



**HAL**  
open science

# The Significance of Carrot and Drumstick Leaves as a Functional Food

Shambhavi Singh, Dr. Anu Ram Kailash Mishra

► **To cite this version:**

Shambhavi Singh, Dr. Anu Ram Kailash Mishra. The Significance of Carrot and Drumstick Leaves as a Functional Food. *Asian Journal of Food Research and Nutrition*, 2024, 3 (3), pp.667-671. hal-04651998

**HAL Id: hal-04651998**

**<https://hal.science/hal-04651998>**

Submitted on 17 Jul 2024

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



# **The Significance of Carrot and Drumstick Leaves as a Functional Food**

**Shambhavi <sup>a++\*</sup> and Anu Ram Kailash Mishra <sup>a#</sup>**

<sup>a</sup> Department of Food and Nutrition, Food Science and Technology, School of Home Science, Babasaheb Bhimrao Ambedkar University, Raebareli Road, Lucknow-226025, Uttar Pradesh, India.

## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

## **Article Information**

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/119448>

**Review Article**

**Received: 04/05/2024**

**Accepted: 06/07/2024**

**Published: 17/07/2024**

## **ABSTRACT**

In the past few years, we have seen many people rejudge their attitude to health, diet and wellbeing and increased awareness among people. More than ever before, consumers are relating their dietary habits with their health. As such, the need for functional foods – foods with improved nutritional properties that provide health benefits such as reduced fatigue and enhanced immunity – continues to grow. This shift to more health-conscious food and drink represents a significant step towards good health.

*Keywords: Carrots; drumstick leaves; functional food; health benefits.*

## **1. INTRODUCTION**

“The key role of diet is to provide adequate nutrients to meet metabolic requirements while

giving the human a feeling of satisfaction and well-being. Recent knowledge, however, supports the hypothesis that, on the other side of meeting nutrition needs, diet may modulate

<sup>++</sup> M.Sc. Scholar;

<sup>#</sup> Assistant Professor;

<sup>\*</sup>Corresponding author: E-mail: [shambhavi.1109@gmail.com](mailto:shambhavi.1109@gmail.com);

**Cite as:** Shambhavi, and Anu Ram Kailash Mishra. 2024. “The Significance of Carrot and Drumstick Leaves As a Functional Food”. *Asian Journal of Food Research and Nutrition* 3 (3):667-71. <https://www.journalajfrn.com/index.php/AJFRN/article/view/163>.

various functions in the body and may play detrimental or beneficial roles in some diseases. We stand today at the threshold of a new rim in nutrition sciences" [1]. "Indeed, at least in the western world, concepts in nutrition are flourishing from the past emphasis on survival, hunger satisfaction and preventing adverse effects to an emphasis on the use of foods to encourage a state of well-being and better health and to help diminish the risk of diseases" [2-3]. "These concepts are particularly vital in light of the increasing cost of health care, the steady enhancement in life expectancy and the desire of older people for improved quality of their later years" [1].

## 2. THE SIGNIFICANCE OF FUNCTIONAL FOOD

Functional foods offer countless physiological advantages and lower the risk of chronic illnesses in addition to their elementary nutritional purposes [4]. "As a working definition, a food can be said to be functional if it contains a component (whether or not a nutrient) that aids one or a limited number of functions in the body in a targeted way that is applicable to either the state of well-being and health or the depletion of the risk of diseases, or if it has physiologic or psychologic effect beyond the conventional nutritional effects" [5,6].

A food can be regarded as functional if it is adequately demonstrated to affect beneficially one or more target functions in the body, beyond sufficient nutritional effects in a way which is related to either the state of well-being and health or the reduction of the risk of a disease [7]. "The evolution of functional foods provides a unique opportunity to contribute to improvement of the quality of the food offered to consumers who want to benefit their health and well-being" [1].

