

Effect of nutrient solutions on plant growth (hydroponics)

Student worksheet

Hydroponics

Hydroponics (also called solution culture) is a relatively new approach to growing plants. It is used commonly, but some advantages have been claimed compared with growing plants in soil:

- Less space is needed.
- Higher yields.
- Shorter growing time.
- Greater control.

However, set-up costs are high and diseases and pests can easily affect each plant.

Equipment and materials

- Healthy barley seedlings, germinated one week in advance on moist vermiculite or on moist OASIS.
- Complete-nutrient solution and nutrient-deficient solution (containing none of the nutrient you are investigating).
- For each seedling: test tube, cotton wool, aluminium foil, dropping pipette (see diagram below).

Method

Set up two experiments – one using the complete nutrient solution and the other using the nutrient-deficient solution. In each experiment, use at least four seedlings (in separate test tubes). You will need at least three weeks to complete the two sets of experiments.

Follow the procedure below for both experiments.

1. Shake the nutrient solution (complete or nutrient-deficient) well to aerate it.
2. Fill a test tube with nutrient solution.
3. Push in a cotton wool plug, making sure that it soaks up the solution.
4. Make a small pocket in the plug and sit the seedling in it.
5. Leave the seedling to grow for about several weeks. Refresh the solution every couple of days by tipping out and replacing it with more aerated solution.
6. Monitor growth once a week, noting observations.
7. After four weeks, remove the seedling and blot its roots dry. Measure its mass.
8. Place the seedling in an oven at 80 – 90 °C to dry. Measure its mass every day until three consecutive readings are constant.
9. Record the dry mass of plant material.

Results and conclusions

Record your observation and measurements.

Describe the effect of the nutrient-deficiency you studied.

If other students investigated deficiencies of other nutrients, summarise their results and draw your own conclusions from these results.