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Effect of growth and yield of mustard (*Brassica juncea*) microgreens on different growing media in indoor conditions

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Abstract
Microgreens are fresh, edible vegetables considered as good nutritional benefits because of the presence of their high minerals. Microgreens provide an intense experience that will elevate the overall flavour of any dish. Microgreen cultivation leads to biodiversity protection by selecting wild species which give high nutrient content. In this study, by using 5 different growing media as treatments the experiment is conducted. The experimental material comprised five growing media like Soil, Water, Vermicompost, Cocopeat and FYM. Observations were recorded in five randomly chosen plants for the emergence of seeds (%), plant height (cm), plant weight (gm) and days taken to harvest, yield per tray (gm) and yield per hectare (kg). The character emergence of seeds on day 3 was shown an early performance on treatment (T_1 and T_5). The treatment (T_4) cocopeat was shown the highest plant height (cm) at harvest day 7. Plant weight (gm) was shown highest performance on (T_3) vermicompost. Days to taken for harvest (T_3) vermicompost showed an early performance and the yield per tray (gm) treatment (T_3) showed the highest yield.

Keywords: Microgreen, mustard, media, biodiversity

Introduction

Microgreens began appearing on the menu of restaurants in many cities as a salad. First, it appeared in California, United States, in the early 1980s. While they were initially used as a form of garnish, chefs now realize they also add flavour and visual appeal when included in all types of doses and recipes. Microgreens provide an intense experience that will elevate the overall flavour of any dish. Mustard is a very important crop. It belongs to the family Brassicaceae and the scientific name of mustard is *Brassica juncea*, chromosome number is 2n=32. It originated in the southern Mediterranean region and brown mustard is introduced from China to north India later it is widely distributed to whole over the world. Microgreens are also known as vegetable confetti or micro herbs when referring to aromatic herbs. Microgreen cultivation leads to biodiversity protection by selecting wild species which give high nutrient content.

A healthy diet through microgreens regulates weight gain, and cholesterol and protects from cardiac diseases. Mustard microgreens are capable of fighting diabetes, clearing out sinuses, and helping to relieve congestion. These act as detoxifying agents to purify and strengthen the blood, and diuretics to support kidney function. Microgreens cure anaemia, reduce the risk of eye diseases, maintains strong and healthy bones and promote blood clotting. Mustard microgreens stimulate blood circulation and are effective against fever and colds. Microgreens contain more nutrient and less microbial contamination than sprouts. Due to an increase in consumer awareness about microgreens importance, short production cycle leads to the demand in these years. Controlled environmental agriculture allows year-round harvesting of microgreens and the manipulation of light quantity and quality to alter the nutritional attributes of plants. Microgreens generate little or no food wastage during consumption as no biomass gets wasted as trimming. Microgreens are difficult to store, due to their high surface area to volume ratio, high respiration rate, delicate leaves that easily wilt, rapid post-harvest decay transpiration, leakage of nutrient-rich exudates, tissue damage and early senescence.

Materials and Methods

The present investigation entitled "Effect of growth and yield of mustard (*Brassica juncea*) microgreens on different growing media in indoor" was carried out during the early *Rabi* season of the year 2021 at Pydah Educational Institution, Department of Horticulture, Patavala, Kakinada. The details of experimental techniques, materials and methods adopted for the study are presented in this chapter. The experimental material comprised of five growing Medias *viz.*, Soil, Water, Vermicompost, Cocopeat and FYM. Observations were recorded in five randomly chosen plants for the emergence of seeds (%), plant height (cm), plant weight (gm) and days taken to harvest, yield per tray (gm) and yield per hectare (kg).

Results of growth and yield parameters

Emergence of seeds (%)

Emergence of seeds (%) Day 1

In treatment (T_2) water were shown an early performance of emergence of seeds (50%) at day 1 and treatment (T_1) soil were also shown the early performance of emergence of seeds (30%) at day 1, followed by treatment (T_5) farm yard manure (15%), treatment (T_3) vermicompost (10%) and treatment (T_4) cocopeat (5%) of seeds emergence.

Emergence of seeds (%) Day 2

In treatment (T_5) farm yard manure showed an early seed emergence (95%) on day 2 and treatment (T_1) soil were also showing early performance of emergence of seed (90%) at day 2, followed by treatment (T_2) water (85%), treatment (T_3) vermicompost (65%) and treatment (T_4) cocopeat (50%) of seed emergence was shown.

Emergence of seeds (%) Day 3

In treatment (T5) farm yard manure were shown an early seed emergence (100%) at day 3 and treatment (T_1) soil were also showing early performance of emergence of seed (100%) at a day 3, followed by treatment (T_2) water (95%), treatment (T_4) cocopeat (90%) and treatment (T_3) vermicompost (85%) of seed emergence was shown**.**

Emergence of seeds (%) Day 4

The treatment (T_2) water. (T_3) vermicompost and (T_4) cocopeat were show in a late performance of emergence of seed on day 4.

