Student's Card Growing hydroponic basil by using struvite

Module 1

Introduction

Objective: The aim of this experiment is to demonstrate the principles of **hydroponic cultivation** of **basil plants** fertilized with **struvite** obtained from previous laboratory experiment.
The cultivation of basil plants can be carried out using the appropriate containers for hydroponic growing, however, the use of plastic bottles, in addition to reducing costs, reinforces in the students the advantages of reusing waste materials

Necessities

Reagents	Formula		Quantity or Concentration
Mixture of salts to prepare Hoagland solution			7 g/L
Struvite	$NH_4MgPO_4 \cdot 6H_2O$		100 mg/L
Perlite	$Al_2CaFe_2K_2MgNa_2O_{12}Si$		

List of materials/tools

- NPK nutrients for hydroponics (Hoagland solution)
- Struvite
- 48 basil plants (2 per bottle)
- 24 1/1,5 l PET bottles (polyethylene terephthalate) for beverage coming from recycling
- 48 plastic sieves
- Perlite
- Precision balance
- Distilled water

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Lab Procedure

I. Preparation of basil plants

1. Clean the basil plants roots;
2. Before the struvite treatment, acclimatize the basil plants with the nutritional solution for a 24h period;
3. Cover the whole sieve base with a thin layer of perlite;
4. Insert the plant into the sieve and fill it with other perlite;
5. Repeat with all the other basil plants.

II. Experiment preparation

1. Perform 2 holes of the same dimensions of the sieves on one side of each bottle;
2. Add on the bottom of each bottle 7 g/l of NPK nutrient;
3. Prepare 2 struvite solutions in distilled water at different concentrations: one with 10 mg/l and the other with 100 mg/l;
4. Fill three quarters of the plastic bottles, which will act as controls, with distilled water;
5. Fill the other bottles, 8 per each treatment, with one of the two struvite solutions;
6. Slightly move the bottles in order to dispose equally the nutrient, which is not immediately soluble, on the bottom;
7. Fit the plastic sieves, previously filled with basil plants and clay, in the provided bottle holes and mark them;
8. After 3 or 4 days observe the state of adaptation of the plants and eventual volume variations of each nutritional solution and, in case, bring back to the initial volume;
9. Wait three weeks until the basil plants have grown and observe the differences in the plants growth progress with different struvite concentrations;
10. at the end of this period remove all the plants from the respective solutions, dry with blotting paper, observe attentively the root system development and weight in order to determinate the fresh weight;
11. Dry up in the air the plants after about a week weight again in order to obtain the dry weight.

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Additional Notes

The greenish coloration of the hydroponic solution could be caused by the growth of microalgae; this could be remedied by darkening the solution, for example by covering the bottles with aluminium foil.

Calculations fresh and dry weights of basil plants untreated and treated with struvite

Control	Fresh weight (g)	Dry weight (g)	Struvite 10 mg/L	Fresh weight (g)	Dry weight (g)	Struvite 100 mg/L	Fresh weight (g)	Dry weight (g))
Plant n. 1			Plant n. 1			Plant n. 1		
Plant n. 2			Plant n. 2			Plant n. 2		
Plant n.			Plant n.			Plant n.		
Average			**Average**			**Average**		

Questions

1. To the naked eye, do all the basil plant seem grown in the same way?
2. Does the plants radical system present a similar progress in the three groups?
3. Why has a control group been inserted?
4. Which differences are perceptible in the plants mass?
5. Why has the dry mass also been determined

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