



TOMATO PRODUCTION USING A RECIRCULATION AQUAPONICS SYSTEM

Reyes-Flores M.¹, Sandoval-Villa M.¹, Rodríguez-Mendoza- M. N.¹, Trejo-Téllez L. I.¹, Sánchez-Escudero J.¹, and Reta-Mendiola J.¹
¹Colegio de Postgraduados, Campus Montecillo. Carr. México Texcoco Km 36.5. Texcoco, Estado de México. México

INTRODUCTION

Aquaponics uses water in which the fish live in, as a growth medium to produce crops of interest. Using this allows us to reuse water and available nutrients derived from food and microbial decomposition of fish waste. Recirculating aquaponics systems are an alternative mainly for sustainable water and nutrient management, also can offer good quality products: fish and vegetables.

The objective of this research was to use water and fish waste for the production of tomato (*Solanum lycopersicum* L.) and characterize water quality for optimal development of fish and plants.



MATERIALS AND METHODS

The experiment was carried out in a commercial aquaponics system (Nelson Home Garden & Pade).

Twenty tilapias (*Oreochromis niloticus*) of different weights (grams) (60-100, 100-150, 150-200, and 200-250) were put into four containers. Fifty four tomato plants were used in the growing beds. A similar number of plants were established in a hydroponic system. These tomato plants were watered with the complete nutrient Steiner (1961) solution.

CITATION

Steiner, A. A. 1961. A universal method for preparing nutrient solutions of a certain desired composition. *Plant and Soil* 15: 34-154.
Epstein, E. and A.J. Bloom. 2005. *Mineral nutrition of plants: principles and perspectives*. Sinauer Associates Publishers. Sunderland, MA. 400 p.

RESULTS

- Tomato plants grown in aquaponics delayed four days for flowering compared to the ones grown in hydroponics.
- Plants grown in aquaponics were deficient in macro and micronutrients, not because lack of these elements in the solution but because of the alkaline pH generated. The pH affects the solubility of the ions in solution and the ionic form of various nutrients (Epstein and Bloom, 2005). The increasing solubility facilitates ion availability for roots. Precipitation of Fe^{2+} , Mn^{2+} , PO_4^{3-} , Ca^{2+} and Mg^{2+} to insoluble and not available salts may occur in nutrient solution with $\text{pH} > 7$.
- Productivity was 20% lower in aquaponics system compared to hydroponics.

Variables	Range	Optimum range
NH_4^+ (mg L ⁻¹)	0.8 – 1.6	≤ 2
NO_3^- (mg L ⁻¹)	55 – 103.5	0 - 400
pH	6.8 – 9.0	6.4 – 8.4
Dissolved oxygen (mg L ⁻¹)	4.8 – 5.3	≥ 5
Temperature (°C) max-min	27.2 – 22.1	Min 24 Optimal 28 – 30 Max 32
Average weight gain of fish (g)	40	≈1 g day ⁻¹

