# Comparative Nutritional Analysis of Dry Carrot Powder of Organic Farming and Chemical Farming Carrots

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Research Article

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## ABSTRACT

The consumption and demand of the organic vegetables has been growing all over the world due to good health, clean soil environment and better nutritional quality of food as compared to conventional/chemicals methods. Numerous scientific studies have been conducted on the nutritive value of organic vegetables. In the present study, there are two types of dry powder prepared

(1) Organic farming carrot and
(2) Chemicals farming carrots. After the preparation, nutritional parameters were studied.

Among both, organic farming carrot was found to be overall good nutritional content as compared to chemical organic carrot. Organic farming carrot (dry) was found good amount of nitrogen content (1.98 mg/100 gm), phosphorous (38.54 mg/100 gm), potassium (18.18%), zinc (0.28 mg Zn/100 gm), vitamin A (28.68 mg/100 gm), total antioxidants (80.10%), and better moisture content (72.04%) in comparison to chemical farming carrot (dry). This products and result could be natural food colouring, carrot cake, pudding, juice, stews, soup, orange food colouring, carrot soup or anything you desire some carrot flavor by eco-friendly way

## INTRODUCTION

Carrot (*Daucus carota* L) is one of the important root vegetables grown all over the world and is the main source of nutrients and dietary fibers [1]. China is the chief carrot producing country in the globe [1]. In the India, approximately 22,538 ha is used for cultivation of carrot crops with an annual production of 4.14 lakh tons with major states of Uttar Pradesh, Karnataka, Assam, Punjab, Andhra Pradesh, and Haryana [2]. Recently the consumption of carrot and its products have increased day by day due to good source of moisture, protein, low fat, carbohydrate, total sugars, crude fiber, antioxidants, β-carotene, vitamin A, thiamine, riboflavin, niacin, vitamin C and other nutrients [3]. Besides,they also contain good amount of minerals Ca, Fe, P, Na, K, Mg, Cu, Zn, carotenes, thiamine, riboflavin, niacin, vitamin C and energy value [4]. Sucrose, glucose, xylose and fructose are the types of free carbohydrates/sugars present in the carrot [5]. The crude fiber in the carrot roots comprises of cellulose (71.7%), and hemicellulose (13%) and lignin (15.2%), respectively [6]. The taste of carrot is mainly good due to presence of amino acid, succinic acid, α-ketoglutaric acid, lactic acid and glycolic acid [6]. Caffeic acid, a predominant phenolic acid is present in the carrots. The anthocyanins content is responsible for the pink color in black carrot roots and their content is recorded 1,750 mg/kg [7].

Carrot helps in the maintenance of human health and protection from various diseases including coronary heart disease and cancer as reported by researchers [8]. In the presence of vitamins in the carrot, they help in protecting the body from the effects of oxidative stress [8]. Cultivation of carrot with chemicals may harmful for human health. Use of chemicals not only restricts the carrot crop cultivation due to their direct consumption by humans, but also degrades soil properties [9]. In organic carrot production, synthetic chemicals are banned due to negative impact on the environment. Organic carrot production relies on fertilization methods based on organic fertilizers/mobilization or the use of rhizosphere microbes [10]. Consumers expect organic foods (cultivated by organic fertilizers) to be healthier and safer than conventional/chemical foods and to taste better, but the scientific literature is contradictionary and it has been shown that there is no difference in eating quality between organic and conventional foods and utilization of over-ripened fruits or vegetables like carrot may be used for alcohol production [11].

Carrot roots are mostly used in salad and preparation of curries and halwa sweet in India. It contains approximately 50% of β-carotene could profitably be utilized for the supplementation of cake, bread, biscuits and other functional products [12]. Besides, these roots are commercially converted into nutritionally rich processed products like juice, concentrate, dried powder, canned, preserve, candy, and pickle [12]. Among them, dried powdered carrot has been used in several items in India and offers healthy alternative without much sacrificing in nutritive value. To obtain dehydrated carrot powder with optimum bioactive level and characteristic of unprocessed food, it is of prime concern to assess drying effect onfunctional property [13]. In the present study, organic and chemicals cultivated carrots has been taken and dried. Afterwards, it has been checked nutritional content of dry carrot powder obtained from organic and chemicals cultivated carrots.

## MATERIAL AND METHODS

### Sample collection

Carrot variety: Pusa Rudhira was purchased from vegetables showroom of Lucknow, Uttar Pradesh, India. There was two types of products purchased i,e., (1) Organic farming carrot (2) Chemicals farming carrot which was already certified from National Programme for Organic Production (NPOP), Ministry of Commerce and Industries, Government of India. The organic and chemicals content in the carrot was confirmed by labeling of the product. Carrot vegetable was collected randomly and sample was chosen similar size (on the basis of visual observation). The collected carrot vegetable was washed and further stored at normal room temperature for further study. All the chemicals required for experiments were purchased from standard grades.

