EXPLORING SUSTAINABLE AGRICULTURE: WHEATGRASS (*TRITICUM AESTIVUM*) GROWTH UNDER DIFFERENT AFRICAN CATFISH (*CLARIAS GARIEPINUS*) AQUACULTURE EFFLUENTS AND SUBSTRATE CONDITIONS

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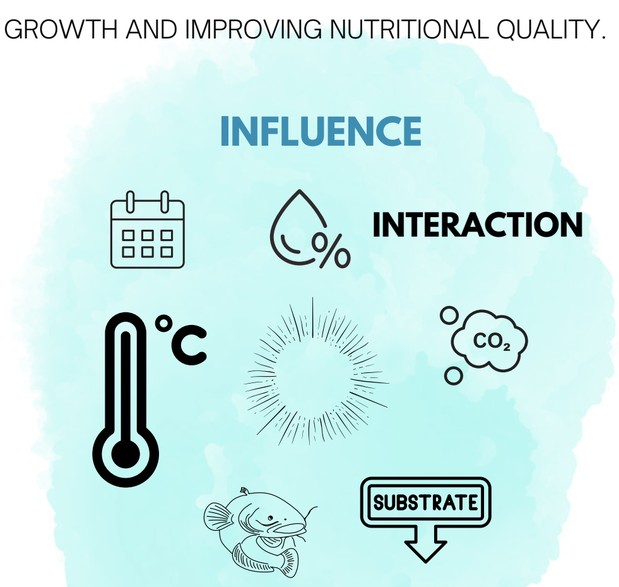
INTRODUCTION

OUR STUDY INVESTIGATES THE OPTIMAL GROWTH CONDITIONS FOR WHEATGRASS, A PLANT KNOWN FOR ITS NUTRITIONAL VALUE. THE STUDY IS STRUCTURED TO EXAMINE THE EFFECTIVENESS OF VARIOUS IRRIGATION SOURCES AND HORTICULTURAL SUBSTRATES, HIGHLIGHTING THE SUSTAINABILITY OF DIFFERENT CULTIVATION METHODS IN PROMOTING EFFICIENT GROWTH AND IMPROVING NUTRITIONAL QUALITY.



Factors Affecting Wheatgrass Growth

MATERIAL AND METHODS

All three studies (I, II, III) were conducted under a similar setup (Xu et al., 2022) at three different time periods, wheatgrass was cultivated using three distinct irrigation sources: the extensive aquaculture unit (EAU/eau), intensive aquaculture unit (IAU/iau), and regular tap water enriched with fertilizer (Control/c). Additionally, various horticultural substrates used were: (I) 100% coconut fibers (c), a mix of 70% coconut fibers and 30% perlite (cp), perlite and vermiculite (50:50; pv), (II) coconut & vermiculite substrate (50:50; cv), and (III) 100% vermiculite (v). The focus was on measuring and analyzing the growth parameters and nutrient content in wheatgrass under these varied conditions.

