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Unveiling the growth potential: Vertical farming's impact on herbal greenery

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Abstract
Vertical farming will be the greatest solution for the production of pesticide/chemical fertilizers free crops. It ensures the more yield in less area. We constructed a vertical farming set up with PVC pipes. We used water alone in the columns. We tested three different plants in two conditions, traditional and VF. All three plants showed efficient growth in VF when compared to traditional field method. Our VF system is a water saving system.

Keywords: Vertical farming, physiological parameters, leaf area, hydroponic

Introduction
Worldwide, many regions are experiencing an increase in water scarcity (Ofori, S., *et al*., 2021) [3]. Even in countries with abundant water resources, uneven distribution can lead to water shortages, particularly during drier months (Hristov, J., *et al*., 2021) [2]. Agriculture remains the leading consumer of available freshwater, representing more than 70% of total usage. Thus, alternative water resources must be sought to complement conventional freshwater sources (Rizzo, L., *et al*., 2020) [5]. In cities, we won't get fresh vegetables at low cost. We cannot cultivate by ourselves, because of limited space.
Rajesh Kumar Kori *et al*. (2018) [4] shed light on the health repercussions of pesticide exposure among farmworkers, hinting at the potential cumulative effects of various contaminants entering the food chain. Their clinical outcomes underscore the urgency of assessing and mitigating risks associated with agricultural practices that involve the use of potentially contaminated water sources.
Vertical farming (VF) is an indoor method of growing crops with a controlled nutrient solution and recycled water in several layers with stable productivity (e.g., plant factories). The crops productivity of VF is higher than in conventional farming, and the growth cycle is also faster. As indoor farms, the benefits of VF are a lower requirement for water and no pesticides and also the absence of fertilizer runoff in hydroponic systems. However, limited crop species are suitable for commercial production using VF: the vegetables, fruits, herbs, and horticultural plants suited for VF have been discussed in earlier studies. In addition to allowing year-round and stable crop production, VF also optimizes plant growth with lower environmental impacts.

Materials and Methods
Vertical farming set-up
Plants were grown vertically in upright cylindrical columns comprised of four modular units with single base. The plant holders are made by making hole in the PVC pipes with a hot air blower gun. The hydroponic holder is used to hold coco- peat. A submersible pump is used to circulate water throughout the columns. The experimental set-up is kept in the partial sunlight.

Control
Plants are grown in the soil in the school campus.

Plant selection
1. Fenugreek
Botanical name: *Trigonella foenum-graecum*

Habit: Herb
Medicinal value: People commonly use fenugreek for diabetes, menstrual cramps, sexual problems, enlarged prostate, high cholesterol, obesity, and many other conditions.

2. Palak
Botanical name: *Spinacia oleracea*

Family: Amaranthaceae

Habit: Herb

Medicinal value: As part of a nutritious diet, it can help support immune function, aid the digestive system, may even have anticancer properties.

3. Coriander
Botanical name: *Coriandrum sativum*

Family: Apiaceae

Habit: Herb

Medicinal value: Stimulant, stomachic, carminative, antispasmodic, diuretic; also hypoglycaemic and anti-inflammatory. Oil-bactericidal and larvicidal, used in China as a remedy for measles, diabetes, aerophagy and gastroenteritis.

Parameters
To interpret the outcomes of our experiments, we selected the following parameters

- Leaf area
- Leaf weight
- Root weight
- Shoot weight

Statistical analysis
The data was analyzed with the help of PAST statistical software

Result
Leaf area of *Trigonella* showed the higher value in the VF plants. In control plants, it is 1.7 cm^2 and in VF 3.2 cm^2. The leaf weight is similar in both cases i.e., 0.07 gm. The shoot weight and root weight showed minor difference among control and VF (Figure 1).
In case of *Coriandrum* the greater difference is found in leaf area and shoot weight. The greater values are noted in VF for both characters (Figure 2).
In *Spinacia*, only leaf area showed significant difference between both conditions. Other parameters are more or less similar (Figure 3).

