



STUDIES ON CARBOHYDRATE AND PROTEIN CONTENTS OF SOME UNDERUTILIZED WILD FRUITS

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ABSTRACT

Western Ghat (Maharashtra), India is well known for excellent plant and animal biodiversity. Due to presence of abundant wild edible fruit species, native tribal peoples were regularly consuming these fruits or fulfilling food necessity. Eleven wild and underutilized edible fruits of *Diospyros melanoxylon* Roxb., *Pithecellobium dulce* Roxb., *Carissa congesta* Weight., *Lantana camara* L., *Opuntia stricta* (Haw.) Haw., *Aegle marmelos* L., *Terminalia catappa* L., *Zizyphus mauritiana* Lam., *Limonia acidissima* L., *Elaeagnus conferta* Roxb. and *Anacardium occidentale* L. have high nutritional potential and medicinal properties. The present study deals with the investigation of carbohydrate and protein content of these eleven wild edible fruits using standard protocols. The carbohydrate and protein content was compared with some commonly consumable fruits. The exploitation of wild fruits as nutritious food for wild as well as urban citizens and to deliver the information about commercial value of these fruit plants are the main intentions of the present study.

KEYWORDS: Wild fruits, nutritional analysis, carbohydrates, proteins, DNSA method, Folins-Lowry method.

1. INTRODUCTION

During the period of food insufficiency, numerous wild plants sources have been utilized as alternatives for a nutritionally balanced diet as well as alternative source of income for tribal communities.^[1] In order to fulfil the daily requirement of calories, tribals were consuming wild fruits as subsidiary food. Wild weeds play an important role in human nutrition as good to excellent source of nutritional components such as proteins, carbohydrates, lipids, vitamins etc.^[2-3] Some of the wild fruits are well known for their remarkable phytochemical potential and tribals were sustainably utilizing them for preventing diseases and nutritious supplements for good health.^[4-5] Literature survey revealed that vegetables and fruits rich diet can protect the human being from various chronic degenerative diseases. Moreover, antioxidant properties can improve the proper functioning of the body and it has been found that regular consumption of fruits can reduce the risk various cardiovascular diseases,^[6-7] cancer,^[8] immune system troubles, arthritis, inflammation and brain dysfunction.^[9] Now a day, wild fruits are becoming more popular and studied intensively for their nutritional potential.^[10]

As a part of current scenario of safeguarding of good health, worldwide researchers were studying the nutritional potential of various types of wild edible

underutilized plants.^[11-12] The aim of the present study is to evaluate the nutritional value of some wild underutilized fruits, including proteins and carbohydrates. The analysis data obtained can be beneficial for commercial production of these fruit plants. Present study focused on carbohydrates and protein contents of eleven wild native fruits (Table 1) of Maharashtra, India.

2. MATERIALS AND METHODS

2.1 Collection of Fruits and Sampling

Wild fruits of *Diospyros melanoxylon* Roxb., *Pithecellobium dulce* Roxb., *Carissa congesta* Weight., *Lantana camara* L., *Opuntia stricta* (Haw.) Haw., *Aegle marmelo* L., *Limonia acidissima* (L.), *Terminalia catappa* L., *Zizyphus mauritiana* Lam., *Elaeagnus conferta* Roxb. and *Anacardium occidentale* L. were collected from Shendi and Ratanwadi area (Bhandardara) Tal- Akole, Dist- Ahmednagar (MS), India in month of March-April 2015 and 2016. The raw and ripened fruit samples were collected and dried under shade.

2.2 Preparation of the plant materials for chemical analysis

All eleven fruit samples were dried in shade in order to remove residual moisture. The shade dried fruits were ground into powder using grinder, filtered and stored in

polythene bags. The stored food powders were used as such for further analysis.

2.3 Chemical Analysis

The carbohydrate content was determined by using DNSA method and protein content was determined by using Folin-Lowry method.^[13] The study was conducted in Research Laboratory, Department of Botany, Shri Muktanand College, Gangapur, Dist- Aurangabad by titrimetric method.

3. RESULTS AND DISCUSSION

In continuation to our ongoing research on applicability of wild fruits in India,^[14-18] the determination of carbohydrate and protein content of eleven wild edible plant viz. *Diospyros melanoxylon* L, *Pithecellobium dulce* Roxb., *Carissa congesta* Weight., *Lantana camara* L., *Opuntia stricta* (Haw) Haw., *Aegle marmelos* L., *Limonia acidissima* (L.), *Terminalia catappa* L., *Zizyphus mauritiana* Lam., *Elaeagnus conferta* Roxb.

and *Anacardium occidentale* L. DNSA and Folin-Lowry method. The results obtained were represented in **Table 2**. Wild edible fruits have been serving as good source of nutritional components such as protein and carbohydrate for the local residents. Earlier reports indicated that protein and carbohydrate content of fruits found in various regions are moderate to high. The variation in protein and carbohydrate content may be due to adaptation of plants in different environmental soil conditions or the harvesting of fruits at different time or the climatic factors and the species variation.^[19] The carbohydrate and protein contents of ten wild fruit species are generally found in Maharashtra (India) indicated a valuable nutrition like other regularly consumable fruits such as orange, grape, lemon etc, as shown in Table 3.^[20] In present study, results obtained clearly indicated that protein and carbohydrate content of dried wild fruits are more adventitious for regular consumption and there is urgent need of exploration and plantation these fruit plants in large scale.

