**International Journal of Research in Engineering and Applied Sciences(IJREAS)**
Available online at http://euroasiapub.org/journals.php
Vol. 7 Issue 3, March-2017, pp. 60~70
ISSN (O): 2249-3905, ISSN(P): 2349-6525 | Impact Factor: 7.196 | Thomson Reuters Researcher ID: L-5236-2015

# Nutritional analysis of underutilized *Carrisa congesta* Wt. fruit during its sequential stages of development

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## Abstract

The *Carissa congesta* Wt. is an underutilized plant for its fruit uses. To promote use of the underutilized fruits and encounter the need of nutritional fruits the following work has been carried out for their nutritional analysis. For that morphological and physic-chemical parameters such as Length, Diameter, Volume and Moisture, Ash, pH and total acidity of fruits has been Measured. The Biochemical changes in carbohydrates, proteins and phenols have been observed during the development of the fruit. pH is High at ripened stage while total acidity is high at pre-ripened stage. Moisture is high at the young stage while ash content is high at ripened stage. Chlorophyll a is high at maturity while chlorophyll b is high at young stage. Total chlorophyll and carotene is also high at mature stage. Anthocyanain is high at ripened stage. Reducing sugar is high at ripened stage, non-reducing sugar and total sugar is high in young stage, while starch is high in ripened stage. Proteins and phenols are high at ripened stage.

**Key wards:** biochemical analysis, *carrisa congusta*, nutritional quality, physico-chemical measurements, underutilized fruits.

## Introduction

The plant of family Apocynaceae: *Carissa congesta* Wt. is an evergreen shrub. Leaves are coriaceous, elliptic-oblong or ovate-oblong and glabrous measuring 2–7 X 1-5 cm. The fruits are berries measures 1–1.4 cm long, ovoid-oblong or ellipsoidal in shape possessing deep-purple or nearly black when ripe. The plant is naturally found growing in deciduous or scrub forests and is also grown in the gardens for its flowers and attractive fruits. Flowering occurs in between February to June and fruit formation takes place between April and June by Shah (1978), Patel and Ramana Rao (2009).

## Materials and Methods

The fruits were collected with sequential development stages from the M.J. Commerce College, M. K. Bhavnagar University campus, Bhavnagar and subjected for their nutritional analaysis.

**Figure 1**: Carrisa Congesta Wt. Plant

The physioco chemical analysis in Length, Diameter and Volume were carried out by the method of Mazumdar and Majumder, 2003. Moisture Content of fresh fruits was observed by following the method of Berwal et al., 2004. The ash content of fruits was measured by the method of Berwal et al., 2004. For recording the pH and total acidity of fruits method of Pandya and Raman Rao, 2010 has been followed.

The pigment analysis was done by the method of Pandya and Mehta, (2016) and Devi (2002). For their 5 gm tissues of leaves and fruit wall were homogenized in 80% acetone and centrifuged. The absorbance was taken at different wavelengths for chlorophyll a, chlorophyll b, total chlorophyll, carotene and anthocyanin.

Following the method of Hedge and Hofreiter (1962) total sugars were estimated by extracting 1gm sample in 5 ml 2.5 N HCl for 3 hrs in boiling water bath. The supernatant was neutralized, cooled and after adding anthrone reagent sugars were estimated spectro-photometrically.

Reducing and non-reducing sugars were estimated spectro-photometrically extracting 1gm sample in 10 ml 80% ethanol and the supernatant was evaporated in boiling water bath. The residue was dissolve in 5ml distilled water and was estimated spectro-photometrically by using DNS (Dinitrosalicylic acid) reagent (Miller, 1972).

Proteins were estimated by extracting 1gm sample in 5 ml phosphate buffer pH 7.2. The supernatant was estimated using Folin-Ciocalteu reagent (FCR) method described by of Lowry et al (1951).

