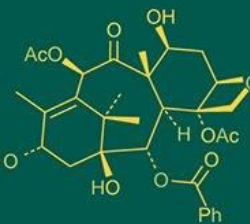
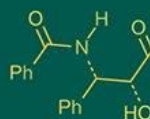
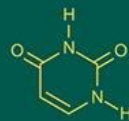
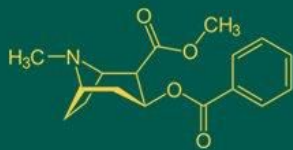


## International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693  
ISSN Online: 2617-4707  
IJABR 2025; SP-9(6): 267-269  
[www.biochemjournal.com](http://www.biochemjournal.com)  
Received: 18-03-2025  
Accepted: 22-04-2025

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## Effect of temperature on phytochemical composition of karonda (*Carissa carandas* L.)

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DOI: <https://www.doi.org/10.33545/26174693.2025.v9.i6Sd.4549>

### Abstract

An experiment has been conducted on effect of temperature on phytochemical composition of Karonda (*Carissa carandas* L.) at Department of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India during the year 2022-2023 and 2023-2024. The experiment was laid out with two treatments and three replications. The results indicated that, the highest phenolics content (1555.81-2100.92 mg GAE/100 g), anthocyanin content (159.73-175.20 mg/100 g), total flavonoid content (749.05-1225.00 mg quercetin/100 g) and total antioxidant activity content by CUPRAC method (13.22-19.54  $\mu$  mol Trolox/g) & FRAP method (2.85-3.90  $\mu$  mol Trolox/g) was observed in treatment HTST (High Temperature Short Time - 80 °C for 60 min) as compared to LTLT (Low Temperature Long Time - 50 °C for 120 min). Henceforth, it might be concluded that, HTST heat processing treatment significantly improved the total phenolics, total flavonoids and anthocyanin content and antioxidant activity of karonda.

**Keywords:** Temperature, karonda, phenols, flavonoids, anthocyanin and antioxidant activity

### 1. Introduction

Over the past few years there has been an increasing interest in natural antioxidants and their role in human health and nutrition. The fact that the oxidation process plays host to several degenerative diseases and can contribute significantly to the risk of human aging and cancer has focused the interest in this subject. Oxidative damage to biological molecules like DNA, protein and lipids induced by free radicals is considered to be linked with many degenerative diseases; cardiovascular, cancer, ocular and neurological such as Alzheimer's and Parkinson's diseases (Ames *et al.*, 1993; Herrmann, 1995; Hertog *et al.*, 1995 and Rice-Evans *et al.*, 1996) [1, 5, 6, 11].

Fruits are the best sources of dietary antioxidants which have health promoting effects (Prior and Cao, 2000; Kaur and Kapoor, 2001) [10, 7]. Karonda (*Carissa carandas* L.) that originates from Bangladesh and India and grows in dry forests and on the Himalayas belongs to the Apocynaceae family. Its fruit contained approximately 13% crude protein, 7.8% polyphenol, 5.3% oil, 58% hydrocarbon, and 31.4% free acid. The main pigment found in the *Carissa carandas* fruit was cyanidin-3-rhamno glucoside, which is the most common form of anthocyanin and figures for its antioxidant properties and role as an excellent natural colorant in food and medicine (Singh, and Uppal, 2015) [12]. Most of the *Carissa* species are used to treat various diseases traditionally, such as headaches, chest pain, rheumatism, gonorrhea, stomach pain, syphilis, hepatitis, edema, rabies, asthma, and cardiac diseases (Dhatwalia *et al.*, 2021) [4]. It has a significant impact on lowering blood sugar levels in diabetic rats (Pandey *et al.*, 2013) [8] and a positive impact on liver function in rats (Pandey *et al.*, 2014) [9].

Temperature plays a crucial role in preserving juice quality (Sistrunk and Marris, 1982) [14]. In this experiment we investigate two heat treatments (HTST and LTLT) for their effect on extraction of antioxidant in increasing the recovery of antioxidant (Anthocyanin and Phenolics) extraction. In the literature, there are only a few studies on karonda anthocyanin, antioxidant properties and phenolic content, not much work has been done on the processing of Karonda and stability of anthocyanin during heating and storage. Keeping this in mind, the current research work proposes to study "Effect temperature on phytochemical composition of karonda (*Carissa carandas* L.).

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## 2. Materials and Methods

### 2.1. Location of the experiment

The present study was carried out during the year 2022-2023 and 2023-2024 at Department of Horticulture, Vasantrao Naik Marathwada Krushi Vidhapeeth, Parbhani, Maharashtra, India.

