University of Salahaddin

College of Agricultural Engineering Sciences

Horticulture Department

Effect of different growing media and acadian fertilizer on Onion (*Allium cepa L.*) production

Research Project

Submitted to the department of (*Horticulture*) in partial fulfillment of the requirements for the degree of B.A or BSc. in (*Agricultural Engineering Sciences*)

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April-2024

SUPERVISOR CERTIFICATION

I certify that this research project was prepared under my supervision at the Department of Horticulture, College of Agricultural Engineering Sciences, University of Salahaddin- Erbil, and I do hereby recommend it to be accepted as a partial fulfillment of the requirements for the Degree of BSc. in (*Agricultural Engineering Sciences*) in Horticulture.

Acknowledgements

Above all, I sincerely thank my merciful and generous God for supplying me with health, wisdom and strength in my work and for his perfect protection and guidance of my life. I want to express my deepest and sincere appreciation to my supervisor Asst. Lect. Mss. Bayan Rokan Aziz for his professional guidance, practical advice, his encouragement at all stages of my work, I also would like to extend my appreciations to my family and all my friends for their supports.

Abstract

This research study explores the impact of different growing media, specifically, peat moss (a1), loam (a2) and a mixture(a3) of peat moss and loam (3), each replicated three times, and two levels of Acadian fertilizer (0 mg as control and 2 mg), on onion (***Allium cepa*** L.) production. The experiment was designed using a randomized complete block design (CRD) with a total of nine treatment combinations. Various growth parameters including plant height, leaf count, bulb diameter, bulb weight, and yield per hectare were measured to assess the effects of these treatments on onion growth and productivity. Statistical analysis indicated significant differences among treatments for most of the parameters studied. Results indicated that the combination of peat moss as a growing medium and 2 mg of Acadian fertilizer significantly enhanced onion growth compared to other treatments. These findings highlight the importance of choosing suitable growing media and fertilizer levels for optimizing onion production. Further investigations could focus on understanding the underlying mechanisms driving these effects and exploring additional factors to improve onion cultivation practices for sustainable agriculture and food security. Foliar application cause significant effect on all vegetative parameter.

Aim of study

The aim of the study was to assess the effectiveness of various growth media and Acadian fertilizers on enhancing the growth of green onions (***Allium cepa*** L). Green onions, also known as scallions or spring onions, are popularly cultivated for their culinary and nutritional value. Evaluating different growth media and fertilizers can provide insights into optimal conditions for maximizing green onion yield, quality, and nutrient content. By examining how these factors influence growth parameters such as plant height, number of leaves development, and overall vigor, the study aims to inform agricultural practices and improve crop management strategies for green onion production.

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1. Introduction

Onion (*Allium cepa* L.) is one of the most important vegetable crops in the world. (**Statistics Canada, 2020).** It is a shallow-rooted, biennial monocot but is usually cultivated as an annual for the production of its bulbs and as a biennial for the production of its seeds because inflorescences are formed in the second year (Steentjes et al., 2020).

Green onion is a very popular food that can be consumed fresh, dried, or in processed or medicinal preparations, and its surface wax can also play a role in its drought resistance (**Liu et al. 2019)**. Green onion is a significant flavoring vegetable that is popular in dishes around the world and is valued for its medicinal uses. More than 200 compounds have been identified in Allium species, including gvarious vitamins, sulfur compounds, amino acids, proteins, lipids, trace elements such as selenium and flavonoids, and various antioxidants **(Štajner et al. 2006).**

The main edible part of the onion is the bulb, with a distinctive flavor and pungent smell. The bulbs usually have three colors (red, yellow/brown, and white) with sweet and non-sweet flavours **(Albishi et al., 2013; Shahidi & Naczk, 2003).** The formation of the onion bulb is affected by environmental factors in the growing regions, especially the day length (**Cardoso & Costa, 2003)**. Onion varieties are categorized into long-day, intermediate-day, and short-day according to the minimum daily duration of light required for bulb forming **(Gökçe et al., 2010).**

Seaweed extracts are used as plant biostimulants and are considered the most economic and effective way to improve the growth, development, quality, and quantity of plants by increasing water and mineral use efficiencies under various environmental stresse**s (9).**

For a long time, industries have used seaweeds as edible sources, fodder, green compost, and unprocessed materials **[20].** Seaweeds, as important oceanic assets, are used in soil reformation to improve the plant growth of

crops. In horticulture, using seaweed products is becoming a time-honored practice **[21].** Seaweeds constitute of a mixture of substances, each with a distinct function and possibly with interactions (neutral, synergistic or antagonistic) between functions. For some substances or mechanisms considerably more knowledge is available than for others. **(du Jardin 2015).**

1.2. Effect of Seaweed Extracts on Onions:

1.2.1. Plant Growth Promotion:

Seaweed extracts are known to contain plant growth-promoting substances, including auxins, cytokinins, and gibberellins. These compounds can positively influence root development, seed germination, and overall plant growth in onions.