The amount of total phenolic contents were estimated by extracting 1gm sample in 10ml 80% ethanol and the extract was evaporated in boiling water bath. The residue was dissolved in 5ml distilled water and by using Folin-Ciocalteu reagent (FCR) under alkaline condition (20% $Na_2co_3$) phenols were estimated spectro-photometrically (Pandya and Raman Rao, 2010).

## Results

### *Morphological measurements*

The fruit of Karanda is a drupe, broadly ovoid, measures 1.23 - 2.26 cm in length, 1.16 - 1.96 in diameter and 1.30 – 3.78 ml in volume. The fruits are sour in taste; occur in cluster of 3 – 10, containing 2 - 4 small flat seeds. The peel and pulp are usually green when immature, but turns

dark purple or nearly black in color when the fruit ripens.

***Physico-chemical Analysis***

The fruit of karanda continues its growth, the pH of the fruit pulp increases from 3.50 at young stage to 5.84 at ripened stage. In contrast, the total acidity of the fruit decreases with increasing maturity, measuring highest with 11.70 % at pre-ripened stage, but with the onset of ripening the acidity declines to 6.30 %, whereas the moisture content of the fruit which is initially high with 80 % in the young fruit decreases marginally to 70.01 % in the ripened stage. Also the ash content of the fruit increases from 0.60 % in young fruit to 0.83 % in the ripened fruit.

**Table:-1 Physico-chemical changes in fruits**

| Stages of fruit | pH | Total acidity | Moisture content | Ash content |
|---|---|---|---|---|
| **Young** | 3.50 | 7.46 | **79.01** | 0.60 |
| **Premature** | 3.78 | 6.70 | 75.44 | 0.65 |
| **Mature** | 4.10 | 6.65 | 74.69 | 0.61 |
| **Preripened** | 4.65 | **11.70** | 73.75 | 0.78 |
| **Ripened** | **5.84** | 6.30 | 70.01 | **0.83** |

***Changes in Pigments:***

In the fruit of *C. congesta*, with the advancement of growth and ripening, a visual change occurs in its color from green to black. The quantitative analysis of pigments reveals that the amount of chlorophyll 'a' increased by two fold from the young stage to the preripened stage, but thereafter it remained more or less unchanged. Also at the mature stage the amount of total chlorophylls is recorded to be as high as 3.13 mg/100 gm, but subsequently it showed a declining trend. Similarly the quantity of carotenoids in the presently worked out *C. congesta* fruit measured high with 7.76 mg/100gm at mature stage but decreased significantly to 4.43 mg/100gm during ripening. In contrast, anthocyanins got accumulated to higher levels from 9.59 mg/100 gm at the young stage to 13.95 mg/100gm at the ripened stage.

**Table: -2 Pigment changes in fruits**

| Stages of fruit | Chlorophyll 'a' | Chlorophyll 'b' | Total Chlorophyll | Carotenoids | Anthocynins |
|---|---|---|---|---|---|
| **Young** | $1.40 \pm 0.07^{a}$ | $\mathbf{1.45 \pm 0.10^{d}}$ | $2.85 \pm 0.18^{b}$ | $5.62 \pm 0.45^{b}$ | $9.59 \pm 0.38^{c}$ |
| **Premature** | $1.52 \pm 0.12^{b}$ | $1.00 \pm 0.13^{a}$ | $2.52 \pm 0.16^{a}$ | $6.28 \pm 0.19^{c}$ | $8.16 \pm 0.52^{a}$ |
| **Mature** | $\mathbf{2.01 \pm 0.08^{c}}$ | $1.12 \pm 0.14^{b}$ | $\mathbf{3.13 \pm 0.07^{c}}$ | $\mathbf{7.76 \pm 1.16^{e}}$ | $10.15 \pm 0.32^{d}$ |
| **Preripened** | $1.51 \pm 0.08^{b}$ | $1.34 \pm 0.13^{c}$ | $2.85 \pm 0.08^{b}$ | $6.78 \pm 1.00^{d}$ | $8.64 \pm 0.40^{b}$ |
| **Ripened** | $1.50 \pm 0.08^{b}$ | $1.36 \pm 0.26^{c}$ | $2.86 \pm 0.14^{b}$ | $4.83 \pm 0.70^{a}$ | $\mathbf{13.95 \pm 0.36^{e}}$ |