Parameters	*Trigonella*		*Coriandrum*		*Spinacia*	
	Control	**VF**	**Control**	**VF**	**Control**	**VF**
Leaf area (cm^2)	1.7 ± 0.07	3.2 ± 0.1	4.7 ± 0.26	6.6 ± 0.4	18.9 ± 0.2	21.4 ± 0.6
Leaf weight (gm)	0.07 ± 0.002	0.07 ± 0.001	0.1 ± 0.003	0.15 ± 0.07	0.7 ± 0.003	0.7 ± 0.009
Shoot weight (gm)	0.58 ± 0.03	0.6 ± 0.01	0.43 ± 0.004	0.72 ± 0.004	1.9 ± 0.007	1.95 ± 0.005
Root weight (gm)	0.024 ± 0.001	0.027 ± 0.001	0.04 ± 0.003	0.05 ± 0.003	0.06 ± 0.001	0.06 ± 0.001

Discussion
Most of the studies on hydroponic experiments used inorganic nutrient solutions. Ana Kovaˇciˇc *et al*., (2023) [1] studied the accumulation of elements in tomato which had grown in waste water. They grew the plant up to the fruiting stage. But we focused on the vegetative growth, as the plants which whole plant is used in the food preparation. The experimental set up used by us is reusable for many years. The circulation of water in the VF system reduces the wastage of water and improves the usage of water. In the future, we planned to use Jeevamirtha or Panchakavya for the production of organic food materials. We planned to arrange awareness program among the housewives.