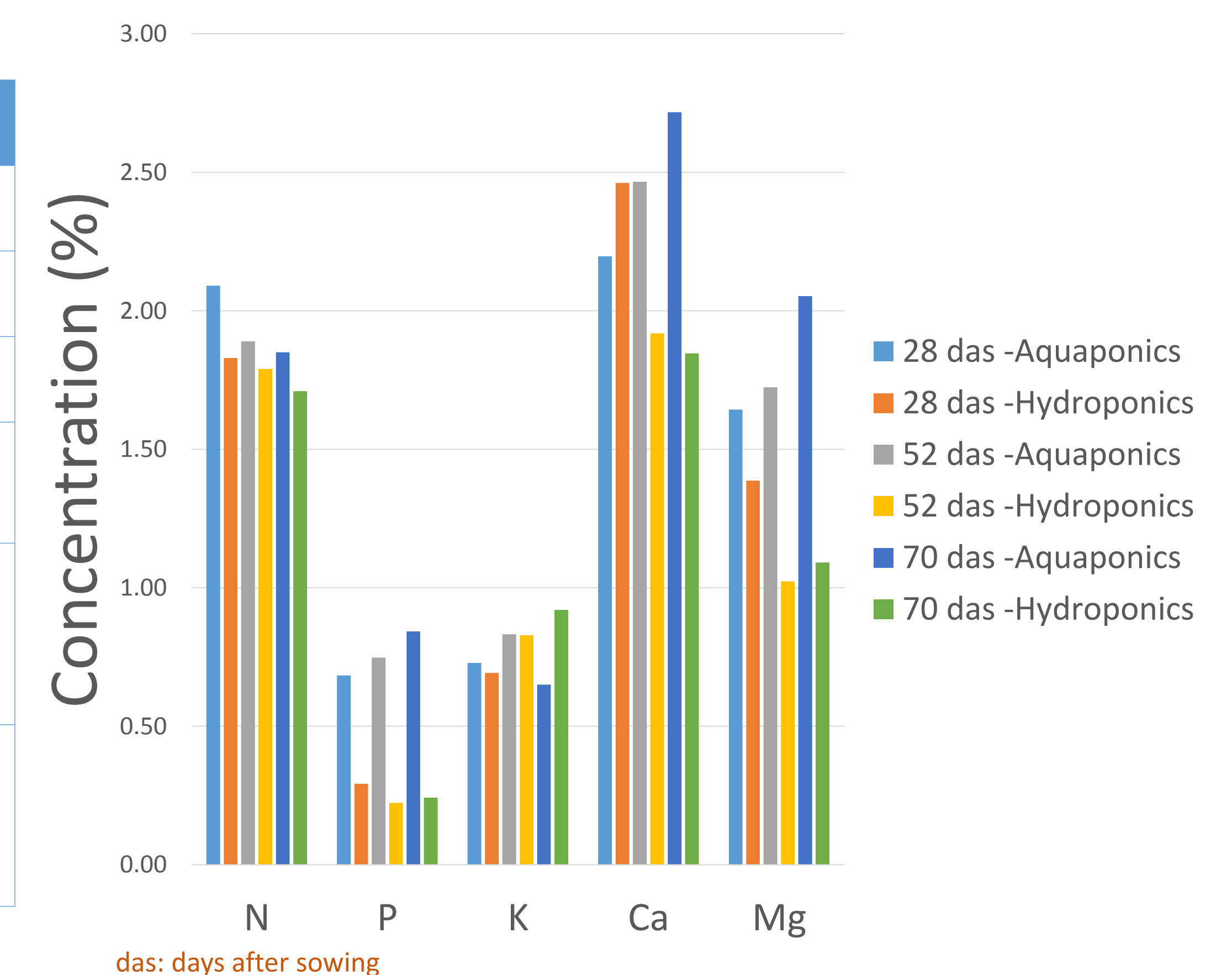


Figure 1. Macronutrients concentration in the plant leaf tissue.

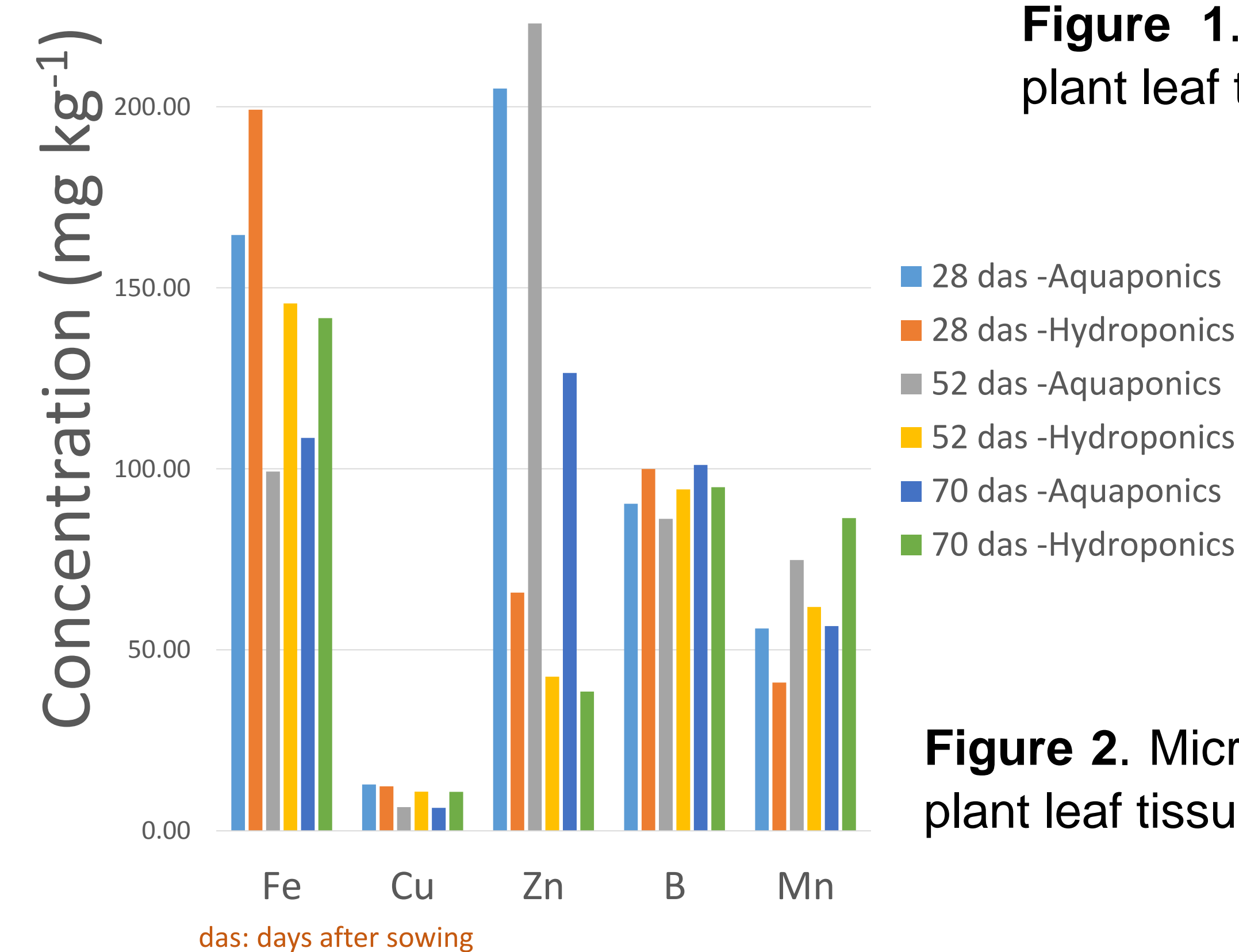


Figure 2. Micronutrients concentration in the plant leaf tissue.

CONCLUSIONS

- Effluent from aquaculture have enough nutrient load to produce acceptable tomato fruit.
- Water quality for fish survival were adequate, but not for optimum plant growth.