***Changes in Carbohydrates:***

The sugar content of *C. congesta* fruit exhibits an initial decrease in its amount from 75.47 mg/gm at young stage to 38.30 mg/gm at the premature stage, but eventually it increases to the tune of 70.71 mg/gm during ripening. The profiling of sugars in the fruit of *C. congesta* revealed the presence of four sugars. Consistency in the quantity of reducing sugars of presently worked out Christ thorn fruit at its sequential stages was also observed to initial decrease in the premature

stage and thereafter increased until ripening. In contrast, non-reducing sugars observed inconsistency in its amount during the successive growth stages with 67.72 mg/gm at young stage, decreased to 4.10 mg/gm at the premature stage, increased once again to 37.97 mg/gm in the mature stage, remained consistent in the preripened stage and finally decreased to 26.18 mg/gm in the ripened stage. In contrast, the amount of starch was found to get decreased by more than one fold from 103.28 mg/gm at young stage to 60.42 mg/gm at the mature stage, but thereafter the accumulation of starch was observed with 97.92 mg/gm and 150.89 mg/gm in the pre-ripened and ripened stages respectively.

**Table: - 3 Carbohydrates changes in fruits**

| Stages of fruit | Reducing Sugar | Non Reducing Sugar | Total Sugar | Starch |
|---|---|---|---|---|
| Young | $9.01 \pm 1.14^{a}$ | $\mathbf{66.72 \pm 3.92^{d}}$ | $\mathbf{75.47 \pm 3.74^{e}}$ | $103.28 \pm 8.67^{b}$ |
| Premature | $34.19 \pm 1.36^{d}$ | $4.10 \pm 5.48^{a}$ | $38.30 \pm 4.32^{a}$ | $123.51 \pm 21.58^{c}$ |
| Mature | $16.28 \pm 1.71^{b}$ | $37.97 \pm 4.02^{c}$ | $54.25 \pm 2.35^{b}$ | $60.42 \pm 5.08^{a}$ |
| Preripened | $22.83 \pm 2.08^{c}$ | $37.38 \pm 8.02^{c}$ | $60.21 \pm 6.05^{c}$ | $97.92 \pm 11.89^{b}$ |
| Ripened | $\mathbf{44.59 \pm 1.52^{e}}$ | $26.18 \pm 10.2^{b}$ | $70.71 \pm 11.04^{d}$ | $\mathbf{150.89 \pm 11.71^{d}}$ |

***Changes in Proteins and Phenols:***

In contrast with increasing maturity the amount of both, phenols and proteins in the fruit of *C. congesta* increases from 3.23 mg/gm and 2.87 mg/gm in the young stage to 9.93 mg/gm and 33.73 mg/gm at the ripened stage. The phenolic compounds increased by three fold, while that of proteins exhibited an increase by eleven fold.

**Table:- 4 Protein and Phenol changes in fruits**

| **Stages of fruit** | **Young** | **Premature** | **Mature** | **Preripened** | **Ripened** |
|---|---|---|---|---|---|
| **Proteins** | $3.23 \pm 0.42^{b}$ | $5.00 \pm 0.24^{c}$ | $3.12 \pm 0.24^{b}$ | $2.73 \pm 0.15^{a}$ | $\mathbf{9.93 \pm 0.80^{d}}$ |
| **Phenols** | $2.87 \pm 0.36^{a}$ | $7.69 \pm 1.43^{b}$ | $20.43 \pm 1.19^{c}$ | $19.41 \pm 1.25^{c}$ | $\mathbf{33.73 \pm 2.14^{d}}$ |

## Discussion

The results are found to be near about similar with the findings of Patel and Ramana Rao, 2009 where pH is High at ripened stage while total acidity is high at pre-ripened stage. Moisture is high at the young stage while ash content is high at ripened stage. Chlorophyll a is high at maturity while chlorophyll b is high at young stage. Total chlorophyll and carotene is also high at mature stage. Anthocyanain is high at ripened stage. Reducing sugar is high at ripened stage, non-reducing sugar and total sugar is high in young stage, while starch is high in ripened stage. Proteins and phenols are high at ripened stage.