## 3. FUNCTIONAL APPLICATION OF CARROT AND THEIR HEALTH BENEFITS

"Carrot (*Daucus carota*) is one of the most vital seasonal root vegetables belonging to family Apiaceae (Umbelliferae) and is grown largely in India during winter season for its edible tap root. Prime centre of origin of carrot is Afghanistan from where it was diffused to Asia, Europe, North Africa and the Mediterranean region" [8,9]. Although, it has been extensively cultivated for many centuries, the use of carrot as a food

precedes only from the early 20th century. In accordance with the botanical classification of carrot seeds, they are divided into two groups viz., the carotene group (*Daucus carota* ssp. var. *Sativus*) and anthocyanin group (*Daucus carota* ssp. *Sativus* var. *Atrorubens* Alef.). "Though, orange coloured carrot varieties are more usual, utilization of black or purple carrots is currently increasing worldwide due to its health benefits. Black carrot has grabbed the attention of the scientific community due to their higher total phenolics and anthocyanin content, which are importantly related to its antioxidant capacity" [10,11].

"Nutritionally, carrot is ample in both antioxidants i.e. lipophilic (xanthophylls, carotenoids) and hydrophilic (phenols), vitamin A, B<sub>1</sub>, B<sub>2</sub>, C, E, folic acid, flavonoids, phosphorus and extraordinary pectin fibers" [12,13]. "Carotenes is the important pigment present in carrot and is a well-known precursor of vitamin A, have long been identified for their role in vision, cataract prevention but more latterly claims have been made for its anti-cancer properties along with its role in prevention of cardiovascular diseases" [14].

"Carrot extracts, which serve as pedigree of antioxidants, have important functions in preventing many diseases. The biosynthesis, metabolism, and medicinal properties of carotenoids in carrots have been studied far and wide. Research on hormone regulation in the growth and development of carrots has also been extensively performed. Recently, with the enhancement of high-throughput sequencing technology, several efficient tools have been adopted in carrot research. A large amount of sequence data has been produced and applied to ameliorate carrot breeding" [15].

"Carrots are in general consumed as raw (fresh, whole or baby carrots) and/ or processed/ value added form (canned foods, soups, juice and frozen products). Food products are consumed daily by the majority of the population and for years the food industry has focused on increasing the nutritional value of these products because of the arising interest in functional food, especially bioactive substances, food producers look for new sources and carriers for those substances" [16]. "Among several bioactive substances to be found in food such as antioxidants, plant sterols, probiotics, prebiotics and vitamins, a significant role is played by dietary fibre" [17].

“How to process carrots is very important so that they become foods that have a high selling value while maintaining the content of antioxidant compounds contained therein. One way to optimize is to prepare carrot flour that can reprocess into food products. Defining the quality of carrots flour included water and ash content assays. A qualitative assay with the help of colour reaction assays, quantitative analysis, and antioxidant activity using UV-Visible Spectrophotometry” [18]. “Carrots (the main source of carotenoids) have numerous nutritional and health benefits” [19]. The carotenoid content suggests the processing quality of carrot powder. The carotenoid content of carrot powder is examined using digital image processing technology and colour analysis technology, and an estimation model between the carotenoid content and colour characteristics are confirmed. The carrot is dried with the help of different drying methods [20].

#### **4. FUNCTIONAL APPLICATION OF DRUMSTICK LEAVES AND ITS HEALTH BENEFITS**

“Drumstick plant (*Moringa oleifera*) indigenous to India grow well in the tropical and subtropical regions of the world. Their local name is Drumstick tree or Murungai tree. This miracle tree had notable health properties; it is widely cultivated because of its nutritional values. The leaves of this tree are used to cure malnutrition and it also helps for secretions of breast milk in lactating mothers. The use of moringa leaves as a treatment for type II diabetes as well as for cancer is very vital because of its photochemical and antioxidants presence. It is possible to develop a ready-to-eat convenience food item with high quality functional and nutritional properties using pre-treated moringa leaf. Moringa is rich in nutrition owing to the existence of numerous essential phytochemicals present in its leaves, pods and seeds. In fact, moringa is said to bestow 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach” [21]. “Moringa refines the body metabolism. The nutrient benefits in Moringa provide a gentle push over time to improve the body's metabolic processes due to critical nutrients. The Moringa plant imparts the nutrient benefits that so many diets stand in need of. Moringa leaves have numerous health benefits. For example, the moringa leaf can uplift your

immunity, strengthen your bones, treat erectile dysfunction, treat Alzheimer's disease, decrease liver damage, prevent constipation, relieve menstrual pain, and boost libido” [21].