Plant height (cm)

Plant height (cm) Day 3

In treatment (T_5) farm yard manure showed the highest height (7.94 cm), followed by treatment (T_1) soil (4.88 cm) and treatment (T_3) vermicompost (4.78 cm) also showed the highest performance after treatment (T_5) farm yard manure at day 3. The treatment (T_2) water (2.54 cm) were shown the least performance on day 3.

Plant height (cm) Day 4

In treatment (T_5) farm yard manure was shown the highest height (8.34 cm), followed by treatment (T_3) vermicompost (6.88 cm) and treatment (T_1) soil (6.54 cm) also showing the heist performance after treatment (T_5) farm yard manure at day 4. The treatment (T_2) water (4.44cm) were shown the least performance on day 4.

Plant height (cm) Day 5

In treatment (T_5) farm yard manure was shown the highest height (9.08 cm), followed by treatment (T_4) cocopeat (8.9 cm) and treatment (T_3) vermicompost (8.62 cm) were also showing the highest performance after treatment (T_5) farmyard manure at day 5. The treatment (T_2) water (5.76 cm) were shown least performance at day 5.

Plant height (cm) Day 6

In treatment (T_3) vermicompost were shown the highest height (10.1 cm), followed by treatment (T_4) cocopeat (9.98 cm) and treatment (T_5) farmyard manure (7.54 cm) were also showing highest performance after treatments (T_3) vermicompost at day 6. The treatment (T_2) water (6.34 cm) were shown least performance at day 6.

Plant height (cm) Day 7

In treatment (T4) cocopeat were showed the highest height (10.84cm) followed by treatment (T_2) water (7.24 cm) shown the least performance at day 7.

Plant weight (gm)

The treatment (T_3) vermicompost (0.064 gm) were shown highest performance of plant height at last day of harvest. Followed by treatment (T_4) cocopeat (0.062 gm) and treatment (T_5) farm yard manure (0.056 gm) were shown highest performance after treatment (T3) vermicompost at harvest. The remaining treatments (T_1) soil (0.052 gm) and treatment (T_2) water (0.044 gm) were shown the least performance at harvest.

Days to taken for harvest

The treatment (T_3) vermicompost (6 days) showed an early performance followed by treatments (T_1) soil (7 days), (T_2) water (7 days), (T_4) cocopeat (7 days) and (T_5) farm yard manure (FYM) (7 days) were shown late performance.

Yield per tray (gm)

In treatment (T_3) vermicompost showed the highest yield of (54.58 g) followed by treatment (T_4) cocopeat (45.65 g) and treatment (T_5) farm yard manure (31.21 g) and treatment (T_1) soil (25.06 g.). The treatment (T_2) water showed (23.50 g) of the lowest yield.

Yield per hectare (kg)

In treatment (T_3) vermicompost (99.96 kg) was shown highest yield per hectare followed by treatment (T_4) cocopeat (83.60 kg) treatment (T_5) farm yard manure (57.16 kg) treatment (T_1) soil (45.89 kg) and treatment (T_2) water (43.04 kg) with lowest yield per hectare.

Table 1: Growth and yield parameters of mustard microgreen in terms of emergence of seeds (%), plant height (cm).

Parameters	The emergence of seeds (%)				Plant height (cm)				
	Day1	Day2	Day3	Day4	Day 3	Day 4	Day 5	Day 6	Day 7
T_1 - Soil	30%	90%	100%	0%	4.88	6.48	6.88	6.48	0
T_2 - Water	50%	85%	95%	100%	2.54	4.44	5.76	6.24	7.24
T_3 - Vermicompost	10%	65%	85%	100%	4.78	7.48	8.62	10.1	0
T_4 - Cocopeat	5%	50%	90%	100%	3.36	5.42	8.9	9.98	10.84
T_5 - Farm yard manure	15%	95%	100%	0%	7.94	8.34	9.08	7.54	0

Table 2: Growth and yield parameters of mustard microgreen in terms of plant weight (gm), days to taken for harvest, yield per tray (gm) and yield per hectare (kg).

Parameters	Plant weight (gm)	Days to taken for harvest	Yield per tray (gm)	Yield per hectare (kg)
T_1 - Soil	0.052	7	25.06	45.89
T_2 - Water	0.044	7	23.51	43.04
T_3 - Vermicompost	0.064	6	54.58	99.96
T_4 - Cocopeat	0.062	7	45.65	83.61
T_5 - Farm yard manure	0.056	7	31.21	57.16

Conclusion

From the present study, it is concluded that there is a good scope for the development of microgreens in mustard. It is desirable direction for growth and yield characters should be evaluated further and can be exploitation for commercial cultivation The character emergence of seeds day 3 were shown an early performance on treatment (T_1 and T_5). The treatment (T_4) cocopeat were shown a highest plant height (cm) at harvest day 7. Plant weight (gm) were shown highest performance on (T_3) vermicompost. Days to taken for harvest (T_3) vermicompost was showed an early performance and the yield per tray (gm) treatment (T_3) were showed a highest yield.

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