Table 1. Plant Species considered for the determination of carbohydrates and proteins.

Wild Fruit Plant Species	Family	Vernacular name (Marathi)	Ecology and Uses
<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Temburini	It has been found in dry tropical and sub-tropical forests with black or dark brown bark and woody. Leaves are thick pale green and hairy. Fruits are yellowish and fleshy with enlarged calyx like brinjal. Fruits of temburni are useful against diarrhea, dry cough and hypertension. Leaves contain flavones and triterpenes. ^[21]
<i>Pithecellobium dulce</i> (Roxb.) Bth.	Leguminosae (fabaceae)	Vilayati chinch.	The fruits of <i>Pithecellobium dulce</i> (Roxb.) Bth. are in the form of pod, turns pink when ripe and opens to expose an edible pulp. It has medicinal applications against convulsions. It contains carotene, phenylalanine, tryptophan, saponine a sterol glucoside and ascorbic acid. ^[22]
<i>Lantana camara</i> L. var. <i>aculeata</i> (L.)Moldenke	Verbenaceae	Tantani and Ghaneri.	It is the most extensive species of this genus growing in tropical sub-tropical & temperate regions. It is being a large scrambling evergreen strong smelling shrub. The fruit are fleshy berries in cluster, shiny globular in shape. Ripened fruits are black in colour consisting caryophyllene, 1-alpha phellandrene, lantadene A, lantadene, quinine and Lantanine. It has various medicinal properties viz. vulnerary, diaphoretic, carminative, antispasmodic and tonic wounds, ulcers, swelling, tumors and rheumatism. Fruit are known to have antibacterial, antifungal, anti-inflammatory and anti-fertility activity. ^[23-25]
<i>Carissa congesta</i> Weight.	Apocynaceae	Karvand	This species belongs to rank growing strategy, woody, climbing shrub with evergreen leaves. Leaves are opposite oval or elliptic, 1 to 3 inch long and dark green in colour. The flowers are fragrant, tubular with hairy lobes, twisted to the left in the bud. Fruits are developed at terminal clusters, broad ovoid or round, dark purple or nearly black when ripe and bitter. ^[26]
<i>Opuntia stricta</i> (Haw.)Haw.	Cactaceae	Nivdung	It is spread in the form of large colonies can be used as ornamental plant in gardens and later on it has been used as a natural agricultural fencing. Fruits are oval elongated berry with a thick receptacle and juicy

			pericap Fruit and stem have been traditionally used as medicine in several countries. ^[27-28]
<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Beal	It has great mythological significance for Hindus. Fruit is being used for breakfast as a mixture pulp and palm sugar or in the form of syrup. The syrup has therapeutic agent and relives diarrhoea and dysentery. It is rich in minerals and vitamin content, coumarins, alkaloids, sterols and essential oil. ^[29-31]
<i>Terminalia catappa</i> L.	Combretaceae	Deshi badam	<i>Terminalia catappa</i> L. is a large tropical tree in the leadwood tree family combretaceae. The leaves contain several flavonoids, tannins and saponine. Fruit are used in different herbal medicines for various purposes. ^[32]
<i>Zizyphus mauritiana</i> Lam.	Rhamnaceae	Bor	<i>Zizyphus mauritiana</i> Lam is native to temperate and subtropical region. It is a spiny evergreen shrub or small tree upto 15 m high, with trunk 40 cm or more in diameter. The fruit are applied on cuts and ulcers are employed in pulmonary ailments and fever. Fruit are mixed with salt and chilli pepper are given in indigestion and biliousness. ^[33-34]
<i>Limonia acidissima</i> (L.)	Rutaceae	Kavath	It is a native and common to dry plain, apparently drought tolerant and best adapted to light soil. Wood apple is useful for curing scurvy and in relieving flatulence. Seedless pulp of fruit is beneficial for the treatment of dysentery, diarrhoea and piles. ^[35-36]
<i>Elaeagnus conferta</i> Roxb	Elaeagnaceae	Ambal	<i>Elaeagnus conferta</i> Roxb., is native to temperate and subtropical regions of Asia. It is deciduous or evergreen shrubs or small trees. The fruits used as medicine for the treatment of indigestion. The fruit are rich in Ca, Fe, Mn and P. ^[37-38]
<i>Anacardium occidentale</i> L.	Anacardiaceae	Cashew apple	The cashew apple is fleshy, soft, and rich in nutrients and grows on the cashew seed. It can be consumed as fresh or cooked in curries, or fermented into vinegar. Other products such as chutneys and jams are also well-known in countries like India and Brazil. Cashew apple juice helps to burn fats and increases the utilization of either fat or carbohydrates as a fuel. ^[39-41]

Table 2. Determination of carbohydrate and protein contents of some wild fruit samples.