Our portable vertical farming plant

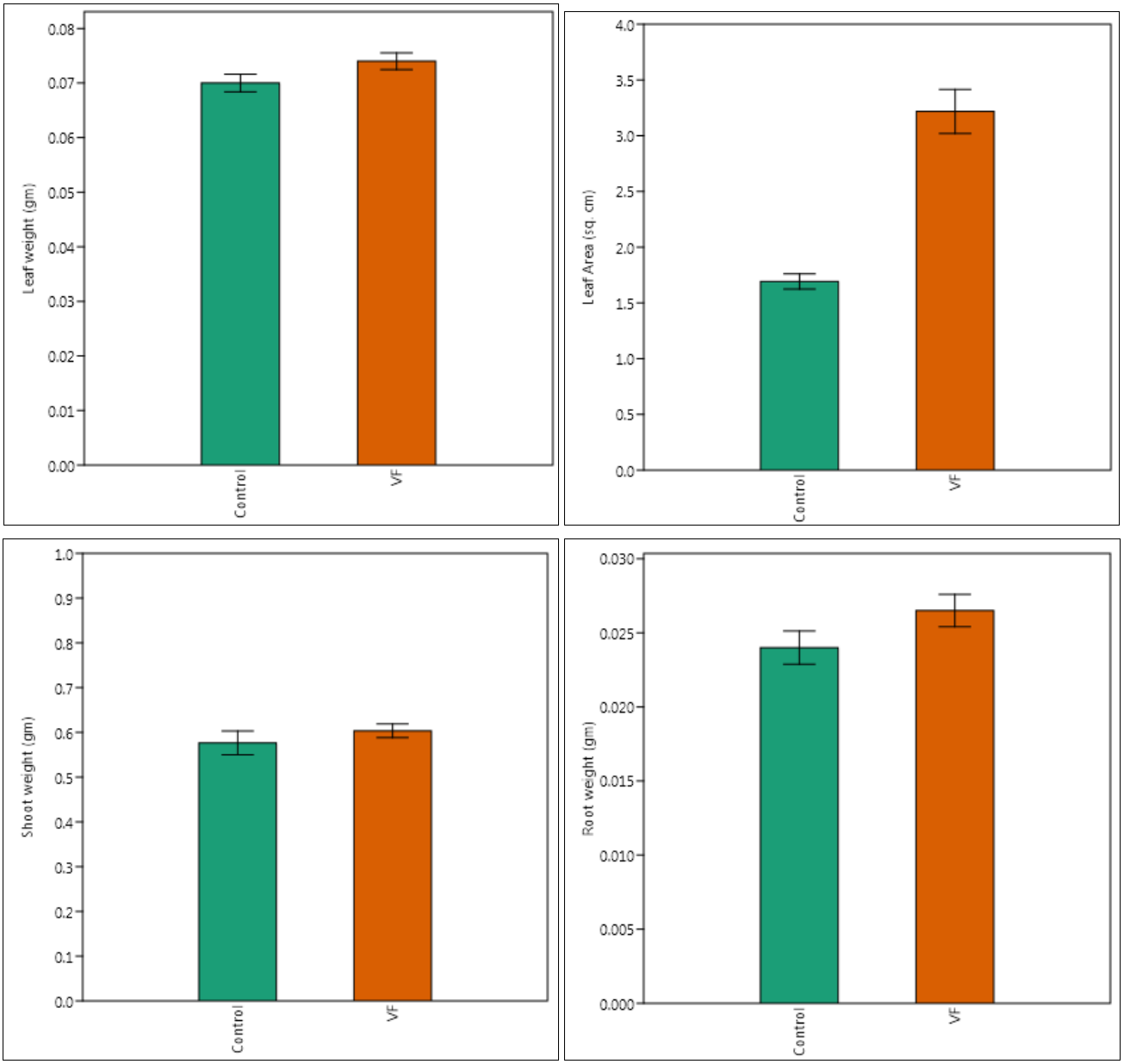
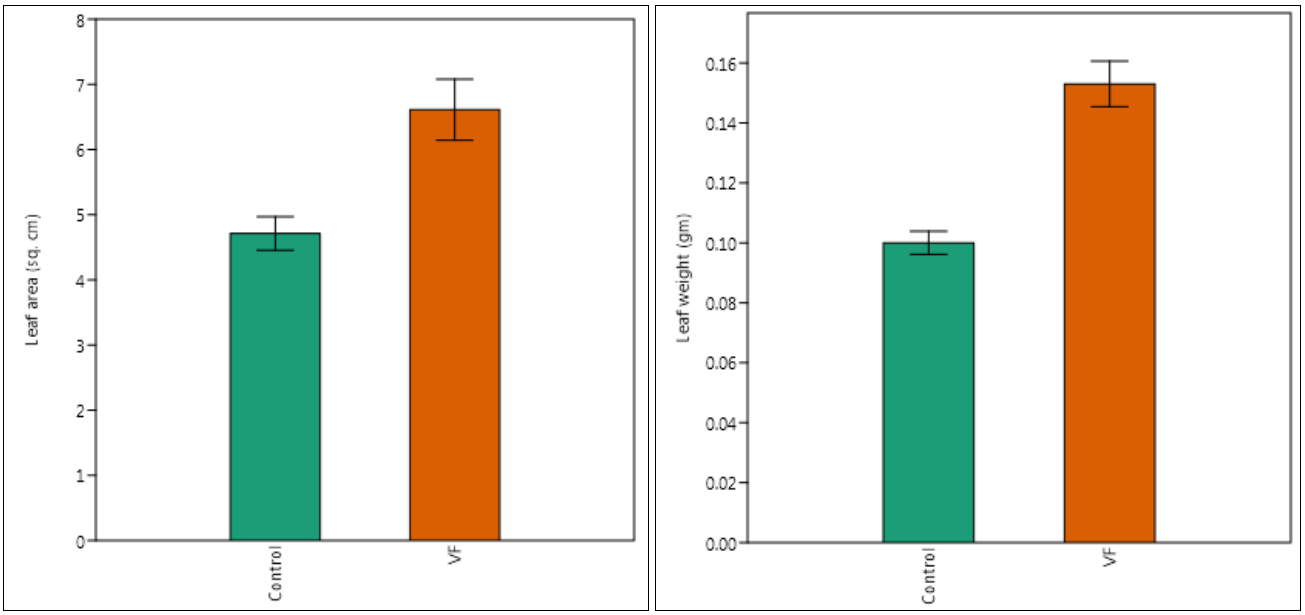