### Preparation of dry carrot powder

For the preparation of dry carrot powder, organic farming carrot (OFC), and chemicals farming carrot (CFC) were chosen. Both procured carrot products was washed with water for removal of dust particles and further peeled and cut into small pieces and blanched prior of dehydration. Blanching was done by putting small pieces of carrot into hot water for five minute to inactivate polyphenol oxidase enzyme. After five minute small pieces were dipped into tap water. Afterward, post blanching small pieces (separately) were grinded and dried at 50 °C in hot air-oven (Model; ThermoFisher Scientific-230) for 4-5 hours (h) in dark until no further change in weight was observed and finely powdered by food Processor (Murphy Richards, SKU:640080). The grinded powder was passed through filter paper (size: 0.40 mm) and kept in air-tight polybags for analysis [14].

### Nutrients analysis

Minerals content of carrot powder was determined after drying. The dry powder was dissolved in 100 ml of 10% hydrochloric acid, filtered and estimated quantitatively using an atomic absorption spectrophotometer (Model:

AA240FS Fast Sequential AAS, USA) as per AOAC. Briefly, the sample was dried in hot air oven (temp: 50 ± 2 °C; time: 24 h) digested with 6 ml of $H_2SO_4$ and $HClO_4$ in a ratio of 9:1 by using hot plate method (for 10 min) for the estimation of phosphorus (P) content. The digested sample (colourless) was diluted into 100 ml double distilled water.

Afterward, the prepared sample was analyzed for P by Vanadomolybdophosphoric yellow color method. Zinc (Zn) content in dry carrot powder was checked after the digestion process by using atomic absorption spectroscopy (AAS) as per Horwitz [15]. Subsequently, potassium (K) uptake in sample was estimated with tri-acid digestion procedure as per Jackson [16]. Total nitrogen (N) from dry carrot sample was examined with an aqueous solution ($HCl/HNO_3$) in a ratio of 3:1 as per alkaline permanganate method [17].

**Vitamin analysis**

For the estimation of Vitamin A, 1 gm carrot sample was dissolved into 20 ml acetone and left 60 min. The reaction mixture was filtered after 60 min. Furthermore, 10 ml of distilled water was added into obtained filter sample. The filtrate sample was further poured into a separate funnel containing 5 ml of petroleum ether. Afterward, the mixture sample was centrifuged at 10, 000 rpm for 10 min and obtained supernatant (upper layer) after discarded of pellet (lower layer). The obtained supernatant sample was read at 440 nm by spectrophotometer and acetone was taken for control sample [18].

**Estimation of antioxidant activity**

1,1-disphenyl-2-picrylhydrazyl (DPPH) as radical scavenging agent was used for the estimation of antioxidant activity of dry carrot powder [19]. Briefly, 1 gm of dry carrot powder sample was dissolved in 100 ml ethanol and allowed to remain still overnight. After overnight incubation, sample was centrifuged at 3000 rpm for 10 min and removed the pelleted or solid part of the sample. Further, 0.2 ml of sample was mixed with 1 ml of freshly prepared DPPH solution (80 µg/ml ethanol) in a test tube covered with aluminium sheet. For control, 0.2 ml distilled water and 1 ml of DPPH solution was added into it. All samples were allowed to remain in the dark for 30 min and further were the absorbance of the samples and blank sample were measured by UV-Vis spectrophotometer at 517 nm.

**Fibre and moisture content**

To estimation of fibre in dry carrot powder, the sample was dried at 130 ± 2 °C for 30 min. After dry the sample, 1 gm of dry carrot sample was filtered via Whatman filter paper No. 42. The sample was further digested with 1.25% sulphuric acid ($H_2SO_4$) on a hot plate (temp: 100 °C) using fibertec hot extraction unit method [20]. The digested sample was inserted and locked into position in front of the radiator in the fibertec hot extraction unit, ensuring that the safety latch was engaged. The reflector was placed in front of the crucibles and all values were put to closed position. Cold water tap (1-2 L/min) was opened for reflux system and 150 ml of preheated 1.25% $H_2SO_4$ was added into each column as reagent 1. Three drops of n-octanol were added to prevent foaming. The heater was turned on and when the reagents started to boil, the heater control was adjusted to moderate the boiling. The solution reached boiling point after 30 minutes, after which the heater was turned off ending the extraction process.

