Hydroponic Farming Simulation Report

1. Simulation Conditions

This report summarizes the simulation of the growth of a Bell pepper in a hydroponic solution.
The volume of the solution used in the simulation is 2 L. The simulation was done for a duration of 20 days and the followig ions were analysed: NH4+, NO3(-), Mg(2+).

The following assumptions were made for the simulation:
- The plant consumes a constant amount of nutriments each day
- The temperature is assumed to be constant at 25 °C and the pressure at 1 atm.
- The effect of the sun exposure and light conditions was neglected.

The following elements were simulated and analysed:
- The amount of salts to add to the solution.
- The evolution of the concentration of the ions of interest in the solution.
- The pH of the solution.

The table below shows the provided optimal concentrations of the ions in the hydroponic solution and the nutritional needs of the Bell pepper plant (fully grown):

Ions	Hydroponic solution [g/L]	Bell pepper nutriments requirements[g]
NH4+	0.018	0.01
Mg(2+)	0.036	0.02
NO3(-)	0.728	0.5

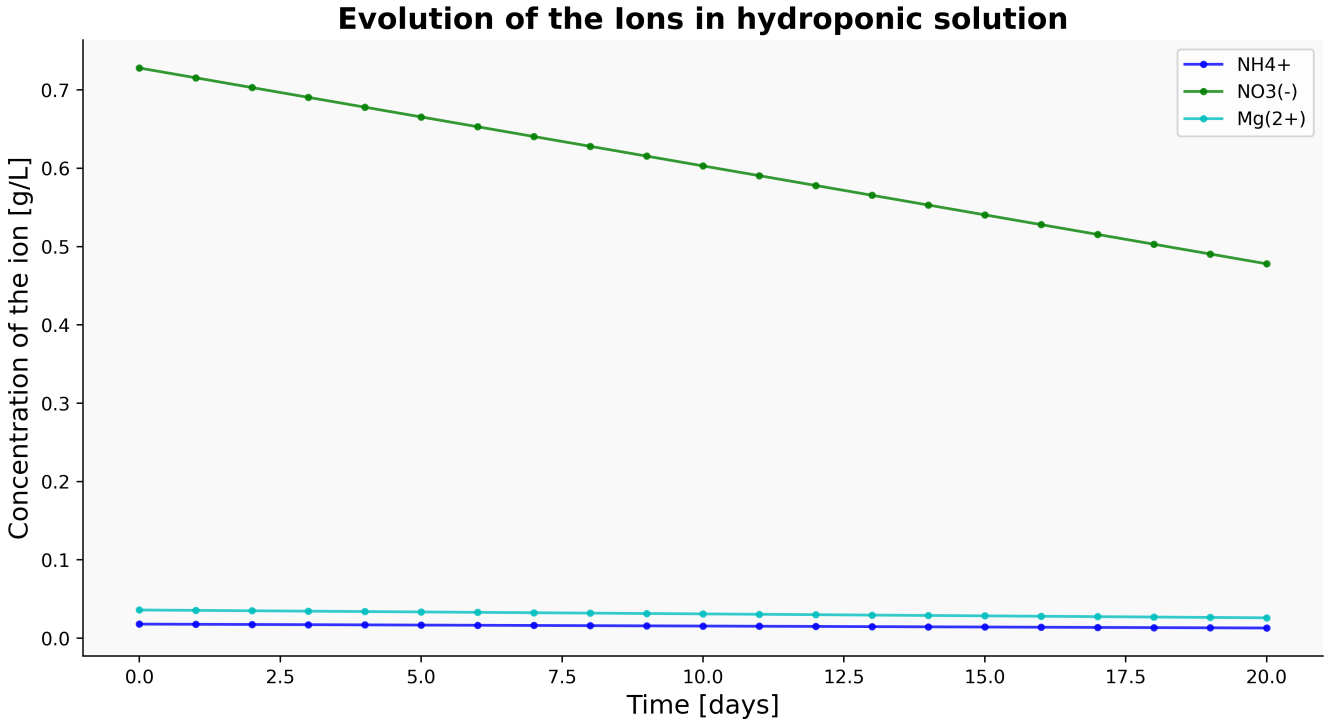
2. Preparation of the solution

The table below shows the mass of salts to add the the 2 L solution to obtain the desired concentrations of the ions for the Bell pepper plant.
The following restrictions were given for the preparation of the solution:
- Forbidden ions: Cl-
- All the salts must be soluble.
- The salts come from a list of commercially available salts.