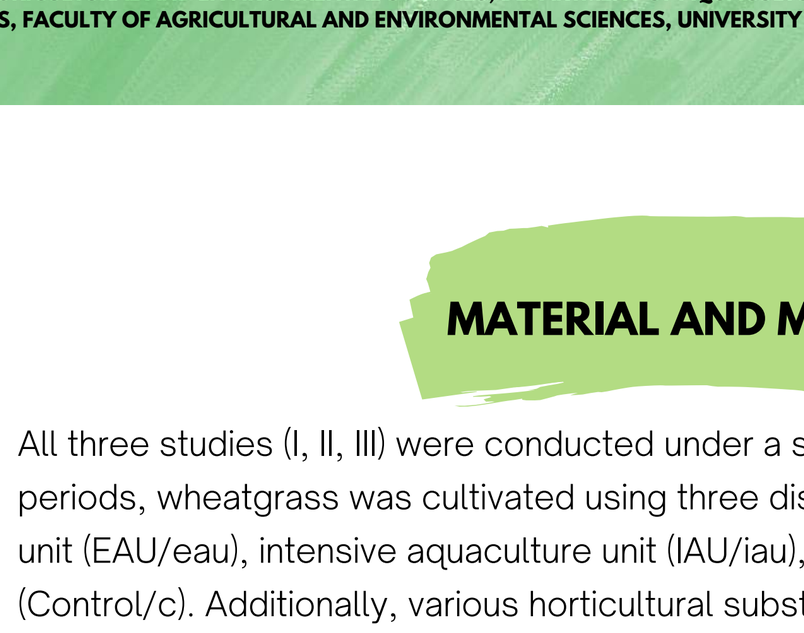


Figure 1. Scheme of the aquaponic system

Figure 2. Wheatgrass cultivation

RESULTS

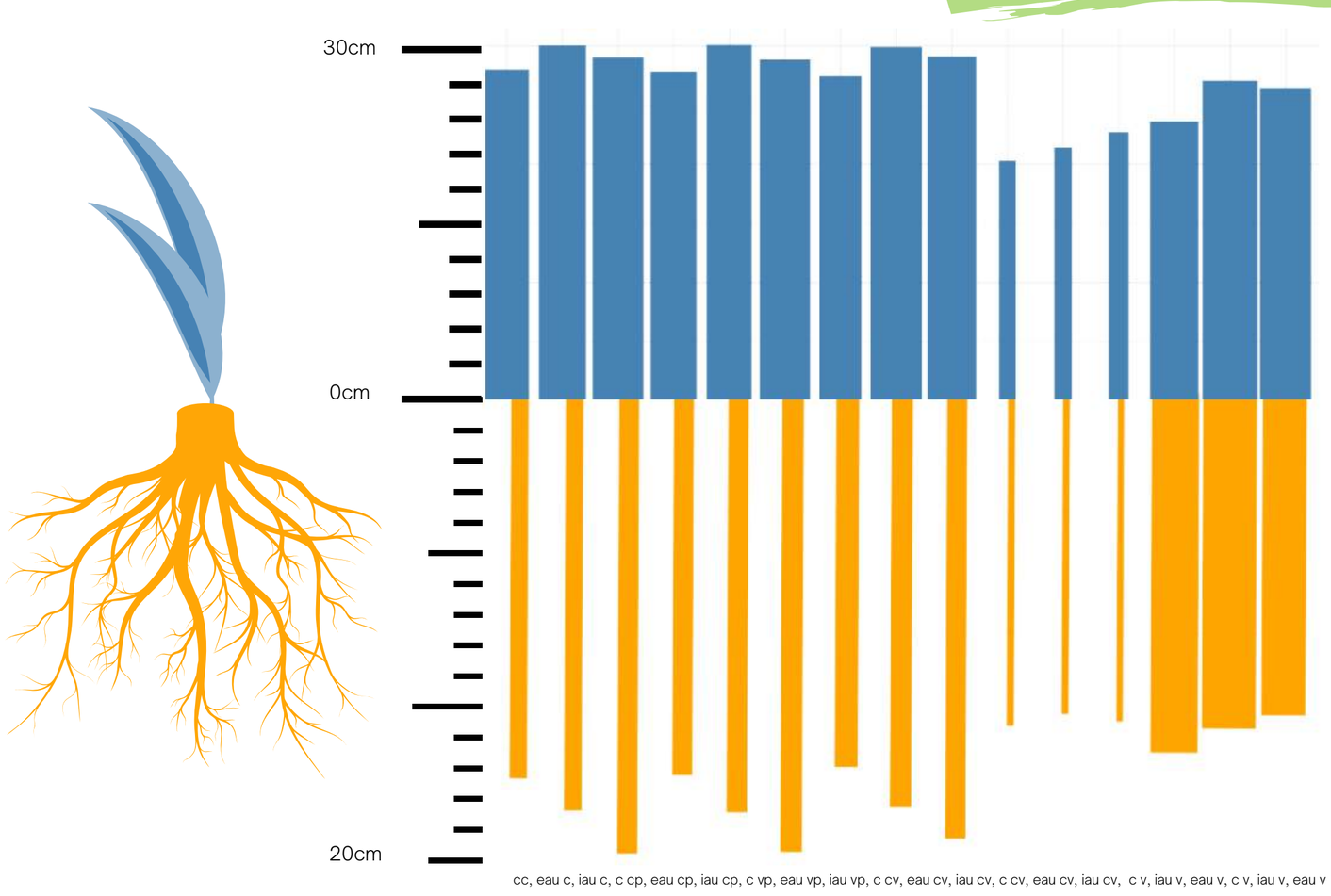


Figure 3. Plant growth parameters. “Blue” represents the shoot, “orange” represents the root, and the width of bar charts represents dry weight; the wider the bar chart, the heavier the weight; the height of bar charts represents length.

Figure 4. Heatmap of nutrient levels in wheatgrass from all different treatments (values on dry matter basis). “vb” means vitamin B; “ve” means vitamin E.

DISCUSSION

Three independent studies confirmed the positive impact of fish effluents on wheatgrass growth. Additionally, these studies highlighted the distinct effects of different substrates and irrigation methods, as well as their interactions, on wheatgrass development.

When analyzed systematically across the three studies, environmental factors such as illumination, temperature, and CO2, along with the interaction effects of treatments, were found to have a significant influence. For instance, vitamin B6 was primarily affected by illumination, while vitamin B12 was influenced by both temperature and illumination. Vitamin B7 was most impacted by the type of irrigation, and vitamin E was influenced by temperature. All of these relationships met the criterion of regression analyses and showed significant correlations. The interaction between irrigation types and media, such as extensive fish water and 100% vermiculite, along with illumination, had a dominant effect on vitamin B6. For plant growth parameters like shoot length, the effects were the result of a combination of various environmental factors rather than a single one.

REFERENCE

Xu L, Ziethen CJ, Appelbaum S, Palm HW, Knaus U. Aquaponics Production of Wheatgrass (Triticum aestivum L.) in Different Horticultural Substrates with African Catfish (Clarias gariepinus) in Northern Germany. AgriEngineering. 2022 Nov 4;4(4):1076-94. https://doi.org/10.3390/agriengineering4040067

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