“Drumstick leaves have vast potential for benefiting humanity. India's ancient tradition of Ayurveda says the leaves of moringa tree prevents the body from contracting 300 organic diseases. The leaves are affordable, abundantly available still are under exploited and are mostly tossed out or go waste. The leaves of *moringa oleifera* are shadow dried and converted into a homogeneous powder referred to as moringa leaf powder (MLP). The leaf powder was examined for proximate, mineral (Ca, P, Fe), Vitamin (beta carotene and vitamin C) composition and anti-nutritional factors (oxalate and phenol). In total 10 separate recipes with different levels (0%, 5%, 10%, 15%,20%) of the leaf powder amalgamation were prepared and assessed for quality on the basis of sensory attributes. The leaf powder holds 23.66% of protein, 28.47% carbohydrate, 7.03% fat, 12.1% fiber 24 mg/ 100g iron, 3405 mg /100g calcium and 218mg /100g phosphorus, 39600 microgram/100g beta carotene and 140 mg/ 100g vitamin C” [22]. “The products prepared by amalgamating the leaf powders were well accepted to the level of 10%. The protein, iron, calcium and beta carotene content were importantly higher in the value-added recipes. The abundantly available affordable leaves of moringa are exceptionally nutritious but one of the most underutilized tropical crops. Dehydration of the leaves will make it a condensed source of nutrients which could be used in the value addition of various products” [22].

“Moringa can hold out against both severe drought and mild frost conditions and hence widely cultivated across the world. With its high nutritive values, every part of the tree is fit for either nutritional or commercial purposes. The leaves are high in minerals, vitamins and other essential phytochemicals. Extracts from the leaves are helpful in treating malnutrition, augment breast milk in lactating mothers. It is used as antioxidant, anticancer, anti-inflammatory, antidiabetic and antimicrobial agent. *M. oleifera* seed, a natural coagulant is largely used in water treatment” [23]. The scientific effort of this research provides glimpse on the use of moringa as a cure for diabetes and cancer and fortification of moringa in commercial products. The moringa is used across disciplines

for its medicinal value and deals with cultivation, nutrition, commercial and prominent pharmacological properties of this “Miracle Tree” [23].

## 5. CONCLUSION

Modern concepts of nutrition include the great significance of functional food because functional food products, apart from their basic nutritional functions, provide many physiological benefits and reduce the risk of several chronic diseases. These food products either contain or add a component with a positive health effect or remove a component with a negative one. Incorporation of carrot and moringa leaves powder can enhance the functionality and also increase the acceptability of moringa leaves and carrot. The largely available inexpensive leaves of moringa are not only exceptionally nutritious but also one of the most underutilized tropical plants. Dehydration of underutilized moringa leaves and carrot can enhance their nutritive value remarkably and the value addition in different products will be helpful in tapping and exploiting their amazing nutritional potential.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

I hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Roberfroid MB. Concepts and strategy of functional food science: the European perspective. *The American journal of clinical nutrition*. 2000;71(6):1660S-1664S.
2. Zarina, Wani AW, Rawat M, Kaur H, Das S, Kaur T, Akram N, Faisal Z, Jan SS, Oyshe NN, Khan MR. Medicinal utilization and nutritional properties of drumstick (*Moringa oleifera*)—A comprehensive review. *Food Science & Nutrition*; 2024.
3. Mehwish HM, Riaz Rajoka MS, Xiong Y, Zheng K, Xiao H, Anjin T, Liu Z, Zhu Q, He Z. *Moringa oleifera*—a functional food and its potential immunomodulatory effects. *Food Reviews International*. 2022;38(7): 1533-52.
4. Fuentes-Zaragoza E, Riquelme-Navarrete MJ, Sánchez-Zapata E, Pérez-Álvarez JA. Resistant starch as functional ingredient: A review. *Food Research International*. 2010; 43(4):931-942.
5. Bellisle F, Blundell JE, Dye L, Fantino M, Fern E, Fletcher RJ, Westerterp-Plantenga MS. Functional food science and behaviour and psychological functions. *British journal of nutrition*. 1998;80(S1): S173-S193.
6. Clydesdale F. A proposal for the establishment of scientific criteria for health claims for functional foods. *Nutr Rev*. 1997;55:413–22.
7. Diplock AT, Aggott PJ, Ashwell M, et al. Scientific concepts of functional foods in Europe: consensus document. *Br J Nutr*. 1999;81(suppl): S1–27.
8. Kalra cl, Kulkarni Sg, Berry Sk. The carrot—a most popular root vegetable. *Indian food pack*. 1987;41(6):46–73.
9. Mazza G, Miniati E. *Anthocyanins in fruits, vegetables and grains*, CRC Press: London, U.K.; 1993. Available: <https://doi.org/10.1201/9781351069700>.
10. Alasalvar, Cesarettin Grigor, John Zhang, Donglin Quantick, Peter Shahidi, Fereidoon. Comparison of Volatiles, Phenolics, Sugars, Antioxidant Vitamins, and Sensory Quality of Different Colored Carrot Varieties. *Journal of agricultural and food chemistry*. 2001;49:1410-6. DOI:10.1021/jf000595h.
11. Santhi, Veerasamy Pushparaj Priya PA, Anita B, Selvaraj, Nithin. Genetic variability, heritability and genetic advance in varieties of carrot (*Daucus carota* L.). *International Journal of Plant Sciences*. 2015;10:136-141. DOI:10.15740/HAS/IJPS/10.2/136-141.
12. Breithaupt, Dietmar & Bamedi, Ameneh. Carotenoid Esters in Vegetables and Fruits: A Screening with Emphasis on  $\beta$ -Cryptoxanthin Esters. *Journal of Agricultural and Food Chemistry - J Agr Food Chem*. 2001;49:2686-2686. DOI:10.1021/jf010490u.
13. Sharma, Krishan Karki, Swati Thakur N. Attri, Surekha. Chemical composition, functional properties and processing of carrot-A review. *Journal of food science and technology*. 2012;49:22-32. DOI:10.1007/s13197-011-0310-7.

14. Kaur P. et al. Process Biochemistry. 2019; 76:155-164.
15. Que Feng QF, Hou XiLin HX, Wang GuangLong WG, Xu ZhiSheng XZ, Tan GuoFei TG, Li Tong LT, Xiong Ai Sheng XA. Advances in research on the carrot, an important root vegetable in the Apiaceae family Horticulture Research. 2019;6:69. Available:<https://doi.org/10.1038/s41438-019-0150-6>.
16. Ktenioudaki, Anastasia Gallagher, Eimear. Recent advances in the development of high-fibre baked products. Trends in Food Science & Technology. 2012;28:4–14. DOI:10.1016/j.tifs.2012.06.004.
17. Rocío Rodríguez, Ana Jiménez, Juan Fernández-Bolaños, Rafael Guillén, Antonia Heredia. Dietary fibre from vegetable products as source of functional ingredients, Trends in Food Science & Technology. 2006;17(1):3-15. ISSN 0924-2244.
18. Agustin AD, Purwasih R, Kalimasadha PP. Development of Carrots (*Daucus Carota* L.) Flour Steamed Brownies. Interest: Jurnal Ilmu Kesehatan. 2022;275-287.
19. Kamel DG, Hammam ARA, Nagm El-Diin MAH, Awasti N, Abdel-Rahman AM. Nutritional, antioxidant, and antimicrobial assessment of carrot powder and its application as a functional ingredient in probiotic soft cheese. J Dairy Sci. 2023; 106(3):1672-1686. DOI:10.3168/jds.2022-22090. PMID: 36822788.
20. Gong Y, Deng G, Han C, Ning X. Process optimization based on carrot powder color characteristics. Engineering in agriculture, environment and food. 2015;8(3):137-142.
21. Yegambal S, Swarnalatha A. Nutrient analysis and development of products in drumstick leaves. Journal of Pharmacognosy and Phytochemistry. 2019;8(1):1173-1176.
22. Joshi P, Varma K. Preparation of Value-Added Products from Dehydrated Drumstick Leaves. Online Int. Interdiscip. J. 2017;7:41-48.
23. Gopalakrishnan L, Doriya K, Kumar DS. Moringa oleifera: A review on nutritive importance and its medicinal application. Food science and human wellness. 2016; 5(2):49-56.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:

<https://www.sdiarticle5.com/review-history/119448>