

SI Environmental Science - Full Discipline Demo

Salinization of Soils

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Environmental Science - Full Discipline Demo
Course	SI Environmental Science - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Identify each statement as true or false.

⚡ Salinized soils are detrimental to agriculture.

⚡ Most plants can excrete the salt absorbed from soil.

⚡ Halophytes are adapted to live in salinized soils.

⚡

The primary effect of soil salinization on plants is creating a toxic imbalance within cells.

True

False

1

2

Correct answers:

1 Salinized soils are detrimental to agriculture.

Halophytes are adapted to live in salinized soils.

2

The primary effect of soil salinization on plants is creating a toxic imbalance within cells.

Most plants can excrete the salt absorbed from soil.

Categorize each source of salinization as natural or man-made.

Natural	Man-made
1	2

⌵ Irrigation

⌵ Coastal flooding

⌵ Parent rock deterioration

⌵ Tree and shrub removal

Correct answers:

- 1 Coastal flooding Parent rock deterioration
- 2 Irrigation Tree and shrub removal

Exploration

The primary effect of soil salinization on plants is limiting the ability of roots to absorb water even under wet soil conditions.

- ☒ True ✓
- ☐ False

_____ are salt-tolerant plants with adaptations to grow and reproduce in saline soils.

- ☒ Halophytes ✓
- ☐ Glycophytes
- ☐ Selenites
- ☐ Epiphytes

_____ is the leading human cause of salinization around the world.

- ☒ Irrigation ✓
- ☐ Parent rock degradation
- ☐ Coastal flooding
- ☐ Road salting

Exercise 1

How was soil salinization modeled in the experimental procedures?

Soil salinization was modeled by adding both pure water (dH₂O) and saline water of varying concentrations (0.5-2.0%) to paper towel disks inside Petri dishes that served as germination containers for bean seeds.

How could using tap water, instead of distilled water, to create saline solutions affect the results of this experiment.

Distilled water is pure H₂O, whereas most tap water sources contain some salts. These salts would have increased the saline concentrations used in this experiment, increasing the effects of salinization on seed germination.

Why should Petri dishes containing germinating beans be weighed at 24-hour intervals?

The Petri dishes should be weighed at 24-hour intervals to determine the amount of water lost due to evaporation, so that water could be added to maintain the original mass and salinity values for each of the treatments. Evaporation would cause the saline levels of the remaining solution inside the Petri dishes to increase.

What was the minimum salt concentration that affected bean germination in your results? Reference Data Table 1 and Graph 1 in your answer.

0.5% salinity was the minimum salt concentration affecting bean germination in SI results. At this salinity, zero beans completely germinated, and only six beans partially germinated as recorded in Data Table 1.

Based on your results, would you categorize the bean species used in this experiment as a halophyte or glycophyte? Include the definition of each term in your answer.

The bean species used in this experiment would be categorized as a glycophyte since salinity levels of 0.5% and higher significantly affected germination rates. To be considered a halophyte, the beans would be resistant to salinization in excess of 1.0%. Only beans in 0.0% salinity exhibited complete germination in this experiment.

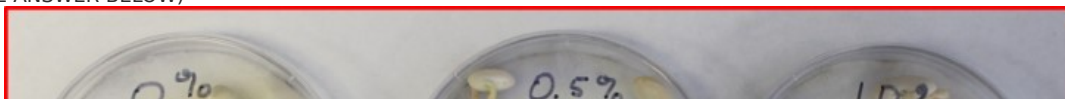
Based on your results, would beans be an ideal crop species for growing in arid basin areas of the western United States? Relate natural and human caused sources of soil salinization in your answer.

