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Study on the role of microgreens in human life

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Abstract

In development countries like India 13.5% people are chronically undernourished with Western-Asia and Sub-Saharan Africa, the most severely affected regions.(Anonymous, 2015). Microgreens meaning referred as new emerging food products, which are young seedlings of vegetables and herbs, having two fully developed cotyledons with the first pair of true leaves emerging or partially expanded. Microgreens are a new class of small, fresh, edible vegetables considered as a good nutritional source because of their high mineral and bioactive compound content of minerals and antioxidant bioactive compounds (Fuente *et al.* 2019). Microgreens meaning referred as new emerging food products, which are young seedlings of vegetables and herbs, having two fully developed cotyledons with the first pair of true leaves emerging or partially expanded. Microgreens can be produced from many vegetables, herbaceous plants, aromatic herbs, grains and wild species and possess distinctive organoleptic properties, such as colour, shape, texture and taste. An experiment was conducted to determine the concentrations of ascorbic acid, carotenoids, phyloquinone and tocopherols in 25 commercially available microgreens. Results showed that different microgreens provided extremely varying amounts of vitamins and carotenoids. Total ascorbic acid contents ranged from 20.4 to 147.0 mg per 100 g fresh weight (FW), while β -carotene, lutein/zeaxanthin and violaxanthin concentrations ranged from 0.6 to 12.1, 1.3 to 10.1 and 0.9 to 7.7 mg/100g FW, respectively. Among the 25 microgreens assayed, red cabbage, carotenoids, phyloquinone and tocopherols, respectively. In comparison with nutritional concentrations in mature leaves (USDA National Nutrients Database), the microgreen cotyledon leaves possessed higher nutritional densities. (Xiao *et al.* 2012).

Keywords: Role, Microgreens, Human life

Introduction

In development countries like India 13.5% people are chronically undernourished with Western-Asia and Sub-Saharan Africa, the most severely affected regions. (Anonymous, 2015) [2]. The spectrum of life in terms of income, life style and spending is changing rapidly with economic development leading to major challenge of numerous diseases related to nutritional deficiencies. Non-availability of fresh and pesticide residue free vegetables for consumption (Choe *et al.* 2018) [3]. Diet-related diseases such as obesity, diabetes, cardiovascular disease, hypertension, stroke, and cancer are escalating both in developed and developing countries, in part due to imbalanced food consumption patterns. Microgreens are a new class of edible vegetables (Pinto *et al.*, 2015), a very specific type which includes seedlings of edible vegetables, herbs or other plants, ranging in size from 5 to 10 cm (Xiao *et al.*, 2012) [1]. Wheatgrass was grown and dried, then sold as a medicine in most North American pharmacies during the 1930s. In the 1960s sunflower, buckwheat and radish were frequently grown in sunny windows as winter "Greens". In the 1970s, healthy home grown "Grasses" were popularized for their health benefits. In the 1980s, chefs started growing "Cresses" and

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“Seedlings” for garnishing. In the 1990s, California chefs started to popularize them as “Vegetable Confetti.” The first documented use of the word “MICROGREENS” in USA 1998. Then in the 2000s, local producers throughout North America started distributing fresh “Microgreens” to their local retail outlets. 2010: Microgreens started to appear at grocery stores so that food enthusiasts could enjoy them at home. Phytonutrient levels differ according to the growth stages of the plant and often decrease from the seedling to the fully developed stage. 7 days after germination, young lettuce seedlings had the highest total phenolic concentration and antioxidant capacity in comparison to the older leaves. Microgreens are 4-6 times more nutrient dense than their adult counterparts. Supplemental UV-A irradiation can improve antioxidant properties of microgreens. Microgreens from Brassica species are good sources of phenols. Among the 25 commercial microgreens tested, red cabbage, red sorrel, garnet amaranth and green daikon radish had the highest concentrations of vitamin C, vitamin A, vitamin K and vitamin E, respectively. Microgreens generally had higher levels of phytonutrients like vitamins C, B₉ and K₁ and the carotenoids than mature leaves. So, microgreens= ‘Functional Foods’ which have health promoting or disease preventing properties. Flavor is sweet and tangy, similar to spinach. A microgreen with gorgeous magenta leaves to add vibrant dash of color to salad or for use as a garnish. An easy to grow and vigorous growing with very attractive, deep reddish metallic purple leaves with a delicious, mild spinach like flavor. It is nutritious with antioxidant properties and rich in vitamins. Distinctive hot, highly nutritious. Rich in vitamins, minerals, enzymes, protein and chlorophyll. Stimulate the immune system. Traditional microgreen with finely curled leaves and a peppery flavor. Use in arnishing and addition to salads and sandwiches. Good source of vitamin A, C and Sulphur. Fine, feathery foliage and a great flavor. Goes well with eggs, cucumbers, cheese, salmon and cabbage. Nutritious microgreen, high in protein, vitamins A, D, E, B and minerals. Stimulate the appetite and effective against anemia and fatigue. Mild cabbage like flavor, colorful leaves, add vibrancy to salads. Rich in antioxidants believed to help prevent macula degeneration and other conditions of the eye. Mildly spicy and very tender. Highly nutritious, rich in Omega-3 fatty acids. A good source of vitamins, minerals, antioxidants and amino acids. Spicy microgreen. Ca, Fe, K, Zn, carotene, antioxidants, vitamins and protein found high. Stimulate immune system. Beautiful, red purple microgreen, mild sweet cabbage flavor. Rich in vitamins A, B, C, E, K and minerals and chlorophyll. Stimulate immune system. Light leaves and Liquorish flavor. Higher in K, vitamin C, B and