### 2.2. Treatment details

In the present experiment, freshly harvested karonda fruits were brought to laboratory of Department of Horticulture and washed thoroughly with ordinary tap water to remove adhering dirt and dust. Washed material was thoroughly peeled with stainless steel knife to remove upper layers. Scooped out the flesh and were crushed coarsely by using laboratory scale blender. The seeds are separated from the pulp. The crushed mass was then each of this macerate was pressed in hydraulic press using nylon filter bag at 2000 lb/m<sup>2</sup> to express or extract the juice antioxidant (total phenols, total flavonoid, anthocyanin and antioxidant activity) content.

- Low temperature long time (LTLT) - 50 °C for 120 min.
- High temperature short time (HTST) - 80 °C for 60 min.

### 2.3. Measurement and analysis of the observations

#### 2.3.1. Determination of total phenolic content

Total polyphenolic content in karonda fruit samples was estimated spectrophotometrically Folin cio-cealtau reagent (FCR) as described by Singleton *et al.*, (1999) <sup>[13]</sup>.

#### 2.3.2. Determination of anthocyanin content

Total monomeric anthocyanin content was determined on UV-visible spectrophotometer by pH differential method (Wrolstad *et al.*, 2005) <sup>[15]</sup> using talo buffer, pH 1 and pH 4 4.5 buffers and absorbance measurements were made at 510 and 700 nm using 1.00 cm path length curvature.

#### 2.3.3. Determination of total flavonoids content

Total flavonoids were measured by a colorimetric assay

developed by Zhishen *et al.*, (1999) <sup>[16]</sup>.

### 2.3.4. Determination of antioxidant activity

FRAP (Ferric Reducing Antioxidant Power) assay was performed according to the procedure described by Benazir and Strain (1996) <sup>[3]</sup> with some modifications. FRAP values are obtained by comparing the absorbance change at 593 nm in test reaction mixtures with those containing ferrous ions in known concentration.

CUPRAC (Cupric Reducing Antioxidant Capacity) technique recently developed by Apak *et al.*, (2004) <sup>[2]</sup>.

## 3. Results and Discussion

### 3.1 Effect of temperature on phytochemical composition of karonda

The Data revealed that, the significance difference found between two heat treatment with regard to their total phenolics and anthocyanin content. The highest phenolics content (1555.81-2100.92 mg GAE/100 g), anthocyanin content (159.73-175.20 mg/100 g), total flavonoid content (749.05-1225.00 mg quercetin/100 g) and total antioxidant activity content by CUPRAC method (13.22-19.54  $\mu$  mol Trolox/g) & FRAP method (2.85-3.90  $\mu$  mol Trolox/g) was observed in treatment HTST (High Temperature Short Time-80 °C for 60 min) While, the lowest phenolics content (1525.99-2075.59 mg GAE/100 g), anthocyanin content (141.53-151.78 mg/100 g), total flavonoid content (730.56-1205.53 mg quercetin/100 g) and total antioxidant activity content by CUPRAC method (13.02-19.38  $\mu$  mol Trolox/g) & FRAP method (2.79-3.81  $\mu$  mol Trolox/g) was observed in treatment LTLT (Low Temperature Long Time-50 °C for 120 min).

The highest Phenolics, Flavonoids and anthocyanin in the juice were achieved at HTST while the juice viscosity was lowest. (Sistrunk and Morris, 1982) <sup>[14]</sup> Was reported that increase in extraction temperature increase color, acidity and phenolic compound in the juice as the color component that can be found in skins and phenol are highest in seed and skins.

**Table 3.1:** Effect of temperature on antioxidant composition of karonda

| Heat treatment | Total Phenol<br>(mg GAE/100 g) | Anthocyanin<br>(mg/100 g) | Total flavonoid<br>(mg quercetin /100 g) | Antioxidant activity         |                            |
|----------------|--------------------------------|---------------------------|------------------------------------------|------------------------------|----------------------------|
|                |                                |                           |                                          | CUPRAC ( $\mu$ mol Trolox/g) | FRAP ( $\mu$ mol Trolox/g) |
| LTLT           | 1525.99-2075.69                | 141.53-151.78             | 730.56-1205.53                           | 13.02-19.38                  | 2.79-3.81                  |
| HTST           | 1555.81-2100.92                | 159.73-175.20             | 749.08-1225.00                           | 13.22-19.54                  | 2.85-3.90                  |

## 4. Conclusion

Overall processing of karonda by HTST heat processing treatment significantly improved the antioxidant activity of karonda. It also enhances the total phenolic, total flavonoids and anthocyanin content.

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