## Conclusion

The fruits of *Carrisa congesta* Wt. consists high amount of nutritive values, that can be helpful to encounter the need of the healthy fruits from the underutilized fruits to make in the commercial practices.

## References

1) Berwal, J. S., Grewel, R. B., Kapoor, C. M. and Garg, M. K. (2004) Practical methods in food analysis. Agrotech Publishing Academy, Udaipur, India, pp. 64 – 77.
2) Devi, P. (2002). Principles and methods of plant molecular biology, biochemistry and genetics, Agrobios, India.
3) Hedge and Hofeiter, B. T (1962). In: Carbohydrates chemistry, 17, Academic press, New York.
4) Lowry, O. H., Rosebrought N. J., Farr A. L. and Randall R. J. (1951). Protein measurement with Folin-Phenol reagent. J. Bio. Chem. 193: 265-272.
5) Mazumdar B. C., Majumder K. 2003. Methods on physico-chemical analysis of fruits, Daya Publishing house, Delhi, India.
6) Miller, G. L. (1972). Use of DNS reagent for determination of reducing sugar. Anal. Chem. 31, 426.
7) Pandya Jay B. and Ramana Rao T. V.. (2010). "Analysis of certain biochemical changes associated with growth and ripening of pumpkin fruit in relation to its seed development". *PRAJNA,* 18: 34 - 39. ISSN 0975 – 2595
8) Pandya J. B. and Mehta S. K. (2016). "Source and sink relationship In Adansonia digitata L. due to the presence of photosynthetic pigments" International Journal of Research in Engineering and Applied Sciences 6:1 74-80. (ISSN 2249-3905)
9) Parel P. R. And Ramana Rao T. V. (2009) study of certain physiological and histo-architectural changes associated with growth and ripening of some underutilized fruits. Ph.D. Thesis.
10) Shah, G. L. (1978) Flora of Gujarat State Vol. I & II. Sardar Patel University.

