International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 22-09-2021, Accepted: 07-10-2021, Published: 23-10-2021
Volume 6, Issue 5, 2021, Page No. 1376-1378

Influence of growing media on herbage yield of onion (*Allium cepa* L.) microgreens

Priyadarshini V M[1], P Madhana Kumari[2]
[1] Scholar, Department of Horticulture Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India
[2] Assistant Professor, Department of Horticulture Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

Abstract
Microgreens in horticultural sector is considered to be an innovative product. They are appreciated by people all around the world because of their novelty and health-related benefits. They can easily be cultivated in indoor production systems for kitchen garden. The aim of the present study was to evaluate the influence of six different growing media *viz.*, farm yard manure, vermicompost, cocopeat, perlite, vermiculite and sand on onion (*Allium cepa*) microgreens. Among the different medias, cocopeat has highest influence on growth parameters of onion seedlings like days to first germination, days to 50% germination, germination percentage, vigour index and seedling height. Similarly, cocopeat had a positive significant influence on physiological and yield parameters like fresh weight, dry weight, 100 seedlings weight and yield per tray. Through this study we were able to understand that, the choice of substrate significantly affected the growth, yield and dry matter percentage of onion microgreens.

Keywords: onion, microgreens, growing media, herbage yield

Introduction
A miniature form of the green leafy vegetables, referred to as microgreens has gained popularity as a novel culinary ingredient during the last decade (Treadwell *et al.*, 2010) [16]. Microgreens, frequently known as "vegetable confetti" are tender, young greens that enhances the texture, color and flavor of salads to garnish a variety of main dishes. These greens are harvested when they attain first true leaf stage and are sold with the stem, cotyledons and true leaves attached. They are among a variety of novel salad greens available on the market that are typically distinguished categorically by their size and age (Danielle *et al.*, 2010). Microgreens garner immense potential for adapting leafy vegetable production to a micro-scale and for improving nutritional value in human diet (Kyriacou *et al.*, 2016). Onion belongs to the Allium family that also includes garlic, shallots, chives, and leeks. Onions come in different forms, colors, and flavors. The most common types are red, yellow, and white onions. The vegetable is very versatile and can be prepared in a variety of ways, such as being grilled, fried, baked, boiled, braised, roasted, sautéed, or even eaten raw. Microgreens seeds will grow into a grass-like green that still has the onion flavor. The stems are soft and slightly crunchy in texture. The benefit of using onions as microgreens is that you can use them in a variety of dishes, and they will not make you cry as they don't produce the chemical irritant known as syn-propanethial-S-oxide. FYM has a pH of 7.43, electrical conductivity of 1.63 ds/m and organic carbon 196.46 g/ kg. On an average well decomposed farmyard manure contains 0.5 per cent N, 0.2 per cent P_2O_5 and 0.5 per cent K_2O. Vermicompost has the following physical and chemical properties; pH (7.72), EC (6.88 ds/m), organic carbon (17.3 %), total nitrogen (3.5 %), total phosphorus (0.71 %) and total potassium (950.5 mg/kg). Cocopeat has good aeration and water-holding characteristics. Cocopeat has a TPS (total pore space) of 86–94% and an AFP (air-filled pore space) of 9–14%, while cocopeat has a TPS of 98% and an AFP of around 70% (Raviv *et al.*, 2002) [11]. According to Prasad (1997a) [10], cocopeat is characterized by a relatively high EAW (easily available water) of around 35%. The use of perlite provides improved aeration and drainage and optimum moisture retention and nutrient availability. While perlite is mainly used to improve the drainage properties in a mix, vermiculite is used to increase the water-holding capacity of a growing medium. It can hold 3–4 times its weight of water. Furthermore, vermiculite can hold positive-charged nutrients such as K, Mg and Ca. Many grades of sand are available and can be used as a growing medium or as a component of various substrate mixtures in order to improve the drainage properties. Gutierrez (2018) [6] claims that the microgreen production industry is split evenly between conventional and hydroponic growing methods. Currently, there is not enough evidence available to growers to make informed decisions on what type of production methods would work best for their situation. In spite of big advantages of large quantities of locally available growing materials for substrate production, no standardized growing substrates are available for microgreen production on commercial scale and only limited scientific investigations on production is available, based on this constraint, this study was conducted to identify the suitable growing media for onion microgreen cultivation.

Materials and Methodology
Plant materials and Sampling
Onion (*Allium cepa*) microgreen was cultivated in Pondicherry, India in indoor cultivation so as to enable the production of microgreens for daily consumption. The growing substrates used for the study include; Farm Yard

Manure, Vermicompost, Cocopeat, Vermilculite, Perlite and Sand. These 6 treatments were laid out in CRD (Completely Randomised Block Design) replicated thrice.

