Effects of soil salinisation

Resource sheet 3 (for teachers)

The effect of salinity on seed germination

Materials

- Seeds of two plant varieties (e.g. beans, sunflower)
- 10 Petri dishes
- Cotton wool
- Dropper bottles (5) containing the following:
- distilled water (control)
- 0.25 grams salt per litre distilled water
- 0.50 grams salt per litre distilled water
- grams salt per litre distilled water
- grams salt per litre distilled water
- Plastic film

Method

1. Place cotton wool in the bottom of each Petri dish.
2. Label one set of 5 dishes A1 to E1; label the remaining 5 dishes A2 to E2.
3. Spread seeds of one variety across the cotton wool in one set of 5 Petri dishes. Repeat for the second seed variety in the other set of dishes.
4. In each set of dishes, place distilled water dish A, the lowest concentration of salt in dish B, and so on. Add only sufficient to moisten the seeds.
5. Cover each dish with plastic film to prevent drying out. Place the dishes in a well lit area (not necessarily in direct sunlight).
6. Check the dishes every two days and add solution as necessary to keep the seeds moist. At each check count the number of germinated seeds.
7. Continue checking for a period of one to two weeks. At the final check, count the ungerminated seeds as well as the germinated ones.
8. Calculate the ratio of germinated seeds to ungerminated seeds and compare them for differing salt concentrations. (Germination ratio = ungerminated seeds / germinated seeds).

Results and analysis

- Record the results in a table.
- Draw a bar graph of the germination percentage at differing salt concentrations for each seed variety.
- What effect does salt have on seed germination? Explain.
- How did the two kinds of seeds differ in their response to the salt solution? Point out any differences between them.
- What are the implications for farmers in salt-affected areas?

The effect of salinity on plant growth

Materials

- Ruler
- Fast-growing plants that have reached an advanced stage of germination (e.g. beans, sunflower)
- Coarse washed sand
- 5 plastic plant pots (15 cm in diameter)
- Measuring cylinders
- Beakers

- 20 litres non-saline nutrient solution ('Aquasol' or similar, mixed as per instructions; ensure micro-nutrients are included)
- Dropper bottles containing 5 salt/nutrient solutions at the following concentrations:
- nutrient solution only (control)
- 0.25 grams salt per litre nutrient solution
- 0.50 grams salt per litre nutrient solution
- grams salt per litre nutrient solution
- grams salt per litre nutrient solution
- Foil

Method

1. Place plants in coarse washed sand, with four plants in each plant pot.
2. Make up the salt/nutrient solutions as described above.
3. Irrigate each of the pots, when necessary, from the top of the sand and let excess solution drain away through the bottom of the pot. To save on solution you can grow the plants in beakers of solution and change the solution once a week — the plants will deplete the solution of some of the elements over that time and it needs to be replaced. If growing plants in solution, it will be essential to provide aeration to roots. Use an air pump (e.g. fish tank aerator per beaker). The beakers of solution need to be wrapped (e.g. in foil) to keep the roots dark.
4. Carefully measure the amounts of solution added to, and the amounts of drainage from, each pot over the next 3 weeks. Measure plant growth (height of stem above soil) at regular intervals. Note events such as appearance of new leaves, and any strange symptoms on any leaves. Use table 1 to record your observations.
5. At the end of 2—3 weeks, when obvious differences have occurred in the treatment plants, harvest the trial and dry and weigh the shoots.

Results and analysis

Table 1

Solution (salt conc.)	*Observations*								
	Amount of solution						*New leaves*	*Leaf appearance*	*Harvested dry weight (relative yield)*
	Week 1		*Week 2*		*Week 3*				
	I	O	I	O	I	O			
control									
0.25 g/L									
0.50 g/L									
1.0 g/L									
2.0 g/L									

I = in (mL solution added) O = out (mL solution drainage)

- Describe your results.
- Is there a relationship between the amount of water used and the salinity of the solution? Explain.
- Plot on separate graphs:
    - the harvested dry mass (relative yield) against salinity
    - the stem height against salinity.