phytonutrient. Decrease risk of heart disease. Hot and spicy. High levels of antioxidants, protein, vitamins, minerals. Stimulate blood circulation and effective against fever and colds. Easy to digest and sweet flavor. Full of vitamins, minerals such as Ca, potassium, Sulfur, protein, enzymes and chlorophyll. Sweet and tender. Very nutritious and source of vitamins A, C, K and minerals Ca, Fe, Mg, P, K, amino acids and protein. Red veined with very tangy. Its sour taste comes from oxalic acid. Boost eye sight, strengthen the immune system, build strong bones, prevent cancer, lower down blood pressure. Blanched corn shoot, sweet flavor and use in garnishing. Good source of vitamin B, antioxidant and carotenoids. Mild carrot flavor with fine textured leaves. Rich in β -carotene and other phytonutrients like lutein and zeaxanthin. Beautiful skin, cancer prevention and anti-aging.

Materials and Methods

Flat tray with good drainage. Media: Organic potting mix, Cocopeat, Vermiculite or mix. Organically certified or untreated seed. Fill the tray with media 2-3 cm deep and moisture it. Soaking Then sprinkle the seeds top of the media Covered with paper towel/ Vermiculite/ Cocopeat. Watering by fine spray. High light conditions with low humidity and good air circulation. Requires 12 and 16 hours of light. Not need much fertilizer. Diluted organic nutrients. *e.g.* seaweed spraying will improve the nutrient levels in the microgreens. Germination paper dipping into fertilizer if grown without media. Appearance of 1st set of true leaves. Cutting above from media surface. Packing without roots. Some types will regrow and can be cut several times.

Invert the media, top it up with a bit of fresh media and replant. The plants need more light or feeding. Move in stronger light or try spraying with a dilute solution like Seaweed Plant Starter. Too much seed will cause ‘damping off’, it can be overcome by treating the media by Trichoderma. Some seeds will not germinate at very high or very low temperatures. Over soaking of seeds may result in dead seeds. In recent years, consumption of microgreens has increased along with consumer awareness and appreciation for their tender texture, distinctive fresh flavors and concentrated bioactive compounds such as vitamins, minerals, antioxidants as compared to mature leafy greens. Microgreen Salads: All the flavor of a Big Salad in a Tiny Pile on Plate.

Commercial Utility

Living microgreens are the freshest and most nutritious greens. Living microgreens can be stored in the refrigerator for up to 14 days or stored at room temperature for 2-3 days with daily watering.