1.2.2. Nutrient Uptake and Stress Resistance:

Seaweed extracts may enhance the nutrient uptake efficiency of plants. This can contribute to improved nutrient availability for onions, potentially leading to increased yield. Additionally, seaweed extracts have been reported to enhance plants' resistance to environmental stresses.

1.2.3. Bioactive Compounds and Secondary Metabolites:

Seaweeds are rich sources of bioactive compounds, such as polysaccharides, polyphenols, and antioxidants. These compounds may play a role in improving the quality of onions and enhancing their nutritional content.

2. Materials and Methods

2.1. Description of the experiments

The experiment commenced on November 22, 2023, with the planting of Onion bulblets (Cv. Yellow Local) in vases. Each onion had a volume of 6 cm^3 and weighed 3 g. The experimental setup comprised 18 experimental units, with foliar application of two concentrations of Acadian fertilizer (0.0 and 2.0 g) on the plants. Three different soil media were utilized: loam, peat moss, and a 1:1 mixture of both. The plastic vases used had a capacity of 3 liters.

On December 1, 2023, the onion leaves had grown sufficiently, and on January 20, 2024, they were sprayed with the Acadian fertilizer. The experimental design employed was a Complete Randomized Design (CRD). To determine dry weight, plants were oven-dried at 70°C for 72 hours. Measurements were taken using a caliper.

Additionally, chlorophyll content was measured using an SPAD Instrument. This provided further insight into the physiological responses of the onion plants to different soil media and Acadian fertilizer concentrations.

A total of 18 treatments were administered, considering the combinations of soil media, Acadian fertilizer concentrations, and their interactions. This comprehensive approach allowed for a thorough assessment of the effects of varying soil media and Acadian fertilizer concentrations on onion growth parameters.

2.2. Layout and Experiment design

The experiment will be designed according to factorial design (CRD) with three replicates and two treatments.

We used two levels of treatments:

1. 0.0 gm Control
2. 2.0 gm. L^{-1} / Acadian

Parameters:

1. Plant Height (cm)
2. Leaf Length (cm)
3. No. Leaves.
4. Chlorophyll Content %.
5. Wet Weight (g).
6. Dry Weight(g).

3. RESULTS AND DISCUSSION

Table (1): Effect of different growing media and a cadian fertilizer on Plant height of Onion (*Allium cepa* L.) production.

Media	Plant Height (cm)		Mean a
	$b_{1(0)}$	$b_{2(2)}$	
a1 (Peatmoss)	121.67ab	132.33a	127.00a
a2 (Loam)	87.33d	106.33c	96.83b
a3 (Mixture)	113.33bc	125.667ab	119.50a
Mean b	107.44b	121.44a	

Results in table (1) indicated significant differences among same treatments. The best value (132.33) was recorded from (2gm.L^{-1}) **a cadian fertilizer** and Peatmoss **growing media**.

(2): Effect of different growing media and a cadian fertilizer on Leaf Length of Onion (*Allium cepa* L.) production.

Media	Leaf Length (cm)		Mean a
	$b_{1(0)}$	$b_{2(2)}$	
a1 (Peatmoss)	66.00b	76.00ab	71.00a
a2 (Loam)	45.33d	55.00c	50.17b
a3 (Mixture)	71.67ab	78.33a	75.00a
Mean b	61.00b	69.78a	

Data in table (2) revealed that the interaction of mixture **growing** media and (2gm.L^{-1})**cadian** have significant difference in same treatment. The highest value (**78.33**) however, the lowest value (**45.33**) was recorded from loam **growing media.**

Table (3): Effect of different growing media and a cadian fertilizer on Number of Leaf of Onion (*Allium cepa* L.) production.