Sr. No	Plant Name	Family	Common Name	Carbohydrates (gm/100gm)	Proteins (gm/100gm)
1.	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Temburini	16	2.6
2.	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Fabaceae	Vilayati Chinch (Red)	9.2	13.5
3.	<i>Carissa congesta</i> Weight.	Apocynaceae	Karvand	20	3.5
4.	<i>Lantana camara</i> L. var. Aculeate (L.) Moldenke	Verbenaceae	Ghaneri	37.6	7.2
5.	<i>Opuntia stricta</i> (Haw.) Haw.	Cactaceae	Nivdung	20	6.4
6.	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Beal	22	4.9
7.	<i>Limonia acidissima</i> (L.)	Rutaceae	Kavath	24.4	3.25
8.	<i>Terminalia catappa</i> L.	Combretaceae	Deshi badam	20.8	23
9.	<i>Zizyphus mauritiana</i> Lam.	Rhamnaceae	Bor	5.2	16.8
10.	<i>Elaeagnus conferta</i> Roxb.	Elaeagnaceae	Ambal	26	18
11.	<i>Anacardium occidentale</i> L.	Anacardiaceae	Cashew Apple	35.2	4.6

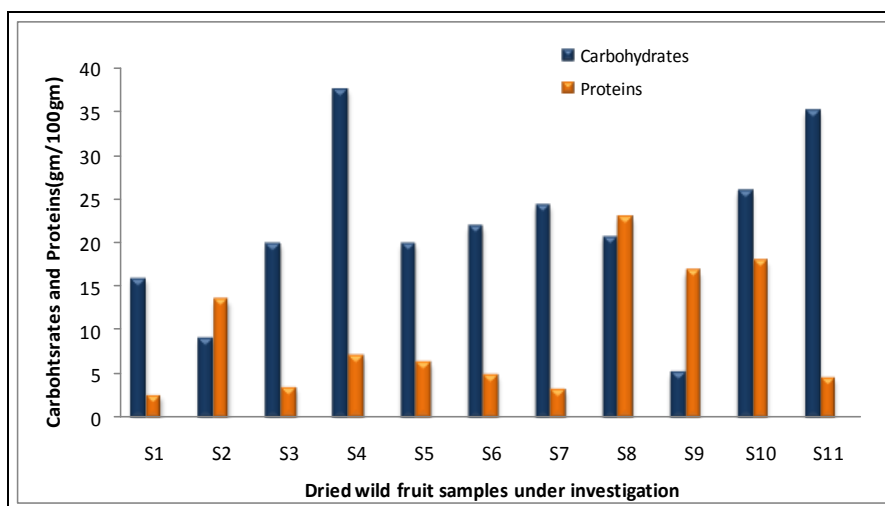


Figure 1. Graphical presentation carbohydrates and protein content of dried wild fruits under investigation.

Table 3. Relative carbohydrate and protein content of some wild fruits under investigation with selected well known fruits.

Sr. No	Common name of the fruit	Carbohydrates(%)	Proteins(%)
1.	Grape	17.15	0.63
2.	Sapota	ND	0.7
3.	Guava	14.3	2.54
4.	Pomegranate	17.17	0.95
5.	Banana	22.84	1.09
6.	papaya	9.81	0.61
7.	Strawberry	7.0	0.61
8.	Orange	11.54	0.7
9.	apple	13.81	0.26
10.	Lemon	9.32	1.1
11.	Pineapple	11.82	0.4
12.	Tembhurni	16	2.6
13.	Vilayati Chinch (Red)	9.2	13.5
14.	Karvand	20	3.5
15.	Ghaneri	37.6	7.2
16.	Nivdung	20	6.4
17.	Beal	22	4.9
18.	Kavath	24.4	3.25
19.	Desi badam	20.8	23
20.	Bor	5.2	16.8
21.	Ambal	26	18
22.	Cashew Apple	35.2	4.6

4. CONCLUSION

Determination of carbohydrate and protein content of eleven wild edible fruit of *Diospyros melanoxylon* Roxb., *Pithecellobium dulce* Roxb., *Carissa congesta* Weight, *Lantana camara* L., *Opuntia stricta* (Haw.) Haw., *Aegle marmelos* L., *Limonia acidissima* (L.), *Terminalia catappa* L., *Zizyphus mauritiana* Lam., *Elaeagnus conferta* Roxb. And *Anacardium occidentale* L. was conducted using DNSA and Folin-Lowry method. The carbohydrate and protein content was further compared with some of the commonly consumable fruits.^[20] The comparative results were represented in Table 2. This indicates the carbohydrate and protein potential of wild fruits under investigation were good to excellent. Hence it will be more beneficial than commonly consumable

fruits when vitamin C rich supplement was required.

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Conflict of interest

The authors declare no competing financial interest

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