Optimization of biomass and cultivation costs of the medicinal plants *Euphorbia peplus* and *Artemisia annua* in a vertical hydroponic container

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Introduction

- Diversification in vertical farming by cultivating high added value plants is seen as economically less challenging to ordinary leafy green crop cultivation.
- The objectives of the study were the optimization of the plant biomass and the calculation of their cost price under vertical cultivation conditions.

Fig. 1 Modified Vertical Hydroponic Shipping Container

Materials and Methods

- *E. peplus* growth was characterized by acting on the nutrients and substrates. Two substrates and nutritive solutions were tested on 24-plants tray with 6 repetitions per combination, for a total of 432 plants tested.
- *A. annua* vertical growth was measured by acting on CO_2 level and light intensity. Two light intensities and CO_2 levels were tested on 12-plants tray with 2 repetitions per combination, for a total of 96 plants tested.

Results ►*Artemisia annua*

Fig. 2 Vertical cultivation of *Artemisia annua*

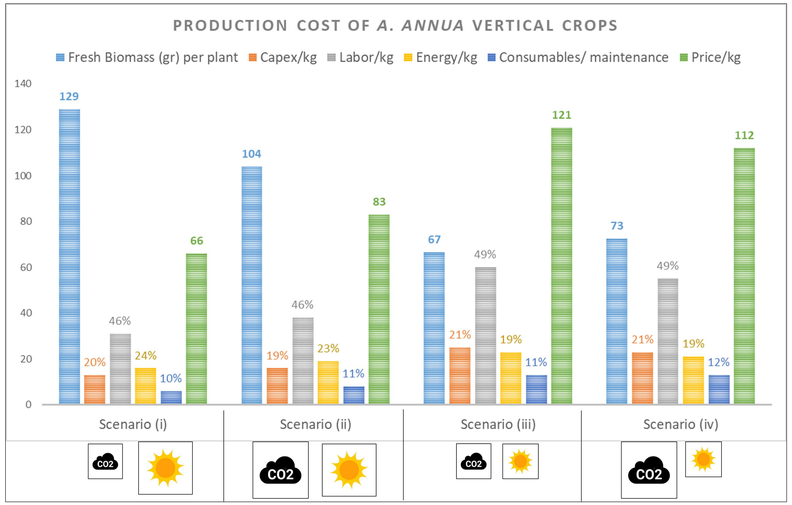

Fig. 3 Fresh biomass per plant and cultivation cost per kg of *A. annua* in vertical farming (capex, labor, energy, consumable and price)

Results ►*Euphorbia peplus*

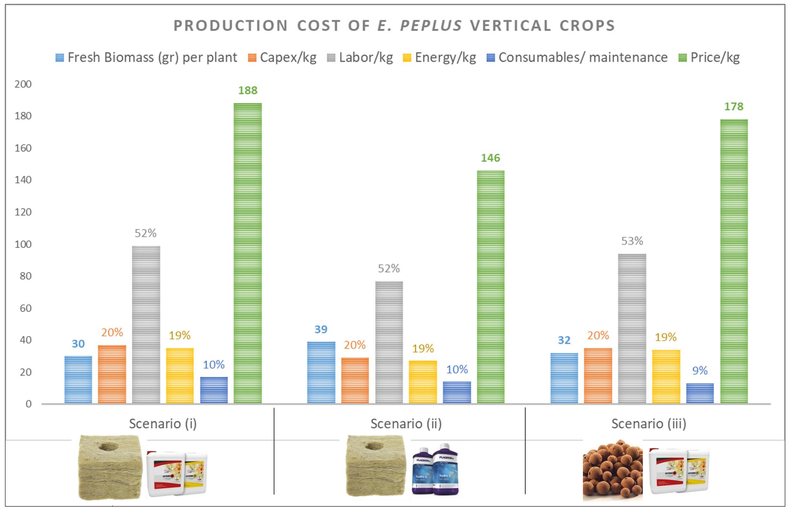

Fig. 4 Vertical cultivation of *Euphorbia peplus*

Fig. 5 Fresh biomass per plant and cultivation cost per kg of *E. peplus* in vertical farming (capex, labor, energy, consumables and price)

Conclusions and perspectives

From the study:

- Production costs are directly linked to the biomass productivity.
- Light intensity has the greatest impact on the biomass.
- Combination of abiotic factors have to be tested.

General conclusions:

- Biomass productivity can be increased by shorter culture cycle, adaptation of environmental factors such as light intensity, nutrient solution, substrate, temperature and CO_2 level.
- Acting on plant factory design by increasing plant density, growing area surface is also important to decrease production cost.

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References: Bafort, F. et al. The Agro-Economic Feasibility of Growing the Medicinal Plant Euphorbia peplus in a Modified Vertical Hydroponic Shipping Container. Horticulturae 2022, 8, 256. https://doi.org/10.3390/horticulturae8030256.