For the estimation of moisture content, dry carrot powder (100 gm) was heated in the hot air oven with the lids of the moisture dishes off at the specified temperature (100 °C) for 72 h. After heating, sample was cooled at room temperature. The initial weight and final weight was calculated using the given formula for estimation of moisture content-M=Mw/Mw+MdX 100%

Where M: moisture content, Mw: mass of water removed from the food bar after drying, Md: mass of food bar after drying, and Mw+Md: initial mass of food sample before drying [21].

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**Statistical analysis**

All the experiments had three triplicates. The collected data were examined using means and using standard deviation as per given method of Gomez and Gomez [22].

## RESULTS AND DISCUSSION

**Nutrient analysis**

There were two types of products. i.e., (1) organic farming carrot (OFC) and (2) chemical farming carrot (CFC). In this study, the nutrients content were determined in OFC and CFC. OFC had the highest nitrogen content of 1.98 ± 0.01 mg/100 gm while CFC has the same nitrogen content of 1.86 ± 0.01 mg/100 mg (Figure 1). These values were generally lower than the reported values for carrot powder by Boskovic-Rakocevic [23]. Nitrogen is an important macronutrient for plant and is a key factor for synthesis of amino acids, which form the building blocks of proteins and enzymes. Proteins make up the structural components of all living organism and enzymes facilitate the vast array of biochemical reactions within a plant [24]. Nitrogen is used to make amino acids in human body which in turn make proteins and also needed to make nucleic acids (DNA and RNA) [24].

In the present study, phosphorous (P) content in OFC was 38.54 mg/100 gm, while CFC had the higher P content (40.52 ± 0.24) as compared to OFC. P is the second most essential macronutrient which is also a limiting factor for plant growth and development apart from nitrogen [25]. In the human, P plays an important role in the formation of bones and teeth. Besides, it plays an important role in how the body uses carbohydrates and fats. It is also needed for the body to make protein for the growth, maintenance, and repair of cells and tissues [26]. In this study, the dry carrot powder was checked for potassium (K) content. OFC was recorded higher K content as compared to CFC. OFC contained 18.18% higher K content as compared to CFC. K is the third important macronutrient for plant which is involved in the plant growth metabolism, accumulation of sugars, seed germination, regulation of stomata, improving resistance to drought and cold tolerance, transpiration, water uptake, formation of adenosine triphosphate (ATP), opening and closing of stomata, increased root formation, and growth regulation of crops [27]. In the present study, the dry carrot powder was found to be better Zn content in the OFC in comparison to CFC. OFC observed 0.28 mg Zn in 100 gm sample, while in CFC, there was found 0.21 mg Zn/100 gm dry carrot sample. Zinc is another essential macronutrient in the cells throughout the human body. It is needed for the body's defensive (immune) system to properly work. It plays a role in cell division, cell growth, wound healing, and the breakdown of carbohydrates. Zn is also needed for the senses of smell and taste. Zn activates enzymes that are responsible for the synthesis of certain proteins. It is used in the formation of chlorophyll and some carbohydrates, conversion of starches to sugars and its presence in plant tissue helps the plant to withstand cold temperatures [28].

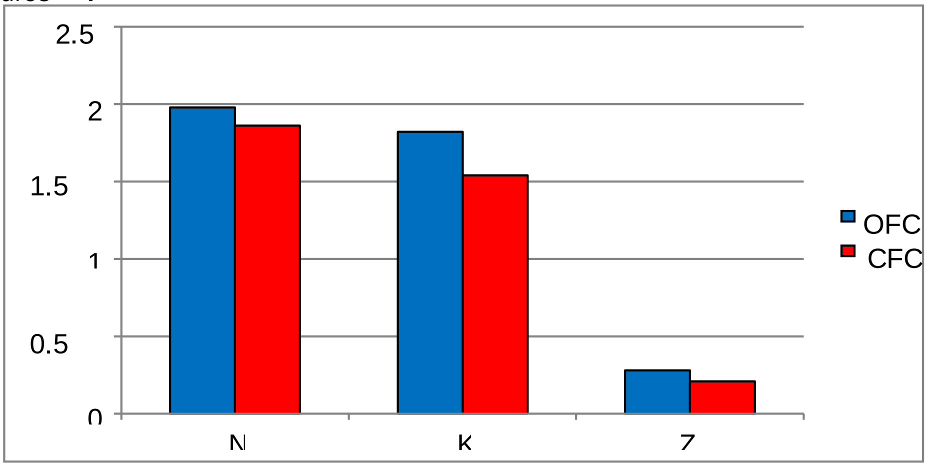


**Figure 1:** Nitrogen (N), potassium (K) and Zinc (Zn) content in dry carrot powder
Data are mean of three replicates ± standard error of means powder, Where: OFC-organic farming carrot, CFC: Chemicals farming.

