

Microgreens: Production Potential and Health Benefits

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Abstract

The rise of malnutrition at the global level has increased the demand for food having high nutritional value. In the recent past, there is a great upsurge in the production and productivity of food grains as well as horticultural produce which is sufficient to feed our burgeoning population. But now the major challenge before us is to ensure nutritional security through conventional or molecular breeding, but it demands a long time. However, this can be achieved in a much shorter period through microgreens. Nowadays, the non-availability of fresh and pesticide residue-free vegetables for consumption is increasingly becoming a major concern for the vegetarian population of our country. Hence, Microgreens: are a new class of edible vegetables with lots of potential in terms of nutritional ability to cure various deficiencies. As these can be easily grown in urban or peri-urban areas, where land is often a limiting factor, either by specialized vegetable farmers or the consumers themselves. Simultaneously, they also offer opportunities for the rural population of our country and emerging alternatives to genetically modified and fortified foods, providing a sufficient amount of nutrition.

Keywords: Malnutrition, microgreens, nutrition

Citation: Katta Sree Vandana and Eggadi Ramesh (2022) Microgreens: Production Potential and Health Benefits. *Journal of Diversity Studies*. V01i01, 16-19. DOI: <http://dx.doi.org/10.5281/zenodo.7541850>

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Article History: Received on: July 29, 2022 | Revised on: September 25, 2022 | Accepted on: October 13, 2022

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INTRODUCTION

Microgreens, popularly known as Vegetable Confetti, defined as young and tender edible immature greens produced from the seeds of different vegetables (broccoli, radish and spinach), grains or herbs (basil, cilantro), including wild species [1-3]. Depending on the species and growing environments, these are usually harvested at 7-14 days after germination when it develops two cotyledonary leaves and the first true leaves have emerged. Microgreens are an emerging class of specialty produce that have gained interest and these are primarily used a new ingredient to enhance and garnish drinks, salads, appetizers, soups, sandwiches and desserts in restaurants [4-7]. Besides, they provide a wide variety of intense flavors, bright colors and good texture to various dishes which attracts the consumers. Microgreens can provide higher

amounts of phytonutrients such as ascorbic acid, beta-carotene, phyloquinone and minerals (Ca, Mg, Fe, Zn, Se, Mn and Mo) as compared to the mature vegetable plants.

Sprouts vs microgreens

Microgreens are distinct from sprouts even if both greens are consumed in an immature state. Sprouts are generally grown in dark, moisture saturated conditions conducive to microbial proliferation, and their consumption, unlike that of micro- and baby-greens, has been implicated in outbreaks of food borne epidemics. Also, microgreens have much stronger flavor enhancing properties than sprouts, and a broad range of leaf color, variety and shape. Based on size or age of salad crop categories, sprouts are the youngest and smallest, microgreens are slightly larger and older (usually 2 in. tall).

Selection of crops for microgreens

The kind of crops that are to be selected for production and sale of microgreens have value in terms of color (red, purple), characteristic textures and distinct flavours. Microgreens are often marketed as speciality mixes, such as sweet, mild, spicy and colorful. Among the group of vegetables and herbs, members of brassicaceae family are widely used for the production of microgreens followed by amaranth, spinach, celery, basil, onion and buckwheat.

Production of Microgreens

Microgreens are produced in a variety of environments (open air, protected environment, indoor) and growing systems (soil, soilless), depending on the scale of production. Microgreens can be grown by individuals for home usage [8]. Production of microgreens in smaller quantities at home is relatively easier as compared to the growing and marketing of high-quality microgreens for commercial purpose. Having the right mix at the perfect stage for harvest is one of the most critical production factors for success. The time for seeding to harvest of microgreens varies from crop to crop [9-11]. For homestead cultivation, grower can use disposable trays for successful cultivation. Media should be preferably inert one like organic potting mixtures, cocopeat, vermiculite alone or in combination of 3:1:1. Partially fill a tray with the media of choice to a depth of 1/2 inch to 1 or 2 inches, depending on irrigation programs. As the concept of microgreens cultivation relates to provide pesticide free and nutritional rich food, so the treatment with any chemical pesticides should be avoided. One essential practice to be followed before the sowing or spreading of seeds in media is soaking. Seeds of spinach and fenugreek require soaking for getting good germination percentage. 1seed/cm² in large seeded species such as pea, chickpea and upto 4 seeds/cm² in small seeded like cabbage, broccoli, radish and amaranth. Then seeds are sprinkled over the media with high density and covered with paper towel/ vermiculite/cocopeat. Generally, bigger sized of seeds are covered with vermiculite or cocopeat and smaller seeds with paper towel. Though, microgreens do not require much care after the spreading of seeds, however ample moisture should be maintained through fine sprays. An alternative production

