OPEN ACCESS Freely available online

ISSN: 2168-9881
Agrotechnology

Commentary

Efficacy of Soilless Substrates on Vegetable Output and Yield Enhancement

Henry Agung*

Department of Agro-Industrial Technology, Gadjah Mada University, Yogyakarta, Indonesia

DESCRIPTION

The global population is expected to reach 9.8 billion by 2050, which poses a great challenge for food security and sustainability. However, the available agricultural land is limited and often degraded by pollution, salinization and drought. Moreover, conventional soil-based agriculture consumes a large amount of water and fertilizers, and is vulnerable to pest and disease outbreaks. Therefore, there is a need for alternative methods of crop production that can save resources, increase productivity and quality, and reduce environmental impact. One of the potential methods is soilless cultivation, which refers to the cultivation of plants without using soil as a roofing material, but instead using mineral nutrient solutions or inert substrates to provide support, water and nutrients to the plants.

Advantages of conventional soil-based agriculture

Saving water: Soilless cultivation can reduce water consumption by up to 90% compared to soil-based agriculture, as the water is recirculated and reused in closed systems, and there is less evaporation and runoff.

Reducing pest and disease problems: Soilless cultivation can minimize the risk of soil-borne pathogens and weeds, as the substrates are sterile or pasteurized, and there is no contact with soil. Moreover, soilless cultivation can improve plant health and resistance by providing optimal growing conditions and balanced nutrition.

Increasing yield and quality: Soilless cultivation can enhance plant growth and development by providing optimal physical and chemical properties of the substrates, such as water holding capacity, air space, drainage, cation exchange capacity, pH buffering capacity, etc. Moreover, soilless cultivation can improve plant quality by increasing the content of bioactive compounds, such as phenolic acids, antioxidants, vitamins, etc.

Enabling urban farming: Soilless cultivation can open up new areas for food production in urban settings, such as rooftops, balconies, walls, etc., where soil is not available or suitable. This can reduce the transportation cost and carbon footprint of food supply, and increase the freshness and safety of food for consumers.

However, soilless cultivation also poses some challenges, such as selecting the appropriate substrate for different crops and systems, managing the nutrient solution composition and pH, monitoring the physical and chemical properties of the substrates, and disposing or recycling the used substrates.

Substrates are the materials that replace soil in soilless cultivation systems. They can be classified into organic or inorganic, natural or synthetic, depending on their origin and composition. Some of the most common substrates used for soilless cultivation are rock wool, perlite, vermiculite, coco peat, peat moss, wood chips, bark, rice hulls, sand, gravel, pumice, zeolite, hydrogel, foam mats and oasis. Each substrate has its own advantages and disadvantages in terms of physical and chemical properties, such as water holding capacity, air space, drainage, and cation exchange capacity, pH buffering capacity, decomposition rate, nutrient availability and cost. Therefore, choosing the right substrate for a specific crop and system is crucial for achieving optimal growth and yield.

Comparison of different substrates on vegetable production and quality

Some studies have compared the effects of different substrates on vegetable production and quality under soilless cultivation.

- A study on lettuce showed that sphagnum moss was a suitable substitute for rock wool substrate, as it produced higher yield and moderate phenolic acid content. However, hemp fibers were not suitable due to their high decomposition rate and nitrogen immobilization by microorganisms. Wood chips also resulted in low yield due to nutrient deficiency.
- A study on tomato showed that perlite/zeolite mixture (1:1) produced higher yield than other mixtures due to its improved aeration and water retention ability. However, perlite alone resulted in lower yield due to its low cation exchange capacity and high leaching of nutrients.

Correspondence to: Henry Agung, Department of Agro-Industrial Technology, Gadjah Mada University, Yogyakarta, Indonesia, E-mail: heragung@gmail.com

Received: 05-Jun-2023, Manuscript No. AGT-23-22009; **Editor assigned:** 08-Jun-2023, PreQC No. AGT-23-22009; **Reviewed:** 22-Jun-2023, QC No. AGT-23-22009; **Revised:** 29-Jun-2023, Manuscript No. AGT-23-22009; **Published:** 06-Jul-2023, DOI:10.35248/2168-9891.23.12.324

Citation: Agung H (2023) Efficacy of Soilless Substrates on Vegetable Output and Yield Enhancement. Agrotechnology. 12:324.

- A study on cucumber showed that coco peat produced higher yield than rock wool due to its high water holding capacity and cation exchange capacity. However, coco peat also required more frequent irrigation and fertilization due to its high salinity and low pH buffering capacity.

These studies indicate that there is no single best substrate for all crops and systems. Rather, the choice of substrate depends on various factors such as crop requirements, system design, environmental conditions and economic feasibility. Therefore, it is important to conduct trials and experiments to evaluate the performance of different substrates before adopting them for commercial production. Soilless cultivation using substrates offers a potential alternative to conventional soil-based type agriculture for producing high-quality vegetables with less environmental impact. However, it also requires careful selection and management of substrates to ensure optimal growth and yield. By understanding the advantages and disadvantages of different substrates and their effects on vegetable production and quality, soilless cultivators can make informed decisions and improve their productivity and profitability.