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MICROGREENS: SUPERFOOD OF 21ST CENTURY

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ABSTRACT

Microgreens are a new class of speciality food in vegetables. They are gaining popularity among the common folks due to their richness in nutrients, minerals and phytochemicals. These are young and tender greens harvested before the true leaves have emerged. They are found in a pleasing palette of colours, textures, and flavours. Common microgreens grown include mustard, cabbage, radish, buckwheat, lettuce, spinach, etc. Due to their abundance in bioactive compounds and health benefits, their consumption has increased.

INTRODUCTION

The global population has been increasing daily; by 2100, the world's population is projected to reach approximately 10.9 billion. To meet the demand for this ever-growing population, there is a need for a more sustainable, accessible, and nutritious food supply. To serve this purpose, microgreens has emerged as an excellent substitute for mature vegetables rich in nutrients and their small quantities provide more nutrients than their mature counterparts. Since the 1900s, these have been produced in Southern California and showed a gradual increase in popularity owing to their freshness and nutritional benefits over the past decade (Lenzi *et al*., 2019). Not to be confused with sprouts, these are the immature vegetable greens which are harvested after cotyledonary leaves are developed. As these are abundantly nutritional and contains significantly higher amounts of phytochemical, vitamins and minerals, incorporating them into the daily diet of the consumer can result in enhancement of the nutritional status of the diet and also contribute to better health of the consumers (Yadav *et al*., 2019; Xiao *et al*., 2012).

TYPES OF MICROGREENS

A variety of seeds can be used to grow microgreens. The most popular species which are used to grow microgreens are from the following families (View & Club., 2019):

Brassicaceae family: Cauliflower, broccoli, cabbage, watercress, radish and arugula (gargeer)

Asteraceae family: Lettuce, endive, chicory and radicchio

Apiaceae family: Dill, carrot, fennel and celery

Amaryllidaceae family: Garlic, onion and leek

Amaranthaceae family: Amaranth, quinoa, swiss chard, beet and spinach

Cucurbitaceae family: Melon, cucumber and squash

Microgreens are not only grown from vegetable seeds but cereals, namely wheat, rice, corn, oat and barley, along with some legumes such as chickpeas, lentils and beans, are also used. The flavour of microgreens may vary greatly from neutral to spicy, slightly sour or even bitter, depending upon the variety. However, in a broad sense, their flavour is considered strong and concentrated (View & Club., 2019).

NUTRITIONAL STATUS OF MICROGREENS

Microgreens are packed with nutrients. Many studies show they are abundant in many bioactive compounds, including vitamins, minerals, and phytochemicals. Microgreens are a great source of antioxidants. Ascorbic acid is a potent antioxidant and is required for various biological functions, such as wound healing, collagen synthesis, and immune system regulation (Chambial *et al*., 2013). Many researchers have claimed that microgreens contain more or an equal amount of ascorbic acid than their mature counterparts (Yadav *et al*., 2019; Di Bella *et al*., 2020; Xiao *et al*., 2012). Researchers have found that the nutritional profile of microgreens can be up to nine times greater than their mature counterparts (Pinto *et al*., 2015). The concentrations of many nutrients vary slightly in microgreens, but most varieties are rich in K, Fe, Zn, Mg and Cu (Xiao *et al*., 2016). Trace minerals like Cu, Zn and Se, act as cofactors or components of antioxidant enzymes (such as super oxidase dismutase), and are crucial in the endogenous antioxidant defence system of the human body and are therefore referred to as antioxidant minerals (Wolonciej *et al*., 2016). These antioxidant minerals have been frequently examined in microgreen samples and contrasted with their mature plants (Lenzi *et al*., 2019; Pinto *et al*., 2015; Xiao *et al*., 2016). For example, Bottle gourd and water spinach contained higher Cu concentrations at their microgreen stage as compared to the mature stage (Yadav *et al*., 2019).

Microgreens are abundantly rich in phytochemicals like carotenoids and phenolics. From a scientific study, it was found that the carotenoid content in the microgreen phase of wheat (*Triticum aestivum* L.) and barley (*Hordeum vulgare* L.) was higher than in its seed phase (Niroula *et al*., 2019). Researchers have found that the Nutrient Quality Score (NQS) of Brassica microgreen like cauliflower was six-fold higher than its mature stage, mainly attributed to the high levels of vitamin A, vitamin E, and carotenoid content in the microgreen stage (Reena *et al*., 2020).

HEALTH BENEFITS OF MICROGREENS

Being a rich source of minerals, nutrients and phytochemicals, their intake in daily diet is associated with reduced risk of many diseases (Bazzano *et al*., 2002; Carter *et al*., 2010). Some of the health benefits of microgreens are stated below:

Heart disease: Consumption of microgreens may reduce the risk of heart diseases as they are rich sources of antioxidants such as polyphenols. According to some studies, microgreens may result in lowering "bad" LDL cholesterol and level of triglyceride (Huang *et al*., 2016; Tangney and Rasmussen, 2013).

Alzheimer's disease: Foods abundant in antioxidants, including polyphenols, can reduce the probability of diseases like Alzheimer's (Guest and Grant, 2016).

Diabetes: Antioxidant-rich food can reduce the risk of type 2 diabetes. Some experiments show that fenugreek microgreens may increase cellular sugar uptake by 22-44% (M.H., 1996; Wadhawan *et al*., 2018).

Cancer: Foods abundant in antioxidants, like fruits and vegetables particularly rich with polyphenols, may decrease the danger of different kinds of cancer (Zhou *et al*., 2016). Some early evidence suggests that sulforaphane, a compound found at especially high levels in broccoli sprouts, may help fight cancer.

Blood pressure: Microgreens are a rich source of fibre and vitamin K, which help to maintain healthy blood pressure.

CONCLUSION

Overall, microgreens have emerged as a novel food, with many studies suggesting their high nutritional and phytochemical qualities than their mature counterparts. Due to their high nutrient density, their potential benefits to human health have increased their acceptability and popularity. However, further research is still required for new interventions in their production and to investigate their potential health benefits.

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