

Boosting the Chemistry of Soil

Data analysis to determine the effectiveness of a soil treatment - Teacher

What is the difference between amounts of nutrients from baseline to treatment?

In order to determine if a treatment makes a difference, some data analysis is necessary. Comparing the raw numbers does not often give an idea of the amount of change from control to treated. One way to analyze data is to look at percent change from the control or baseline to treatment.

Use the plot key to see which condition each of the letters represents.

In this activity, determine the percentage of change in the nutrient by comparing different treatments. The formula to follow is: (new amount - original amount)/original amount

(amount on Aug 1 – amount on July 19) / amount on July 19.

Be sure to indicate whether the change is an increase or decrease.

Nitrogen

% PRESENT IN TISSUE SAMPLE	A	V	U	T	K	S	R	NO	LIGHT	CHECK
7/19/19	3.92	4.87	5.68	5.76	5.25	5.76	5.82	5.75	5.96	5.77
8/1/19 NOT SPRAYED	6.35	5.88	5.36	4.69	5.53	6.14	5.41	5.93	6.11	5.75
8/1/19 SPRAYED	6.57	5.78	5.58	5.58	6.00	6.05	5.42	5.82	5.71	6.40
	A	V	U	T	K	S	R	NO	LIGHT	CHECK
% Change: 7/19 to 8/1 Not Sprayed	62%	21%	-6%	-19%	5%	6%	-7%	3%	3%	0%
% Change: 7/19 to 8/1 Sprayed	67%	19%	-2%	-3%	14%	5%	-7%	1%	-4%	11%
% Change: Not Sprayed to Sprayed	3%	-2%	4%	19%	8%	-1%	0%	-2%	-6%	11%

Phosphorus

% PRESENT IN TISSUE SAMPLE	A	V	U	T	K	S	R	NO	LIGHT	CHECK
7/19/19	0.48	0.52	0.61	0.53	0.43	0.50	0.59	0.51	0.46	0.52
8/1/19 NOT SPRAYED	0.58	0.55	0.45	0.47	0.57	0.52	0.45	0.48	0.51	0.48
8/1/19 SPRAYED	0.55	0.52	0.52	0.48	0.46	0.53	0.47	0.47	0.51	0.55

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	A	V	U	T	K	S	R	NO	LIGHT	CHECK
% Change: 7/19 to 8/1 Not Sprayed	21%	6%	-26%	-11%	33%	4%	-24%	6%	11%	8%
% Change: 7/19 to 8/1 Sprayed	14%	0%	-15%	9%	7%	6%	-12%	8%	11%	6%
% Change: Not Sprayed to Sprayed	-5%	-5%	16%	2%	-19%	2%	4%	-2%	0%	15%

Potassium

% PRESENT IN TISSUE SAMPLE	A	V	U	T	K	S	R	NO	LIGHT	CHECK
7/19/19	2.17	2.39	2.30	2.58	1.85	2.34	2.60	2.33	2.34	2.32
8/1/19 NOT SPRAYED	2.52	2.42	1.97	2.23	2.25	2.21	2.07	2.17	2.26	2.36
8/1/19 SPRAYED	2.43	2.44	2.43	2.43	2.35	2.43	2.43	2.45	2.34	2.51

	A	V	U	T	K	S	R	NO	LIGHT	CHECK
% Change: 7/19 to 8/1 Not Sprayed	16%	1%	-14%	-14%	22%	-6%	-20%	7%	-3%	2%
% Change: 7/19 to 8/1 Sprayed	12%	2%	6%	6%	27%	4%	-7%	5%	0%	8%
% Change: Not Sprayed to Sprayed	-4%	1%	23%	9%	4%	10%	17%	13%	4%	6%

1. Compare the percent change from July to August. Identify any significant changes for nitrogen.

See answers above in blue.

2. Was the change positive or negative? Explain your reasoning.

Some of each. Answers may vary. Remind students of what happens to nitrogen throughout the nitrogen cycle

3. Compare the percent change from 'not sprayed' to 'sprayed' for nitrogen. Identify any significant changes.

See answers above in blue.

4. Were the changes positive or negative, explain your reasoning.

Some of each. Answers may vary. Remind students of what happens to nitrogen throughout the nitrogen cycle

5. Compare the percent change from July to August. Identify any significant changes for phosphorus.

See answers above in blue.

6. Was the change positive or negative? Explain your reasoning.

Some of each. Answers may vary. Remind students of how phosphorus may dissolve in water and how it may attach to soil particles.

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7. Compare the percent change from 'not sprayed' to 'sprayed' for phosphorus, identify any significant changes.

See answers above in blue.

8. Were the changes positive or negative? Explain your reasoning.

Some of each. Answers may vary. Remind students of how phosphorus may dissolve in water and how it may attach to soil particles.

9. Compare the percent change from July to August. Identify any significant changes for potassium.

See answers above in blue.

10. Was the change positive or negative? Explain your reasoning.

Some of each. Answers may vary. Students may need to research how potassium is utilized and where it comes from in soil.

11. Compare the percent change from 'not sprayed' to 'sprayed' for potassium. Identify any significant changes.

See answers above in blue.

12. Were the changes positive or negative? Explain your reasoning.

Some of each. Answers may vary. Students may need to research how potassium is utilized and where it comes from in soil.

13. Does this data help to determine if the soil amendments were effective?

Fertilizol makes the phosphorus more available for plant uptake. Conditions K and S were treated with Fertilizol. According to this data, the application of fertilizol did not significantly increase phosphorus in the plant tissue

Phosphorus percent change	K	S
% Change: 7/19 to 8/1 Not Sprayed	33%	4%
% Change: 7/19 to 8/1 Sprayed	7%	6%
% Change: Not Sprayed to Sprayed	-19%	2%

BioBuild adds microbes to increase phosphate solubilization (increasing the ability for plants to uptake P) and increase nitrogen fixation. Conditions V, U, T utilized BioBuild in differing amounts. According to this data, the amount of phosphorus does not appear to have increased, but the decrease was not as great when sprayed in U; there was an overall increase in phosphorus of 16% when sprayed vs. not sprayed. (This condition used the smallest concentration of BioBuild.)

Phosphorus	V	U	T
% Change: 7/19 to 8/1 Not Sprayed	6%	-26%	-11%
% Change: 7/19 to 8/1 Sprayed	0%	-15%	9%
% Change: Not Sprayed to Sprayed	-5%	16%	2%

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The condition that showed the greatest effect on nitrogen uptake by plants was in T. Spraying resulted in 19% higher amounts of nitrogen in the plant tissue.

Nitrogen	V	U	T
% Change: 7/19 to 8/1 Not Sprayed	21%	-6%	-19%
% Change: 7/19 to 8/1 Sprayed	19%	-2%	-3%
% Change: Not Sprayed to Sprayed	-2%	4%	19%

14. What environmental factors could possibly affect the percent change?

Soil factors such as: pH, temperature, microbes, moisture, original amount of nutrients in soil

15. How would the environmental factors you listed above impact the percent change?

*pH will affect uptake of nutrients; if the pH is too low, nutrients may not be absorbed by roots, leaving more in the soil. More **microbes** in the soil usually help to break down and make nutrients more available resulting in higher absorption. Soil **temperatures** that are too cold or too hot can affect the amount of nutrients absorbed. The **moisture** level in the soil can also impact absorption and respiration of the roots. Too much water can drown the plants keeping them from getting enough oxygen for respiration. Nutrients need to be dissolved in small amounts of soil water in order to be available to roots.*