Plastic trays with dimension 18 x 15 x 6 cm were taken for microgreen cultivation. The trays were filled respective Medias. In each tray, 1 gram of onion seeds were sown. After covering it with a thin layer of media the trays were covered with gunny bag and kept in dark conditions for 2 – 3 days to promote onion seed germination. Later, gunny bag was removed and left in open condition to establish and develop. Growing cycle lasted for about 10 – 12 days. Two growth cycles were maintained.

Growth and Yield Parameters

The microgreens were harvested and various growth and yield parameters were recorded. The various parameters include germination (%), seedling height (cm), vigour index, days to first germination (days), days to 50 % germination (days), 100 seedling weight (g), fresh weight of 50 seedlings (g), dry weight of 50 seedlings (g) and yield/ tray (g).

Statistical Analysis

Statistical analysis was carried out by using DSAASTAT tool. For treatments showing significance, critical differences were worked out at five percent probability level.

Results and discussion

The factor determining the growth and yield factors of any microgreen production is dependent on its growing media. Peat based medias which are widely used for indoor microgreen cultivation are expensive and non-renewable. Other inorganic media, for instance perlite and vermiculite are widely available but are expensive, demanding more production energy and are not easily disposable at the end of production. An alternative solution brings us to the usage of an organic and renewable source. In this study, performance of six different substrates has been used to identify a suitable alternative which is more environment friendly and cost effective.

Growth Parameters

The ANOVA analysis of the data obtained from various treatments revealed that cocopeat is a suitable media for cultivation of indoor onion microgreen cultivation. The growth parameters showed significant positive differences among different media. The germination percentage (73.20 %), days to 1st germination (4.62 days), days to 50 % germination (6.46 days), seedling height (12.01 cm) and vigour index (915.00) were found to be highest in T_3, tray containing cocopeat. Increase in germination percentage in cocopeat media may be due to its improved ability to retain water which helped to improve the nutrient availability, eventually leading to the increased amount of nutrients absorbed by soil. According to Bruckner (1997) [2] and Nkongolo and Caron (1999) [9] reported that relative balance between air and water in the pore spaces of growing media is important step for seed germination and plant development. Cocopeat media were more effective to enhance germination percentage in papaya seedlings compared with media without cocopeat (Bhardwaj, 2014) [1]. This directly affected seedling development during germination as well as seedling quality when it matures (Sabri and Bakar). The improved growth characters may also be due to better organic matter build-up, more translocation of nutrients to aerial parts for synthesis of protoplasmic protein and other components (Singh *et al.*, 2000) [13]. Better growth performance of onion seedlings in cocopeat is perhaps due to high water holding capacity, aeration, reduced bulk density and slightly higher potassium content (Subramani *et al.*, 2020) [14]. The increased growth parameters in cocopeat media may be due to higher phosphorous content. Phosphorous is used in the development of high energy compounds, which in return cause several bio-chemical reactions in plant such as adenosine triphosphate and adenosine diphosphate (Memon, 1996) [8].

Yield Parameters

The physiological and yield parameters *viz*., fresh weight/ 50 seedlings (1.72 g), dry weight/ 50 seedlings (1.37 g), 100 seedling weight (3.51 g) and yield per tray (7.68 g) were found to be significantly influenced by cocopeat media. Cocopeat has an advantage compared to other conventional media in its ability to hold water almost 10 times its weight. The lightweight fibre is also resistant to elements. Comprising of 75% carbohydrates and 25% lignin, cocopeat has a complex polysaccharide as cellulose group. Higher reserves of cellulose and lignin enable cocopeat to be a good food source and breeding ground for beneficial microorganisms. Some of the beneficial microorganisms in the roots that can reproduce well in cocopeat media are rhizobacteria (PGPR) and several types of mycorrhizae. Cocopeat contains high potassium (K) and phosphorus (P), besides that it also contains nitrogen (N), calcium (Ca), magnesium (Mg), boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) and zinc (Zn). These nutrients are nutrients that are needed by plants to support their needs (Sulistiya, 2021). The results were similar to the findings of Farzad Nazari *et al.*, 2011 and Cuckoorani, 2013 [15].

Table 1: Mean on influence of different growing media on growth parameters of onion microgreens.