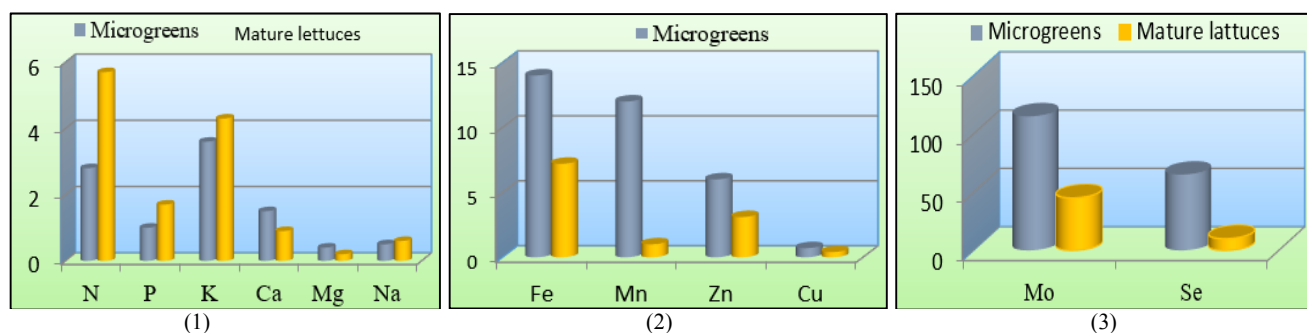


Fig 1, 2, 3: Comparison of mineral contents between microgreens and mature greens of lettuce.

Table 1: Influence of vermiculite orientation and location within the medium on various parameters of microgreens

Seed treatment	Vermiculite orientation	Location within vermiculite	GP (%[deg.])	Radicle length (mm)	Shoot fresh weight (gm ⁻²)
'Early Wonder Tall Top' beet					
Control	-	-	-	-	871 c
Germinated	Horizontal	Top	42.5 [40.7] a	4.8 ab	1191 a
		Bottom	44.0 [41.6] a	6.3 a	1128 ab
Germinated	Vertical	Top	23.4 [28.9] b	3.3 b	1250 a
		Bottom	20.8 [27.1] b	2.9 b	1098 b
	LSD _{0.05}		[7.1]	2.0	148
'Ruby Red' chard					
Control	-	-	-	-	310 d
	Horizontal	Top	40.6 [39.6] a	3.2 a	909 a
		Bottom	42.1 [40.5] a	3.4 a	822 ab
Germinated	Vertical	Top	30.3 [33.4] b	1.9 b	604 c
		Bottom	27.7 [31.8] b	2.2b	704 bc
	LSD _{0.05}		[4.1]	0.9	188

NHRI, Korea

Lee *et al.* (2004)**Table 2:** Effect of *Trichoderma* species on seedling emergence in beet

Pa inoculum level ^a	Damping-off (% (deg.))			First emergence (days)
	University of Delaware, Newark	0	0.5	1.0
Imbibed seed balls				
<i>Th Tv</i> (mg per seed ball) ^b				Mean
0	0 (0)	42 (40)	65 (54)	3.3
0.25	0 (0)	26 (30)	42 (40)	2.8
0.50	0 (0)	23 (28)	46 (43)	3.1
0.75	0 (0)	13 (19)	24 (29)	3.3
1.00	0 (0)	5 (9)	19 (25)	3.3
	LSD _{0.05} = (5)			LSD _{0.05} = 0.26
Dry seed balls	0 (0)	96 (83)	96 (85)	4.6
	LSD _{0.05} = (6)			LSD _{0.05} = 0.32

^a1.0 Pa inoculum level (*Pythium aphanidermatum*)^b Seed balls (3 g) mixed into 1.1 g grade 3 vermiculite. *ThTv* (*Trichoderma harzianum* + *Trichoderma virens*)

Conclusion

Microgreens possessed higher amount of bio-active compounds and minerals in contrast to full greens but showed specificity to particular microgreens e.g. TAA in cabbage, phyloquinone and violaxanthin in garnet amaranths and minerals in lettuce *etc.* Matric priming could be important for better germination in *Beta vulgaris*. Broccoli microgreens raised with the application of CaCl₂ showed higher fresh-dry weight and calcium content. UV-A irradiation supplemental at +360nm is important to improve antioxidant property of microgreens. Susceptibility of microgreens to damping off can be minimized through seed treatment with *Trichoderma harzianum* (Th) + *Trichoderma virens* (Tv). Spraying chinese cabbage micro greens with citric acid followed by ethanol was observed as best treatment to avoid undesirable off-odour, when stored in polyethylene. Buckwheat microgreens showed minimum activity of mesophilic bacteria even after 14 days of storage at 10 °C. Modified atmosphere of 16.6 (m²s pa) OTR was observed to have freshest appearance with lowest electrolyte leakage.

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