Media	Number of Leaf		Mean a
	$b_{1(0)}$	$b_{2(2)}$	
a1 (Peatmoss)	8.33b	10.33a	9.33a
a2 (Loam)	7.67b	9.33ab	8.50a
a3 (Mixture)	7.67b	10.67a	9.17a
Mean b	7.89b	10.11a	

Results in table (3) indicated that the interaction between **different** growing media and a c**adian fertilizer** on number of Leaf had significant effect shows the highest value in the number **(10.33) was recorded. The reason for the increase of studied properties values with the addition of composites** may be to supply of organic matter around the root hair area in which it could lead absorption the organic matter and increase the vegetative growth which enhances the transportation of metabolites of photosynthesis **(**Aisha, A.H., F.A., Rizk, A. M., Shaheen, and M.M., Abdel-Mouty. 2007**).**

Table (4): Effect of different growing media and a cadian fertilizer on Chlorophyll content of Onion (*Allium cepa* L.) production.

Media	Chlorophyll content		Mean a
	$b_{1(0)}$	$b_{2(2)}$	
a1 (Peatmoss)	9.89bc	13.03a	11.46b
a2 (Loam)	9.60c	12.03abc	10.82b
a3 (Mixture)	12.74ab	14.37a	13.56a
Mean b	10.74b	13.14a	

Elucidated in Table (4) showed significant differences in same treatments about Chlorophyll content in leaves whereas, the highest values (14.37) was recorded. It may be due to the fact that these extracts contain many major and minor nutrients and some trace elements, which increased the efficiency of photosynthesis in addition to containing plant extracts on auxins, gibberellins and amino acids, which leads to increased division and elongation of cells and their role in balancing the vital processes Inside the plants. Shakir and AL-Rawi (2017)

Table (5): Effect of different growing media and a cadian fertilizer on Wet weight of Onion (*Allium cepa* L.) production.

Media	Wet weight (gm)		Mean a
	$b_{1(0)}$	$b_{2(2)}$	
a1 (Peatmoss)	22.35b	30.43ab	26.39b
a2 (Loam)	8.42c	12.33c	10.38c
a3 (Mixture)	31.80a	37.40a	34.60a
Mean b	20.86a	26.72a	

In table (5) significant differences among the same treatments were observed in Wet weight according. the higher value (37.40gm) was observed at mixture **growing media** and (2gm.L^{-1}) **a cadian fertilizer, whereas, the lower value (8.42 gm)** was recorded at Loam **growing media no a cadian fertilizer** applied.

Table (6): Effect of different growing media and a cadian fertilizer on Dry weight of Onion (*Allium cepa* L.) production.

Media	Dry weight (gm)		Mean a
	$b_{1(0)}$	$b_{2(2)}$	
a1 (Peatmoss)	3.35ab	2.30bc	2.83b
a2 (Loam)	1.05c	1.04c	1.05c
a3 (Mixture)	4.10a	4.05a	4.08a
Mean b	2.84a	2.46a	

As illustrated in table (6) indicated that the highest value (**4.10) was obtained where no** a cadian applied whereas, the lowest values (**1.04)** was obtained treated with loam **growing media**.

Conclusion:

To sum up, this study examined how different growth conditions and the use of Acadian fertilizer affected the yield of onions (Allium cepa L.). The outcomes showed appreciable gains in a number of crucial metrics that represent the productivity and health of the plants. In particular, wet weight (g), chlorophyll content, bulb diameter (cm), number of leaves, leaf length (cm), and plant height (cm) were significantly increased with the application of Acadian fertilizer. These results highlight how well Acadian fertilizer works to support onion growth and development in a variety of ways.

It is noteworthy, nonetheless, that in terms of dry weight (g), the benefits of the Acadian fertilizer were not as noticeable as they were elsewhere. Although there were notable enhancements in other parameters, the variations in dry weight were somewhat small. To sum up, this study examined how different growth conditions and the use of Acadian fertilizer affected the yield of onions (Allium cepa L.). The outcomes showed appreciable gains in a number of crucial metrics that represent the productivity and health of the plants. In particular, wet weight (g), chlorophyll content, bulb diameter (cm), number of leaves, leaf length (cm), and plant height (cm) were significantly increased with the application of Acadian fertilizer. These results highlight how well Acadian fertilizer works to support onion growth and development in a variety of ways.

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Appendixes