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Nutrient Analysis of Some Selected Wild Edible Fruits of Deciduous Forests of India: an Explorative Study towards Non Conventional Bio-Nutrition

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Abstract: Considering the growing need to identify alternative bio-nutritional sources, 15 wild edible fruits consumed in deciduous forest zone of India were evaluated for their nutritive value in order to prioritize edible wild fruits suitable for domestication. The result showed significance of wild fruit species as important source of nutrient for rural poor. The nutritional value of many wild fruits compared well with domesticated popular fruits as mango, banana, guava, papaya, sapota, pomegranate, strawberry etc. in terms of protein, carbohydrate or Vitamin content. The carbohydrate content in wild varieties as *Mimusops elengi* (18.1%) is found to be at par with mango (17%) and pomegranate (17.1%). High concentration of sugar was noted in *Ziziphus rugosa* (20.7%) compared to domesticated sapota (21.4%), grapes (16.2%) and pomegranate (16.5%). Protein content in *Bridelia tomentosa* (3.1%), *Carissa spinarum* (3.6%) and *Polyalthia suberosa* (1.9%) was found similar to cultivated fruits, viz., guava (2.5%), banana (1.09%) and lemon (1.1%). Maximum proportion of Ascorbic acid/Vitamin-C content was seen in case of *Solanum torvum* (37.4 mg/100 g), *Terminalia citrina* (53.52 mg/100 g), which is higher to banana (8.7 mg/100 g), apple (4.6 mg/100 g), pomegranate (6.1 mg/100 g) and mango (27.7 mg/100 g). Of particular importance are *Eugenia rothii, Mimusops elengi, Ziziphus oenoplia, Ziziphus rugosa, Bridelia tomentosa* and *Carissa spinarum* that had significant level of micronutrient and minerals and therefore were identified as promising species for promotion as backyard planting especially farming systems suffering from crop loss, food shortage and chronic malnutrition.

Key words: Anitioxidants, mineral, protein, phenol, terminalia, wild fruit, ziziphus

INTRODUCTION

In many tropical countries, rural people traditionally harvest wide range of leafy vegetables, roots, tubers, fruits from wild because of its taste, cultural uses, as food supplements or to tide over food shortage. Labeled as famine or hunger food, wild plants have been recognised to have potential to meet household food and income security (Guinand and Dechassa, 2000; Kebu and Fassil, 2006). Many wild fruits notably, Amla, Harida, Bel, Elephant apple have been exploited from wild for centuries across Indian subcontinent on account of its food and medicinal properties. Even today in Mediterranean Europe, gathering of wild fruits is a common practice; so is picking of wild mushroom in northern Europe (Pardo-de-Santayana *et al*., 2007). Non cereal plant foods from forests contribute significantly to the diets of local residents in Africa (Getachew *et al*., 2005). In rural countryside of many developing nations, wild fruits are often the only fruits consumed as people cannot afford cultivated commercial fruits as apple, grapes, pomegranate or orange. In India, the indigenous fruits collected from wild play significant role in the food and nutrient security of rural poor and tribal. Some wild fruits have been identified to have better nutritional value than cultivated fruits (Eromosele *et al*., 1991; Maikhuri *et al*., 1994). As a result, in recent years, a growing interest has emerged to evaluate various wild edible plants for their nutritional features (Nazarudeen, 2010; Aberoumand and Deokule, 2009; Musinguzi *et al*., 2007; Nkafamiya *et al*., 2007; Glew *et al*., 2005). Inventory of wild food resources, ethno-botanical information on its adaptability coupled with nutritional evaluation can only establish the non cultivated variety as real substitute for domesticated or cultivated species. Scrutiny of plants of various tropical forest areas through constituent analysis may lead to selection of valuable wild species that can be taken through crop improvement and hybridization process to establish it as cultivated variety.