S. No	Treatments	Germination (%)	Days To 1st Germination (Days)	Days To 50% Germination (Days)	Vigour Index	Seedling Height (cm)
1.	T_1 – Farm Yard Manure	62.00	5.68	7.65	562.34	10.01
2.	T_2 - Vermicompost	63.80	5.52	7.49	616.31	10.33
3.	T_3 - Cocopeat	73.20	4.62	6.46	915.00	12.01
4.	T_4 - Perlite	68.30	5.07	6.98	750.02	11.01
5.	T_5 - Vermiculite	70.70	4.83	6.72	834.26	11.56
6.	T_6 - Sand	65.90	5.30	7.23	679.43	10.71
	C. D (p=0.05)	1.89	0.19	0.21	53.82	0.36
	S. ED	0.95	0.09	0.11	26.91	0.17

Table 2: Mean on growing media on yield parameters of onion microgreens

S. No	Treatments	100 Seedling Weight (g)	Fresh Weight (g)	Dry Weight (g)	Yield/ Tray (g)
1.	T_1 – Farm Yard Manure	2.78	1.36	1.08	6.05
2.	T_2 - Vermicompost	2.89	1.41	1.12	6.34
3.	T_3 - Cocopeat	3.51	1.72	1.37	7.68
4.	T_4 - Perlite	3.18	1.56	1.24	7.01
5.	T_5 - Vermiculite	3.35	1.64	1.30	7.35
6.	T_6 - Sand	3.03	1.48	1.18	6.67
	C. D (p=0.05)	0.13	0.06	0.05	0.31
	S. ED	0.07	0.03	0.03	0.16

References

1. Bhardwaj RL. Effect of growing media on seed germination and seedling growth of papaya cv. 'Red lady'. African Journal of Plant Science,2014:8(4):178-184.
2. Bruckner U. Physical properties of different potting media and substrate mixture especially air and water capacity. Acta Horticulturae,1997:450:263-270.
3. Cuckoorani M. Organic nutrient scheduling in soilless vegetable cultivation. M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur, 2013.
4. Danielle DT, Hochmuth R, Landrum L and Laughlin W. Microgreens: A New Speciality Crop. EDIS. 10.32473/edis-hs1164-2020.
5. Farzad NF, Homayoun, Morteza, Khosh-Khui and Hassan S. Effect of coir as a component of potting media on growth, flowering and physiological characteristics of hyacinth (Hyacinthus orientalis L. cv. Sonbol-e-Irani). International Journal of Agriculture and Food Science,2011:1(2):34-38.
6. Gutierrez A. Microgreen production with sure to grow pads, Virginia Tech, Department of Horticulture, U. S.A, 2018.
7. Kyriaco MC, Rouphel Y, Gioa FD, Kyratzis A, Serio F, Renna M *et al*. Micro-scale vegetable production and rise of microgreens. Trends in Food Science and Technology,2016:57:103-115.
8. Memon KS. Soil and fertilizer phosphorus. In: Soil Science, Bashir, E. and R. Bantel (Eds.). National Book Foundation, Islamabad, 1996, 291- 316.
9. Nkongolo NV, Caron J. Bark particle sizes and the modification of the physical properties of peat substrates. Canadian Journal of Soil Science,1999:79:111-116.
10. Prasad M. Physical, chemical and biological properties of coir dust. Acta Horticulturae,1997a:450:21-30.
11. Raviv M, Wallach R, Silber A and Bar-Tal A. Substrates and their analysis In: D. Savva and H. Passam (eds.). Hydroponic production of vegetables and ornamentals. Embryo Publ., Athens, Greece, 2002, 25-102.
12. Sabri ASA, Bakar FA. Effect of growing media on the germination and seedling growth of Borneo sour eggplant. Net Journal of Agricultural Science,2021:9(1):9-13.
13. Singh DN, Sahu A, Parida AK. Organic farming technology for sustainable vegetable production in Himachal Pradesh. Himachal Journal of Agricultural Research,2000:26:69-73.
14. Subramani T, Gangaiah B, Baskaran V and Swain S. Effect of Soilless Growing Media on Yield and Quality of Tomato (Solanum lycopersicum L.) under Tropical Island Condition. International Journal of Current Microbiology and Applied Science,2020:9(05):2084-2090.
15. Sulistiya. Response to the growth and results of microgreens broccoli planted hydroponically with various planting media and addition of coconut water sources of nutrition and hormone. Jurnal Pertanian Agros,2021:23(1):217-229.
16. Treadwell D, Hochmuth R, Landrum L, Laughlin W. Microgreens: A new specialty crop (p. HS1164). University of Florida, IFAS Extension, 2010.