



Indian Farmer  
Volume 9, Issue 11, 2022, Pp. 506-510.  
Available online at: [www.indianfarmer.net](http://www.indianfarmer.net)  
ISSN: 2394-1227 (Online)

ORIGINAL PAPER



# Bioactive Compounds and Health Benefits of Carrot

Nikheta Rafiq, Neeraj Gupta, Seerat Gupta and Daman Preet Kour

*Division of Food Science and Technology, Faculty of Agriculture  
Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. Chatha, Jammu*

*\*Corresponding author: [nikheta70@gmail.com](mailto:nikheta70@gmail.com)*

*Article Received: 07 November 2022*

*Published Date: 11 November 2022*

Carrot (*Daucus carota L.*) is one of the most important and popular root vegetable grown extensively in various countries particularly during winter season. Carrot is a significant horticultural crop with high international recognition and economic value. It is also an important source of naturally occurring antioxidants with anticancer potential. Carrots contain a unique blend of kaempferol, quercetin, and luteolin, three flavonoids. Along with various cinnamic acid derivatives, they are also abundant in other phenols, such as chlorogenic, caffeic, and p-hydroxybenzoic acids. The distinctive flavour in carrot is mainly due to presence of terpenoids and polyacetylenes. Besides, comparing to other vegetables, carrots provide significant amount of vitamin A in the human diet (Silva Dias, 2014). The pigments present in different coloured roots have widespread medicinal properties, viz. lutein in the yellow carrots develops macular pigments which is essential for the normal eye functioning (Chrong *et al.*, 2007). The commercialization and industrialization of the carrot in the form of distinct products plays a crucial role in ensuring that people's nutrient needs are met. Carrot roots can be processed into nutrient rich products such as juice, concentrate, dried powder, preserve, pickle, *gazrailla* and candy.

## NUTRITIONAL COMPOSITION OF CARROT

Carrots are rich sources of carotene, ascorbic acid and are known as vitaminized food. Carrots contain 89.35% moisture and 8.73°Brix TSS. It is composed of 10.65% total solids, 9.83 mg/100 g carotenoids, 0.16% titratable acidity, 1.79% reducing sugars, 4.20% non-reducing sugars and 5.99% total sugars (Selvakumar and Tiwari, 2018).

## **BIOACTIVE COMPOUNDS IN CARROT**

The bioactive compounds produced from fruits and vegetables mainly derive from secondary metabolic processes and have abundant health-promoting benefits. These benefits have been linked with the antioxidant potential of bioactive compounds present. The bioactives carotenoids, phenolics, and polyacetylenes are all abundant in carrot. As a vitaminized food, carrots are a large source of natural bioactive substances such as phenolics, polyacetylenes and carotenoids, as well as ascorbic acid and tocopherols. Carrots are regarded as a functional food with considerable health-promoting benefits because they contain a significant amount of different chemicals.

### **Carotenoid contents**

The main particularity of carrot is the massive accumulation of carotenoids that takes place in the root, which gives a characteristic colour in most cultivars. Carotenoids are natural pigments present in multiple food and perform necessary biological functions. The predominant carotenoids are the provitamin A carotenes, accounting for 75% and 23% of  $\beta$ -carotene and  $\alpha$ -carotene, respectively and 1.9% of lutein. Carotenoids are powerful antioxidants and phytonutrients that contribute to human health (Fraser and Bramley, 2004). The functions of carotenoids in the body include regulation of gene expression, inhibition of monocyte adhesion, and platelet activation. The carotenoid pigment does not impact carrot flavour but they make the product more colourful and appealing to consumers (Surles *et al.*, 2004).  $\beta$ -carotene is heterogeneously distributed across the carrot root section and the highest content is in the outer root or phloem while much lower in the xylem (Baranska *et al.*, 2006).