Salts	Mass [g] for 2 L solution
(NH4)H2PO4	0.2296
Ca(NO3)2	0.7369
KNO3	1.466
MgSO4	0.2707
MgCO3	0.0602

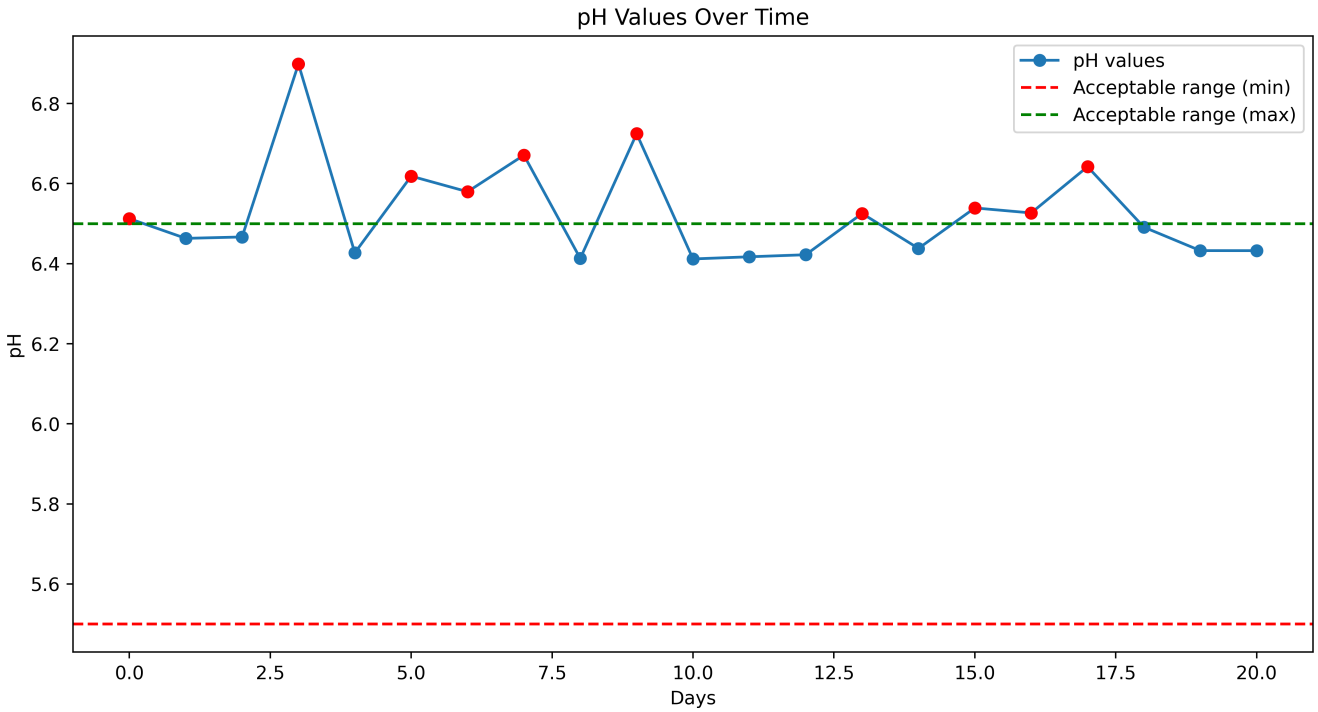
3. Evolution of the concentration of ions

The Figure below shows the concentration of the ions of interest (NH4+, NO3(-), Mg(2+)) as a function of the days of growth of the plant.



4. pH of the solution

The Figure below shows the pH of the solution as a function of the growth of the plant.The pH limits are shown in the graph.



Points of Excess pH Levels

Day	pH
0.0	6.5125
3.0	6.8987
5.0	6.6186
6.0	6.5797
7.0	6.671
9.0	6.7246
13.0	6.5253
15.0	6.5392
16.0	6.5267
17.0	6.6422