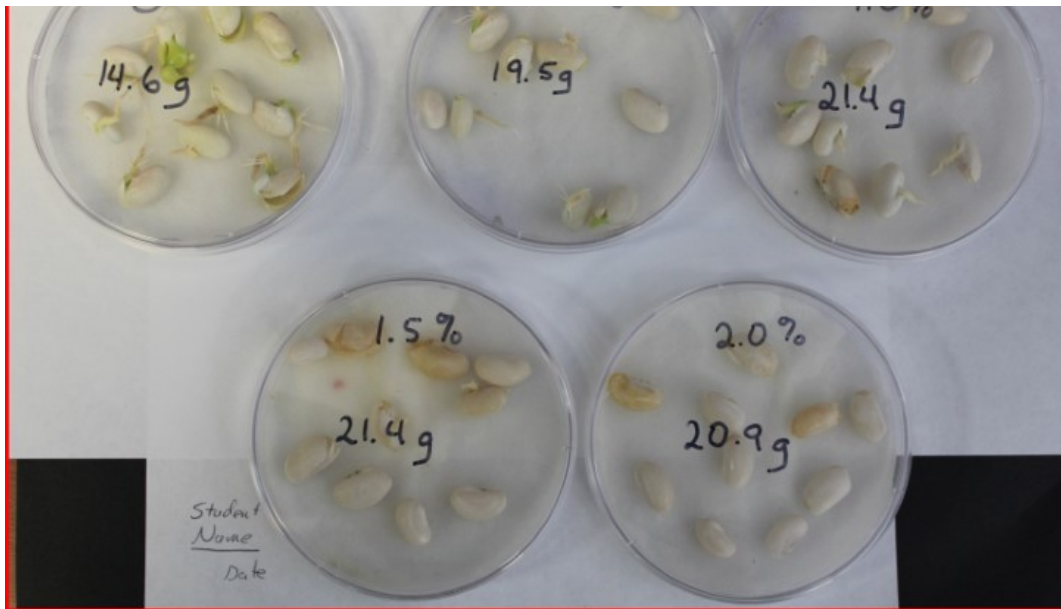
0 / 10000 Word Limit

Data Table 1: Germination Response to Salinity
(SAMPLE ANSWER BELOW)

Bean response	0.0% salinity	0.5% salinity	1.0% salinity	1.5% salinity	2.0% salinity
Complete germination	7	0	0	0	0
Partial germination	3	6	8	2	0
No germination	0	4	2	8	10

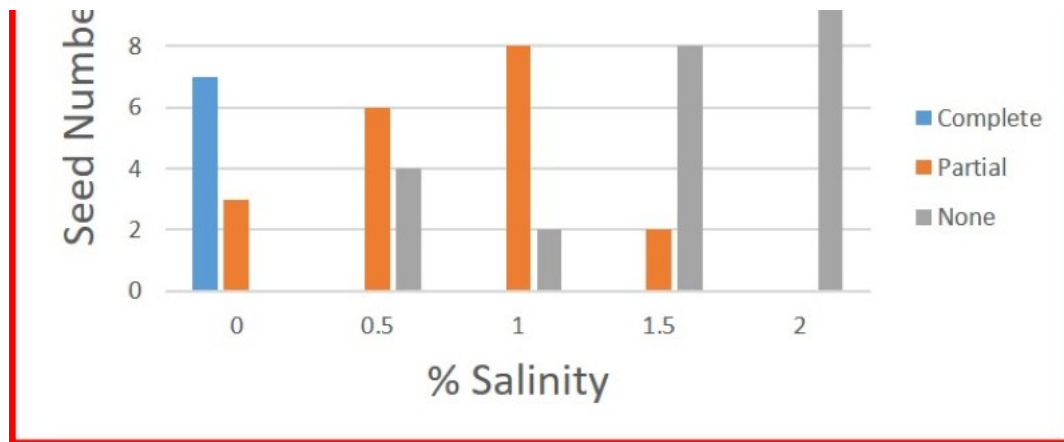
Photo 1: Germination Results after Five Days
(SAMPLE ANSWER BELOW)





Graph 1: Salinization vs. Germination
(SAMPLE ANSWER BELOW)





Competency Review

The primary effect of soil salinization on plants is to limit the ability of roots to absorb ____.

- ☐ carbon dioxide
- ☐ sunlight
- ☒ water
- ☐ nutrients

____ are plants which lack salt-tolerance and are damaged by soils with over 1.0% salinity.

- ☐ Halophytes
- ☒ Glycophytes
- ☐ *Salicornia*
- ☐ Mangroves

Salinized soils are beneficial to agriculture.

- ☐ True
- ☒ False

____ is the most prevalent salt in soils and the focus of salinization studies.

- ☐ KCl
- ☐ Na_2CO_3
- ☒ NaCl
- ☐ CaCO_3

Salinization is more commonly associated with applying too much irrigation water rather than too little.

- ☒ True
- ☐ False

____ water should be used when making salt solutions for a salinization experiment.

- ☒ Distilled ✓
- ☐ Drinking
- ☐ Tap
- ☐ Well

Petri dishes containing germinating beans should be weighed daily to determine water loss due to evaporation.

- ☒ True ✓
- ☐ False

A salt concentration of 1.0% inhibits the complete germination of bean seeds.

- ☒ True ✓
- ☐ False

Groundwater with a salt concentration of 0.5% is an appropriate water source for irrigating field beans.

- ☐ True
- ☒ False ✓

Extension Questions

Seeds of some plants are able to survive salinized soils by delaying germination until seasonal rains arrive and flush salts from the soil. Describe how you would change the procedures of this experiment to determine if beans are able to delay germination in response to salinized soils. (SAMPLE ANSWER BELOW)

The experiment would be conducted as performed in this lesson for five days. Then the beans in the 2.0% Petri dish would be rinsed in distilled water and placed in a 0.0% Petri dish and then observed for five additional days to determine if complete germination occurs. Only beans from the 2.0% Petri dish would be used for the new procedures because these were the only beans that displayed no signs of germination during the initial experiment.

