

Soil-based Aquaponics: One Step Closer to Organic Certification

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1 ISSUE

Aquaponics is the symbiotic cultivation of plants and fish in the same recirculating water system: fish waste is absorbed by the plants, which grow and clean the water for the fish. Although aquaponics is regarded as a highly sustainable technology for its waste recycling and water saving aspects, aquaponic produce (fish and plants) is not certifiable as organic in the European Union. The main reason for this is the absence of soil in conventional aquaponic systems, deemed necessary for organic crop production.

2 SOLUTION

Creating and testing aquaponic systems that include soil, assessing the potentially beneficial effect of soil on plant and fish growth and health.

3 OBJECTIVES

- Determine the effects of soil-based aquaponics on plant and fish growth and quality
- Identify the most-suitable system to carry out soil-based aquaponics

4 HYPOTHESES

- Fish growth/health is affected by the addition of soil in the system.
- Plant growth is enhanced by the addition of soil in the system.

5 APPROACH

The growing capacity of plants in soil-based aquaponic systems is compared to that of conventional aquaponic systems. The design of the soil-based aquaponic systems is inspired by conventional aquaponics, with water recirculating between the plant and the fish units.

6 SPECIES

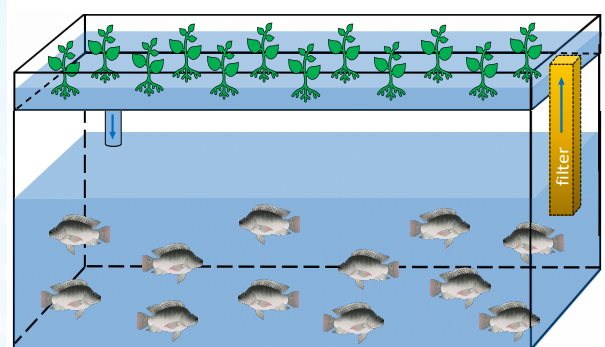
- 🌿 Basil (*Ocimum basilicum*)
- 🐟 Nile tilapia (*Oreochromis niloticus*)

MATERIALS & METHODS

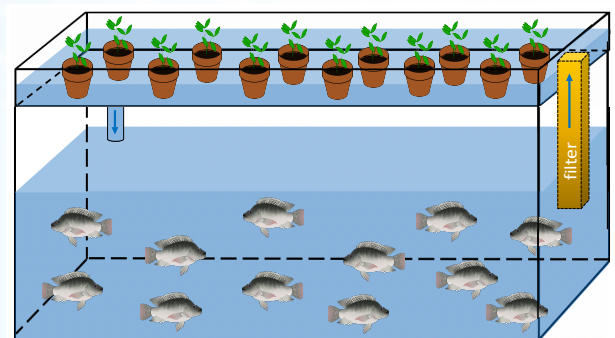
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Water is pumped from the fish tank into a tray on top, where plants are grown either without media (control), or in pots with soil. Water then percolates back into the fish unit, forming a full cycle.

control (replicates: 6)



soil-based aquaponics (replicates: 6)



MEASUREMENTS

8

- Plants: Stem length and diameter, leaf area, leaf number, root length and dry weight, number of main shoots, number of leaf whorls per shoot, total fresh and dry weight, chlorophyll content, nutritional analyses, aromatic compounds concentration.
- Fish: Wet weight, length, mortalities, lesions, absence of scales, fin damage, schooling behaviour.
- Water: pH, temperature, electrical conductivity, dissolved oxygen, turbidity, ammonia, nitrite, nitrate, iron, calcium, magnesium, potassium, phosphorus.
- Soil: Nitrogen, phosphorous, potassium, respiration rate, electrical conductivity, bulk density, microbial activity.



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