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Broccoli microgreens: A crop that can diversify the food systems

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ABSTRACT

In the article the researchers question covers the present scenario of malnourishment and the current agricultural practices that destroys nature. Moreover the microgreens are emerging as in the category of super foods. Food systems must be revised as to cope up with the rise in world's population in an unprecedented rate. While the article points out the association between micro nutrient deficiency and the prominence of microgreens in a scientific manner. The study have examined the mineral concentration of one specific variety of microgreen .The nutrititive value of the microgreens was also been analyzed to pinpoint the importance of the micronutrient abundance in microgreens thus cultivated. Surprisingly the article have clearly stated the numerous micro nutrients were also found in broccoli microgreens .It was also clear that less amount of space and growing environment are needed for the growth of microgreens. The prime result is that the microgreens can be grown in rural as well as urban settings without utilizing much money and space.

Key Words : Malnourishment, Microgreens, Broccoli, Settings, Space

INTRODUCTION

As the world expands it is necessary to feed the entire population with much amount of food which should also be nutritious. Before switching into the insecticides and pesticides addicted agricultural practices, it is the high time to change to the farming practices that use fewer amounts of efforts, energy, space and money. In India major water bodies are being contaminated with agricultural runoff, thereby causing the death of millions of aquatic lives. A safer practice that has no negative impacts in environment is the need of the time. Therefore cultivation which requires no fertilizers and less space with large amounts of micronutrient produce. Therefore it is the priority for establishing dietary guidelines to satisfy human nutritional requirements with a diversity of foods that can be produced with minimized environmental impact (Burlingame, 2014; Ridgway *et al.,* 2015).

One of the main advantage of microgreen production is that the produce is of lesser quantity compared to the production of regular vegetables. As a result the amount of food waste produced will be very less .The specific problem that is common in both developing and developed countries is the micronutrient malnutrition. Among the micronutrients iron, zinc and selenium is the common deficiency. The mineral malnutrition is more severe in Asia and Africa because of the large soil degradation that results in decreased nutritional value of crops. One of the Millennium Development Goals is the prevention of mineral malnutrion as it is considered as the gloal challenges to mankind. Efforts are being in process to mitigate the mineral malnutrition by focusing of biofortification methods and genetically engineered crops that provides more mineral uptake .However the newly emerging crops that are rich in micronutrients and requires no biofortification and genetic engineering is the

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microgreens. Micro greens are edible seedlings that are usually harvested within 7-14 days of time after germination. Variety of herbs, vegetables and even flowers are grown as microgreens. Microgreens are rich in flavor, some of the microgreens are quite spicy, than their mature counterparts and have grown in popularity among culinary artists for adding texture and flavor accents to salads, sandwiches, and other dishes (Mayer *et al.,* 2008).

As the microgreens are rich in its flavor the culinary demand for microgreens are growing rapidly and have reached almost all the food courts in California. The very interesting part is that the amount of micronutrient is about 40 per cent higher in that of the regular vegetables grown. The microgreens can also be grown by inexperienced gardeners in urban areas . The study on the micronutrient composition in microgreens are yet to be discovered widely and to be established. In this study, the mineral concentration has determined for broccoli microgreens which have been grown hydroponically (Treadwell *et al.,* 2010; Wallin, 2013 ;Weber, 2016 and 2017).

METHODOLOGY

Growth of microgreens:

The microgreen variety selected for the growth was broccoli seeds (*Brassica oleracea*). Hydroponic growing pads and vermicompost are used for the growth of the microgreens. A 15 , 5" × 5" insert trays are also been used for the growth . The seeds were separately placed in five trays each of which one set of five trays contains vermicompost and other set of five trays contained hydroponic growing pads. The tray with vermicompost (C) seeds and trays with hydroponics growing pads (HW) were been hydrated with deionized water during the experiment. The other set of five trays with hydroponic growing pads (HFG) were been hydrated with Hydroponics Advanced Nutrient System, made in sterile deionized water. After sowing, seeds were kept in dark until germination and were kept covered using aluminium foil.

Harvest of microgreens:

Microgreens are harvested after seven days of sowing. Scissors were used for harvesting the microgreens. The scissors used for harvesting were cleaned with ethanol.

Microgreens are dried and were ground to fine powder in a mortar and pestle and were analyzed in Penn State Agricultural Analytical Services Lab (University Park, PA, USA) .Quantity measurements of, K, Ca, Mg, S, Na, Fe, Mn, Cu, Zn, Al, and B were done.

RESULTS AND DISCUSSION

Microgreens were grown among the HFG,HW and C growing treatments. The fresh mass of microgreens harvested from the HFG treatment was statistically greater than the average fresh mass harvested from the C treatment or the HW treatment.

The micronutrient analysis of the microgreens were analyzed and recorded. The microgreens grown in vermicompost had significantly greater amounts of K, Ca, Mg, Na, Zn, Mn, Fe, Cu, and Al than microgreens grown in HFW or HW treatments. The Mn, Fe, Cu, Zn, and Al concentrations were statistically the same in HFG and HW grown microgreens. Microgreens grown in HFG treatment had significantly higher K, Na, N, P, Ca, Mg, and S than the HW microgreens . Nitrogen was the only element for which either the HFG or HW microgreens had a significantly higher concentration than the C microgreens .The broccoli microgreens were found to be having higher ratios of P, K, Ca, Mg, Mn, Fe, Na, and Zn compared to mature vegetables.

The nutritional value of the microgreens, demonstrated that broccoli microgreens have higher nutritional value than that of mature vegetable with respect to several of the minerals examined. Regardless of how they were grown, microgreens had larger quantities of Mg, Mn, Cu, and Zn than the vegetable.

The relatively high nutritional value of broccoli microgreens compared to the vegetable is consistent with previous studies reporting that produce at early growth stages (*i.e.*, sprouts, microgreens, "baby" vegetables) are denser sources of nutrition than their mature counterparts. It has been noted that vegetables, especially when grown on nutrient poor soils, have low mineral concentrations. Fertilization of nutrient poor soils can increase mineral concentration in plant leaves, but not always in the produce that is consumed because minerals are not distributed evenly in all plant parts. The cultivation methods utilized in this study significantly impacted the elemental concentration of the microgreens. With respect to the 13 elements analyzed, C microgreens had significantly greater quantities of nine elements (K, Ca, Mg, Na, Mn, Fe, Cu, Al, and Zn) than the hydroponically grown microgreens. Relative to the HW microgreens, HFG microgreens had significantly greater quantities of only

seven of the elements (N, P, K, Ca, Mg, S, and Na) (White and Broadley, 2005).

Conclusion :

The study provides clear idea on the potential benefits of microgreen production and the amount of micronutrients available in the microgreens. An awareness class along with a visual aid that describes the importance of microgreens and the potential benefits of the microgreens should be given to increase the public interest and knowledge. The microgreen production with fewer amounts of space and with no pesticides and insecticides which can be grown in urban settings is the need of the hour which is to be communicated for public awareness.

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