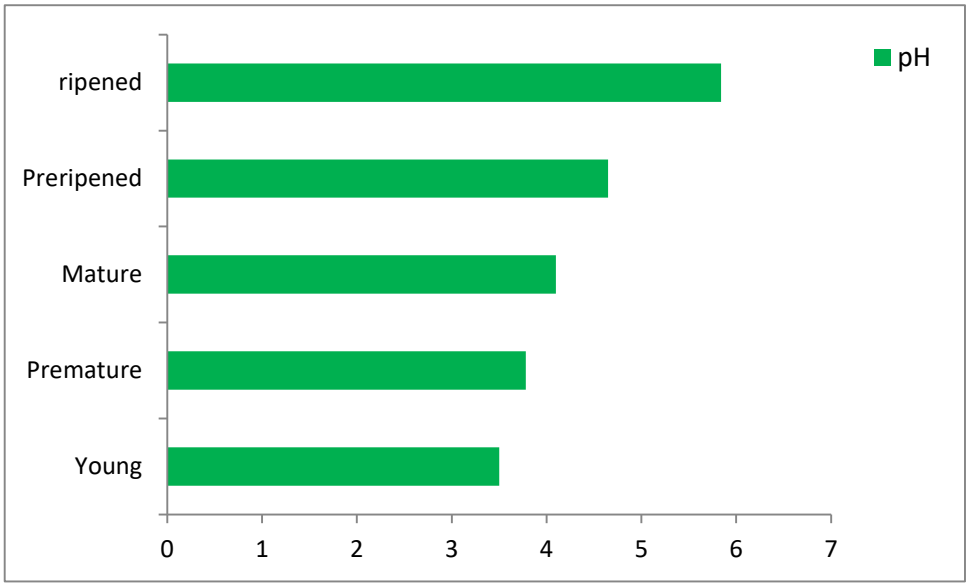


**Figure - 2: pH content in fruits**

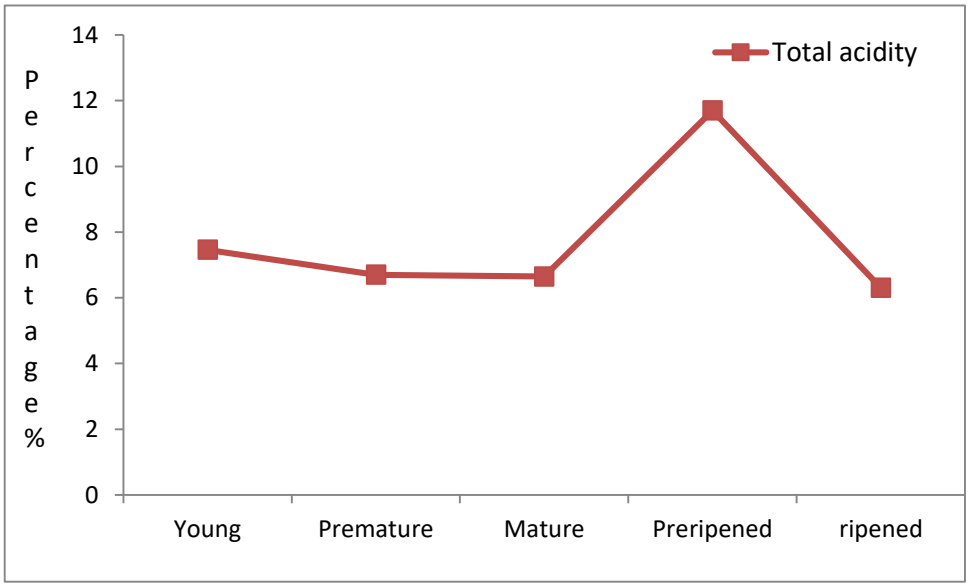


**Figure - 3: Total acidity in fruits**

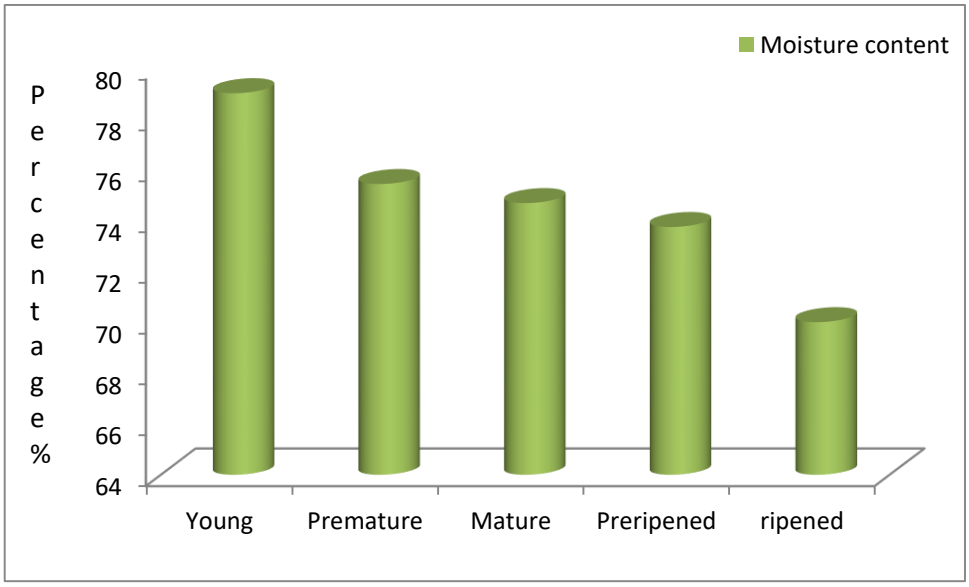