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### Vitamins and fibre content

Carrot is the good source of vitamin A. Hence, in the current study we found that OFC and CFC showed good amount of vitamin A. Vitamins are the mostly organic compounds that people need in small quantities in the diet. Most of the vitamins need to come from food because the body either does not produce them or produces very little amount. Among all vitamins, vitamin A plays an important function in the body like vision, growth, and reproduction [29]. In the present study, dry carrot powder contained huge amount of fibre. OFC was found to be 28.68 mg/100 gm of dry weight of carrot, while CFC was record 26.38 mg/100 gm. There was found no more difference between OFC and CFC in the terms of fibre content. Fibre is the indigestible parts of plant foods, such as carrot vegetable. It is type of a carbohydrate that helps keep our digestive systems healthy. They provide several health benefits such as normalization of bowel movements, helping maintain bowel health, lowering of cholesterol levels, helping in controlling blood sugar levels, aid in achieving healthy weight, helping you live longer [30].

### Antioxidant and moisture content

The moisture content of the OFC indicates the amount of liquid glucose present in the sample. It was found to be better moisture content in the CFC (72.04%) in comparison to OFC. In the presence of higher moisture content in the food, microbes such as bacteria, molds, and fungi can easily attack. In this way, the self-life of the food has been decreased when the moisture content will be high [31]. However, moisture of the food did not change the taste, colour and other nutritional properties (Guiné) (Figure 2).

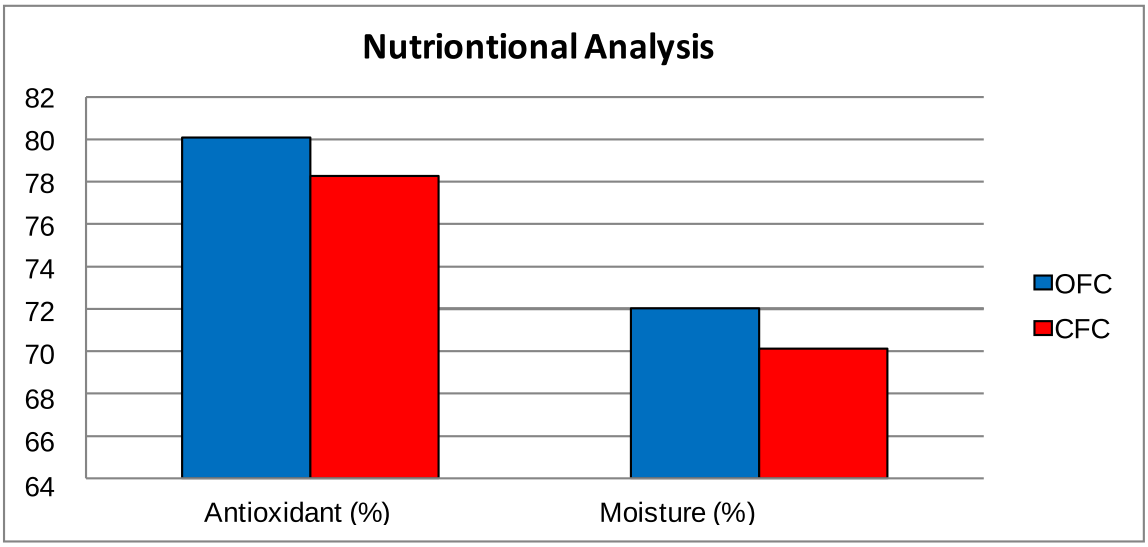


**Figure 2:** Antioxidant and moisture content analysis in dry carrot powder
Data are mean of three replicates ± standard error of means powder, where: OFC-organic farming carrot
CFC: Chemicals farming carrot.

## CONCLUSION

Carrot is a rich source of nutrients, fiber, antioxidants and moisture content. The presence of such types of nutrients in the carrot roots makes them to inhibit cancers, free radical scavengers, anti-mutagenic and immunoenhancers. In the present study, dry carrot powder was prepared and found to be a most attractive and nutritious products. Organic farming carrot contained overall good nutrients source in the terms of minerals content, antioxidant, and fibre content which contributes to the energy, nutrient requirements and fighting against diseases due to oxidative stress. The exploitation of dry carrot powder cultivated by organic farming as cheap and effective products, for providing the vital facility to complete this could be a better option for healthy food, reducing health problems related with chemicals and providing green good products to agro, food and pharmaceutical industries.

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