### **Phenolic compounds**

Phenolic compounds constitute a substantial and important class of secondary metabolites synthesized by plants to protect themselves from oxidative stress and invasive pathogens including bacteria, viruses, and fungi. Some phenolics act as an antioxidant in carrot. Phenolic compound also plays a vital role in enhancing the sensory qualities of food such as colour, aroma, flavour, bitterness or astringency. Carrots contained mainly hydroxycinnamic acids and derivatives. Among them, chlorogenic acid is a major hydroxycinnamic acid, representing 42.2% to 61.8% of total phenolic compounds detected in different carrot tissues. Other hydroxycinnamic derivatives such as dicaffeoylquinic acids may exert some strong antioxidant activities along with chlorogenic acid (Zhang and Hamazu, 2004).

### **Polyacetylenes**

Polyacetylenes are extremely cytotoxic against several cancer cells and have revealed antifungal, anti-inflammatory and anti-platelet aggregatory characteristics (Baranska *et al.*, 2013). Polyacetylenes together with carotenoids and phenolics, are considered as bioactive compounds with a potential effect on prevention and therapy of human diseases (Christensen and Brandt, 2006). Carrots contain the highest concentrations of

the polyacetylenes falcarinol, falcarindiol and falcarindiol 3-acetate. Falcarinol is uniformly distributed in all parts of carrot, while falcarindiol and falcarindiol 3-acetate are more distributed inside the higher and outer segments (Kjellenberg *et al.*, 2010). Aliphatic C17-polyacetylenes of the falcarinol type are widely distributed in the plants of Apiaceae family and responsible for the bitter off-flavour of carrots (Czepa and Hofmann, 2004). Boiling carrots for 12 minutes reduce the falcarinol content by 70% in comparison to raw carrots (Hansen *et al.*, 2003).

## **HEALTH BENEFITS OF CARROT**

Carrot is a multi-nutritional food source. It is abundant in biologically active substances which are known for their beneficial benefits on human health.

### **Antioxidant**

Like many other coloured vegetables carrot is a gold mine of antioxidants. The presence of high concentration of antioxidant carotenoids especially  $\beta$ -carotene may account for the biological and medicinal properties of carrots. Carrots include carotenoids, polyphenols, and vitamins that function as antioxidants. Carotenoids widely distributed in orange carrots are potent antioxidants which can neutralize the effect of free radicals. Carrot roots contain flavonoids and phenolic derivatives, which are essential antioxidants. They also exert anticarcinogenic activities, reduce inflammation and modulate immune response (Zhang and Hamazu, 2004).

### **Anti-Ageing**

Carrots contain Vitamin C that aids collagen production in the body. Collagen is a type of protein that is vital for the maintenance of the skin elasticity. It slows down the ageing process and prevents wrinkles. Vitamin A, being an antioxidant, also attacks the free radicals to prevent the signs of aging like wrinkles and pigmentation.

### **Sun Protection**

Carrots contain beta-carotene, a substance that is good for the skin and is converted to vitamin A inside the body. It offers defence against the sun's damaging rays and aids in skin tissue healing. The antioxidants and carotenoids protect and condition the skin to increase its immunity against the sun and heal sunburns. In fact, the consumption of carrot juice in summer acts as a natural sun block (Vasudevan *et al.*, 2006).

### **Wound Healing**

Carrot has good wound healing properties. Carrot root's ethanolic extract, which is mostly composed of flavonoids and phenolic derivatives, may contribute in enhancing its curative property (Patil *et al.*, 2012). Carrot helps in regulation of collagen expression and suppression of excessive amounts of lipid peroxides which also contribute to wound healing benefits.

## Cardio and Hepatoprotective

Carrots contain a variety of antioxidants and polyacetylenes which together, provide a protective shield to the heart. According to studies, consuming foods rich in carotenoids reduces the chance of developing heart diseases. Besides being extremely high in beta-carotene, carrots also contain alpha-carotene and lutein. The regular consumption of carrots protects your heart from oxidative damage, plaque formation and harmful cholesterol rise. This is because they contain soluble fibers which bind with bile acids (Muralidharan *et al.*, 2008).