**Figure - 4: Moisture content in fruits**

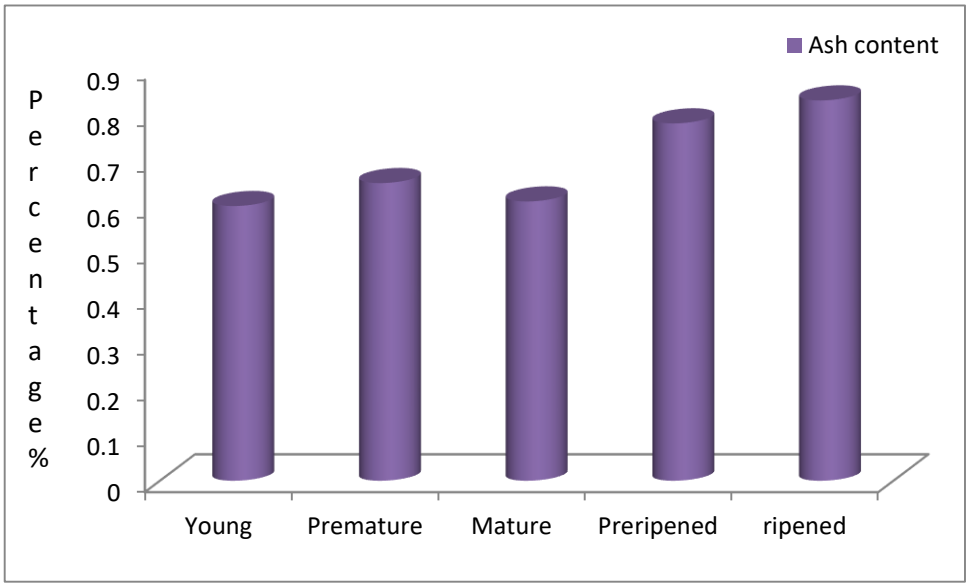


**Figure - 5: Ash content in fruits**

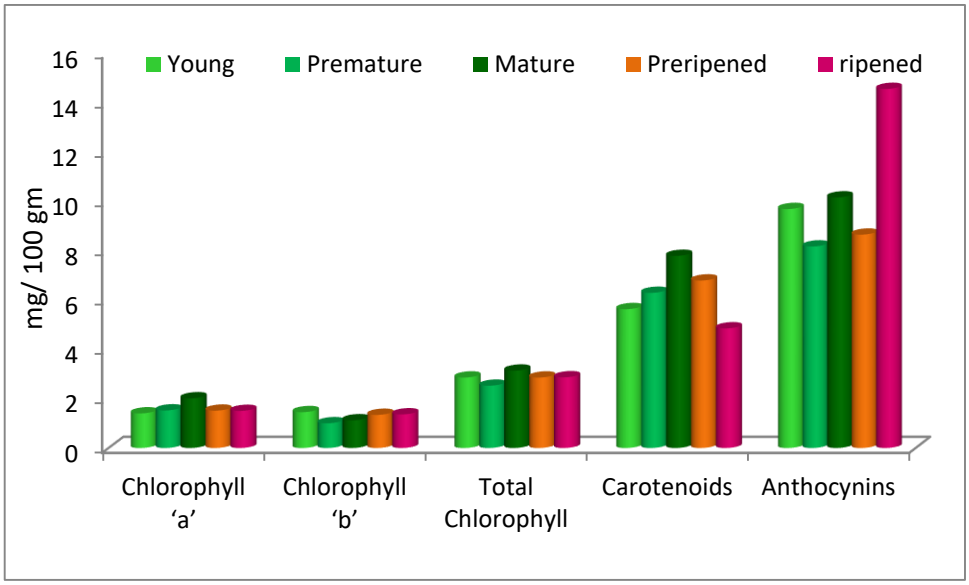