system involves the materials (burlap or food grade plastic) as a mat or lining to be placed in the bottom of a tray or longer trough. These mat systems are often used in a commercially available production system using wide NFT-type troughs. Most growers indicate they want to seed as thickly as possible to maximize production, but not too thickly because crowding encourages elongated stems and increases the risk of disease. Most crops require little or no fertilizer, because the seed provides adequate nutrition for the young crop. Some longer-growing microgreen crops, such as micro carrot, dill, and celery, may benefit from a light fertilization applied to the tray bottom with 80 ppm of nitrogen for 30 seconds. High light requirement for a period of 12-16 hours should be maintained along with low humidity and good air circulation for better growth and development of microgreens [12-13]

Harvesting of microgreens

Microgreens can be harvested when they reach the first true leaf stage, usually at about 2 in. tall. Time from seeding to harvest can vary greatly from crop to crop i.e., 7 to 21 days. Harvesting is done by the cutting of above portion from media surface with scissors. Some types will regrow and can be cut several times. Media can be used successfully for another crop of microgreens. Cutting with knife is very time-consuming part of the production cycle and is often mentioned by growers as a major drawback. The seeding mat type of production system has gained popularity with many growers because it facilitates faster harvesting. The mats can be picked up by hand and held vertically while an electric knife or trimmer is used for harvesting, allowing cut microgreens to fall from the mat into a clean harvest container. Harvested microgreens are highly perishable and should be washed and cooled as quickly as possible. Commercial microgreens are most often stored in plastic clamshell containers of about 4-8 ounces by weight and refrigerated at 2.5-3.5 °C upto 7 days. Biodegradable clamshell containers are also available for packaging.

Nutritional and Health benefits

In vitro and in vivo research studies have demonstrated microgreens have anti-inflammatory, anti-cancer, anti-bacterial, and anti-hyperglycemic properties, further strengthening

their attractiveness as a new functional food that is beneficial to human health. Microgreens have significant concentrations of glucosinolates, these are the precursors of isothiocyanates molecules that are known to induce specific pathways in mammals that block the growth of tumors. Florets of broccoli (*Brassica oleracea* L. var. *italica*) are widely consumed because of their concentrated phytonutrients, especially glucosinolates (GLS).

GLS are associated with many health benefits, including lowering cholesterol levels, aiding detoxification processes and lessening the impact of allergens. Most notably, GLS have been linked to cancer prevention and cancer-fighting properties. The hydrolytic products of glucosinolates, isothiocyanates (ITCs) and indoles, are responsible for these anti-cancer properties, by causing apoptosis of cancer cells, modulating cell cycles, suppressing inflammation, and boosting the expression of detoxifying enzymes, which reduce the carcinogenic effects of environmental toxins [14-16]. Microgreens considered as “Functional foods” the food products that possess particular health promoting or disease preventing properties that are additional to their normal nutritional values [17-18]. Purple cabbage microgreens consists of vitamin E greater than 40 times than its fully grown equivalent (0.06/100 g fresh weight) [19-21]. Microgreens have higher dietary top quality and prospective convenience of dish incorporation show that they will promote fresh vegetable usage and raised bioactive compound consumption for human wellness and health. Further, these reduce cardiovascular as well as metabolic risk [22-25].

CONCLUSION

Microgreens are novel functional food sources with immense potential for sustainably diversifying global food systems, improving nutritional value in human diet, and facilitating the access of a steadily growing urban population to fresh microscale vegetables. Furthermore, due to their short growth cycle, these nutrient-dense food sources can be produced with minimal input, without using pesticides; hence, they have low environmental impacts and a broad acceptance among health-conscious consumers. Furthermore, microgreens are usually consumed raw; there is hardly a loss or degradation of heat-sensitive micronutrients or vitamins through food

processing.

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