## CONCLUSION

Carrots are grown and consumed worldwide for their nutritional value and health properties. It is considered as an economical and renewable resource of natural bioactive ingredients due to the abundance of compound with high biological properties. Ascorbic acid, phenolics, polyacetylenes and carotenoids from carrot roots provide unparalleled support to combat the global health challenges. These substances offer considerable therapeutic effects against conditions such as diabetes, cancer, gastrointestinal problems, cardiovascular conditions and cancer. Due to the potential application in health promotion, illness prevention, and therapy, the antioxidant activity and composition of bioactive chemicals, carrot is attracting interest from the scientific community.

## REFERENCES

- Baranska, M., Baranski, R., Schulz, H. and Nothnagel, T. 2006. Tissue-specific accumulation of carotenoids in carrot roots. *Planta*, **224**(5): 1028-1037.
- Baranska, M., Roman, M., Schulz, H. and Baranski, R. 2013. Recent advances in Raman analysis of plants: alkaloids, carotenoids, and polyacetylenes. *Current Analytical Chemistry*, **9**(1): 108-127.
- Christensen, L.P. and Brandt, K. 2006. Bioactive polyacetylenes in food plants of the Apiaceae family: occurrence, bioactivity and analysis. *Journal of pharmaceutical and biomedical analysis*, **41**(3): 683-693.
- Chrong, E.W.I., Wong, T.Y., Kreis, A.J., Simpson, J.A. and Guymer, R.H. 2007. Dietary antioxidants and primary prevention of age related macular degeneration: Systemic review and meta-analysis. *British Medical Journal*, **335**: 755-759.
- Czepa, A. and Hofmann, T. 2004. Quantitative studies and sensory analyses on the influence of cultivar, spatial tissue distribution and industrial processing on the bitter off-taste of carrots (*Daucus carota* L.) and carrot products. *Journal of Agricultural and Food Chemistry*, **52**(14): 4508-4514.
- Fraser, PD. and Bramley, PM. 2004. The biosynthesis and nutritional uses of carotenoids. *Progress in Lipid Research*, **43**: 228-265.
- Hansen, S.L., Purup, S. and Christensen, L.P. 2003. Bioactivity of falcarinol and the influence of processing and storage on its content in carrots (*Daucus carota* L.). *Journal of the Science of Food and Agriculture*, **83**(10): 1010-1017.

- Kjellenberg, L., Johansson, E., Gustavsson, K.E. and Olsson, M.E. 2010. Effects of harvesting date and storage on the amounts of polyacetylenes in carrots, *Daucus carota*. *Journal of Agricultural and Food Chemistry*, **58**(22): 11703-11708.
- Muralidharan, P., Balamurugan, G. and Kumar, P. 2008. Inotropic and cardioprotective effects of *Daucus carota* Linn. on isoproterenol-induced myocardial infarction. *Bangladesh Journal of Pharmacology*, **3**(2): 74-79.
- Patil, M.V.K., Kandhare, A.D. and Bhise, S.D. 2012. Pharmacological evaluation of ethanolic extract of *Daucus carota* Linn root formulated cream on wound healing using excision and incision wound model. *Asian Pacific Journal of Tropical Biomedicine*, **2**(2): 646-655.
- Selvakumar, R. and Tiwari, R.B. 2018. Physico-chemical changes in osmotically dehydrated carrot slices during storage. *International Journal of Chemical Studies*, **6**: 1685-1690.
- Silva Dias, D.J.C. 2014. Nutritional and health benefits of carrots and their seed extracts. *Food and Nutrition Sciences*, **5**(22): 2147-2156.
- Surles RL., Weng N., Simon PW. and Tanumihardjo SA. 2004. Carotenoid profiles and consumer sensory evaluation of specialty carrots (*Daucus carota*, L.) of various colors. *Journal of Agricultural and Food Chemistry*, **52**: 3417-3421.
- Vasudevan, M., Gunnam, K.K. and Parle, M. 2006. Antinociceptive and anti-inflammatory properties of *Daucus carota* seeds extract. *Journal of health science*, **52**(5): 598-606.
- Zhang, D. and Hamauzu, Y. 2004. Phenolic compounds and their antioxidant properties in different tissues of carrots (*Daucus carota* L.). *Journal of Food Agriculture and Environment*, **2**: 95-100.