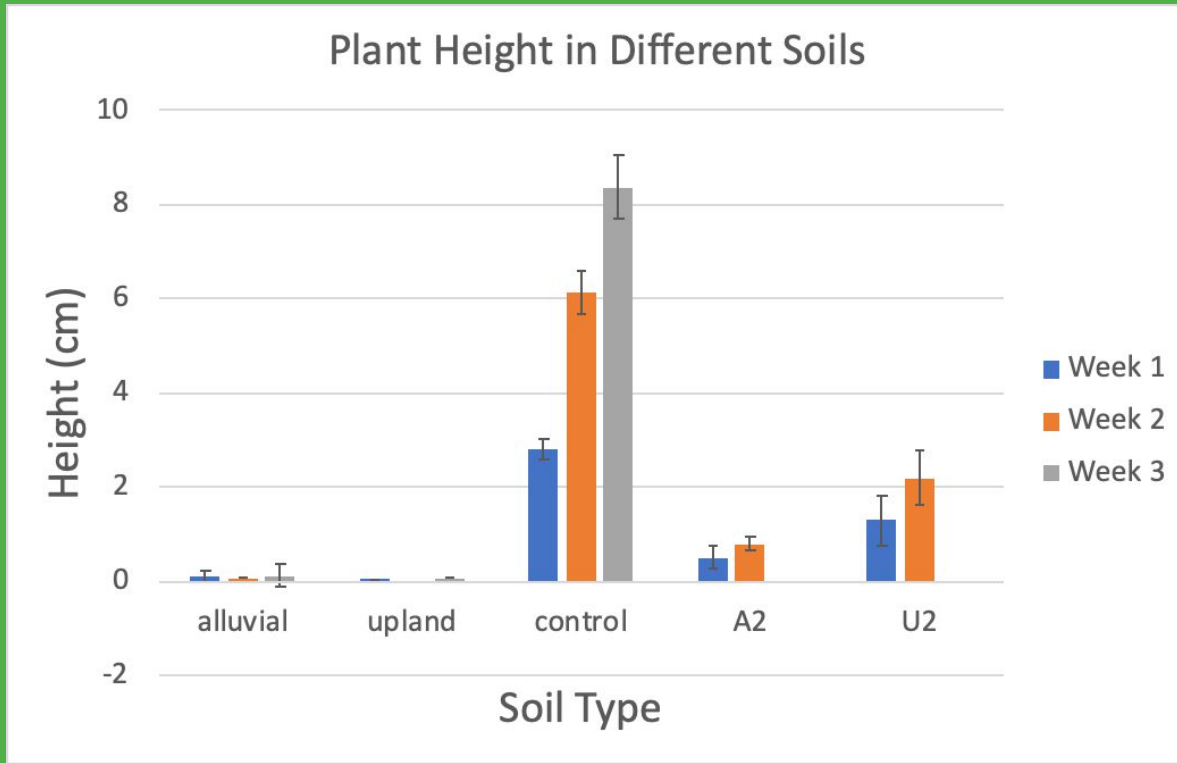
Treatment

F=0.01

P=0.922

Figure 1. The Number of Leaves Grown on Each Plant in Different Soils

Results



ANOVA

Time

F=31.6

P=<.0001

Treatment

F=393.04

P=<.0001

Time

F= 0.09

P= 0.7693

Treatment

F=0.3

P=0.5939

Figure 2. Average Plant Height in Different Soils



Discussion

Particle Size

Alluvial:

Dense sediment made growth difficult.

Upland:

Too much **coarse** sand.

Second trials:

Grew under **crushed** soil.





Soil pH

- *Brassica rapa* grows well between 5.5 and 6.8 pH (Duke 1978).
- Soil types varied in pH between 6.2 and 6.7.
- Differences **not** significant enough to influence growth.

	<u>Length (cm)</u>
<u>pH3</u>	17.39
<u>pH4</u>	19.11
<u>pH5</u>	20.45
<u>pH6</u>	20.86
<u>pH7</u>	19.98

Growth of *Brassica rapa* in varying degrees of pH levels. (Allen & Wold 2014).

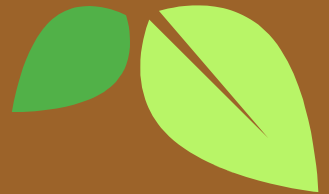




Organic Matter

Enjoy extremely **high organic matter** concentrations more closely resembling control group (Kalpana et. al 2012).

High organic content in soil allows for a self-sustaining microbial community.



Conclusion



- **Loose**, unconsolidated soil is essential for significant *Brassica rapa* growth.
- High organic matter concentration provides a sustainable habitat for plant growth without the use of fertilizer.
- Natural soils reside at comfortable pH levels for plant growth.

ANY
QUESTIONS?





Citations

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