**Figure - 6: Pigment changes in fruits**

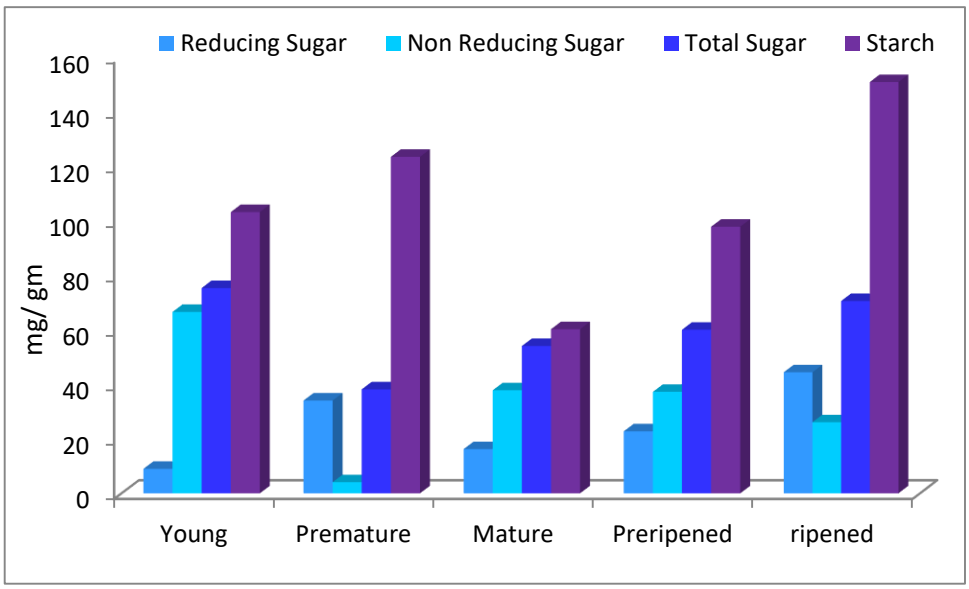


**Figure - 7: Carbohydrates changes in fruits**

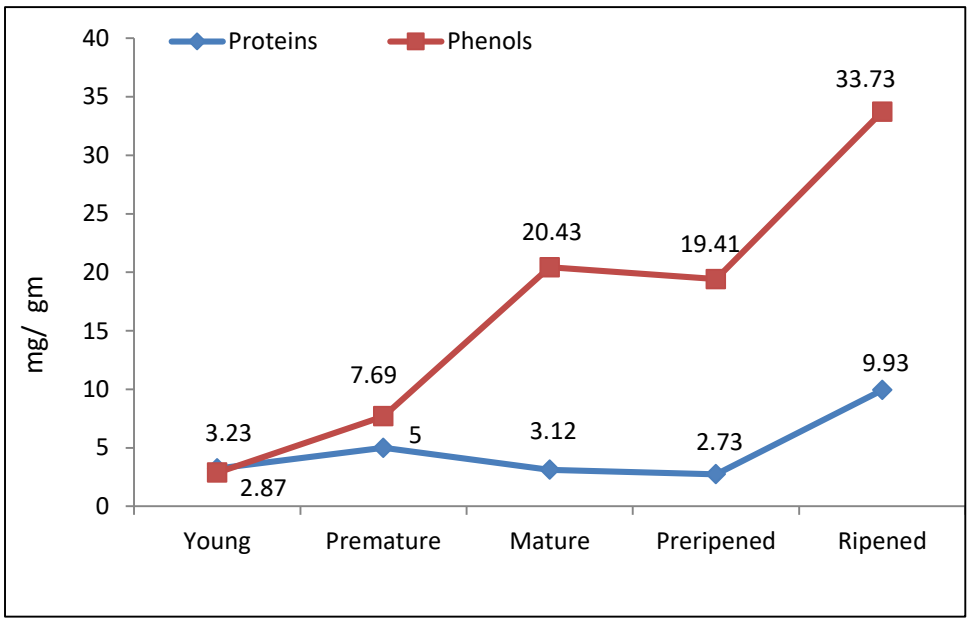


**Figure - 8: Carbohydrates changes in fruits**