Fig 1: Trigonella foenum-graecum physiological factors of control and VF



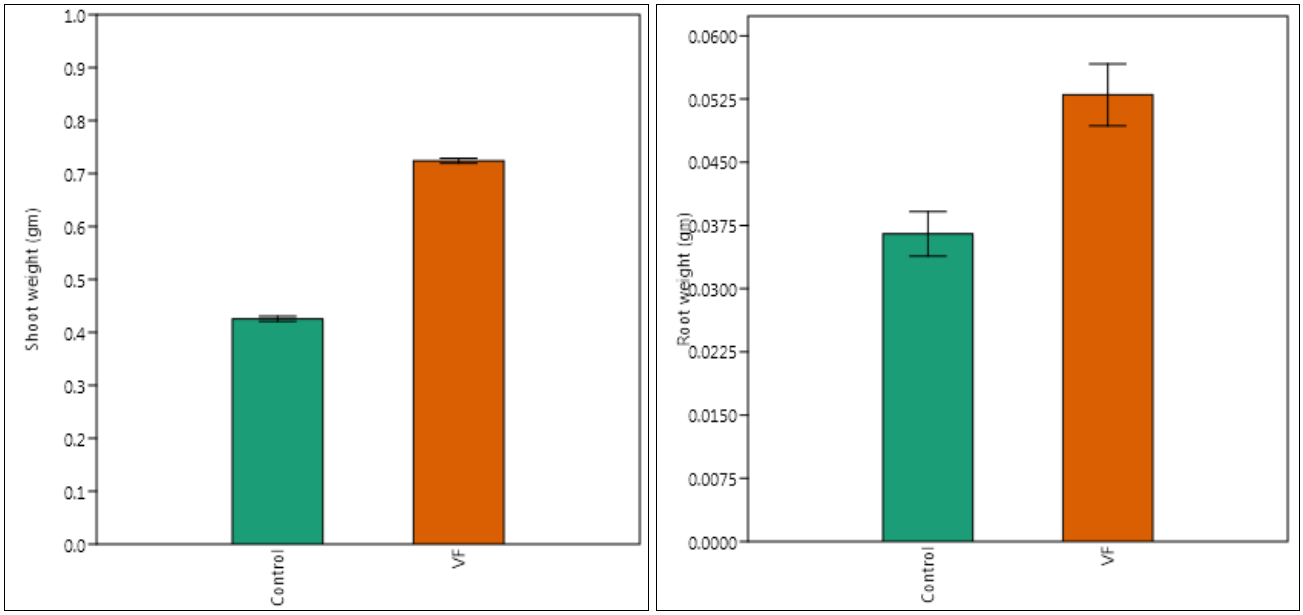


Fig 2: Coriandrum sativum physiological factors of control and VF plants

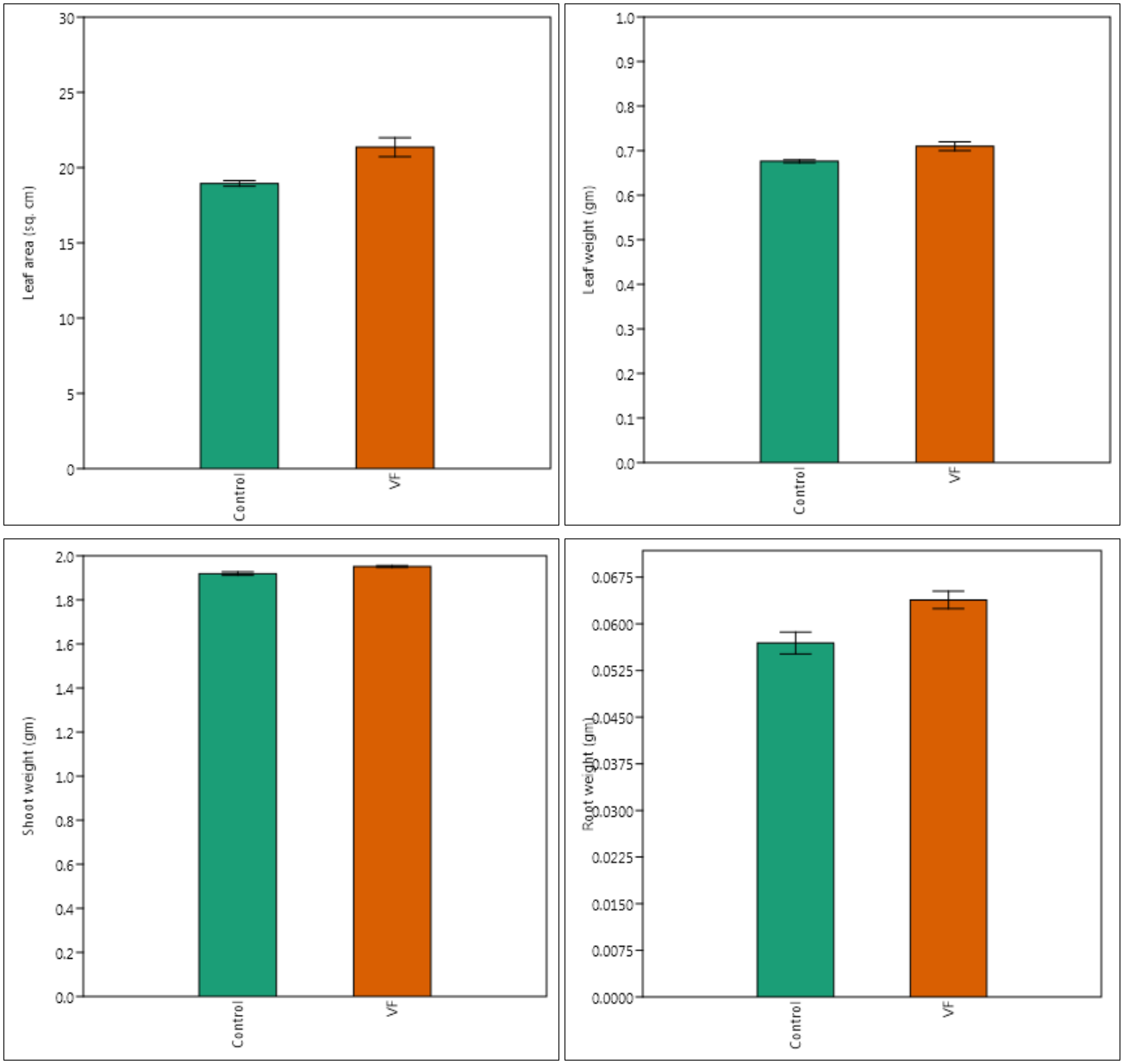


Fig 3: *Spinacia oleracea* physiological factors of control and VF plants

Conclusion

Vertical Farming positively impacted the growth parameters of Fenugreek, Coriander, and Palak, particularly enhancing leaf area and shoot weight across the three plant types. Further research into specific environmental factors in VF contributing to these improvements is recommended.

References

1. Ana Kovaˇciˇc, Eirini Andreasidou, Anˇze Brus, Anja Vehar, Doris Potoˇcnik, Marta Jagodic Hudobivnik *et al*. Contaminant uptake in wastewater irrigated tomatoe, Journal of Hazardous Materials. 2023;448:130-964
2. Hristov J, Barreiro-Hurle J, Salputra G, Blanco M, Witzke P. Reuse of treated water in European agriculture: potential to address water scarcity under climate change. Agric Water Manag. 2021;251:106-872. https://doi.org/10.1016/j. agwat.2021.106872.
3. Ofori S, Puˇsk´aˇcov´a A, Růˇziˇckov´a I, Wanner J. Treated wastewater reuse for irrigation: pros and cons. Sci Total Environ. 2021, 760. https://doi.org/10.1016/j. scitotenv; c2020, 144026.
4. Kori RK, Singh MK, Jain AK, Yadav RS. Neurochemical and Behavioral Dysfunctions in Pesticide Exposed Farm Workers: A Clinical Outcome. Ind J Clin Biochem. 2018(Oct-Dec);33(4):372-381.
5. Rizzo L, Gernjak W, Krzeminski P, Malato S, McArdell CS, Perez JAS *et al*. Best available technologies and treatment trains to address current challenges in urban wastewater reuse for irrigation of crops in EU countries. Sci Total Environ. 2020;710:136-312. https://doi.org/10.1016/j. scitotenv.2019.136312