Of the estimated 2800 species of vascular plants of Orissa state (India), about 150 wild edible fruit species occurring in different parts of eastern India's deciduous forests are consumed in various quantities by rural communities (Mahapatra and Panda, 2009). The wild edible species are gathered mostly for home consumption and mainly by forest dwellers, tribal and marginalized rural communities. But some fruits as Chironji, Mahua, and Cashew are collected from forests for sale as well since it fetch good price. Most fruits in India are collected from wild in small quantity for consumption or at time

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Table 1: General account of wild edible fruits selected for nutritional analysis

Species	Local name	Fruit	Habit	Uses
Bridelia tomentosa (Euphorbiaceae)	Lata kasi	Drupe	Shrub	Ripe fruits are edible
Carissa spinarum (Apocynaceae)	Khira koli	Berry	Dwarf shrub	Ripe berries are eaten raw or as cooked preservatives
Eugenia rothii (Myrtaceae)	Sagadabatua	Berry	Bushy shrub	Ripe fleshy fruits are eaten. Wood is used for handles, posts, pastles
Glycosmis pentaphylla (Rutaceae)	Chauladhua koli	Berry	Shrub	Ripe berries are pulpy and eaten raw by tribals and villagers
Mimusops elengi (Sapotaceae)	Baula	Berry	Tree	The ripe fruits are edible; occasionally used for making pickles and preservatives
Morinda tinctora (Rubiaceae)	Aachhu	Syncarp	Tree	The ripe fruits are edible
Phyllanthus acidus (Euphorbiaceae)	Nara koli	Drupe	Tree	Fruits are used for preparing jellies and preserves
Polyalthia suberosa (Annonaceae)	Gua koli	Berry	Shrub	Ripe fruits are edible. A decoction of root is used as abortifacient
Solanum torvum (Solanaceae)	Bheji baigana	Berry	Shrub	The green fresh fruits are edible
Streblus taxoidis (Moraceae)	Jhumpuri	Drupe	Shrub	The fruit along with the foliaceous perianth wrapped around it is sold in markets as leafy vegetables
Terminalia citrina (Combretaceae)	-	Drupe	Tree	Used in traditional medicine in Thailand to treat diarrhea and skin infections
Toddalia asiatica (Rutaceae)	Tundapoda koli	Berry	Woody vine	Toddalia asiatica is used medicinally by Venda herbalists
Ziziphus mauritiana (Rhamnaceae)	Bara koli	Drupe	Small tree	The fruits are eaten either fresh, pickled, candied or in preserves
Ziziphus oenoplia (Rhamnaceae)	Kantai koli	Drupe	Shrub	Traditional people eat the fruit for the relief of stomach pain
Ziziphus rugosa (Rhamnaceae)	Tin koli	Drupe	Shrub	The ripe fruits being sweet in taste are eaten raw. The crushed deflated seeds yield starch

during the festivals. But information on their nutritional and anti nutritional properties are lacking. Since none of the indigenous fruit plants has been brought under farm cultivation yet, detail on their nutritional utility storage ability etc., are not known except its consumption value and taste. Besides, there are many wild fruit relatives in forests that are underexploited, and their economic potential is yet to be tapped. In general information on edibility and therapeutic properties of wild fruits is scanty and data on their nutritional composition is negligible (FAO, 1984; Aloskar *et al*., 1992). A wide array of wild fruits are collected by forest dwellers; particularly tribal communities in eastern Indian states of Orissa, Jharkhand and Chattisgarh to supplement their food which necessitates scientific investigation of wild fruit plants nutritional and anti-nutritive properties. The present study explores the nutritional status of 15 wild edible fruits of deciduous forests of eastern India by profiling their biochemical attributes i.e., protein, carbohydrate, sugars, vitamin, anti oxidants and micronutrient.

MATERIALS AND METHODS

We shortlisted 15 species that are widely consumed in rural areas in eastern India (Orissa and Jharkand state) mainly in the forest fringe villages and known for its good taste. A general account of the selected fruit plants is presented in Table 1. To estimate the nutritive values, healthy and disinfected ripe fruits collected from various forest blocks during 2009-10 were analysed in the RPRC Laboratory, Bhubaneswar.

Analysis of samples: All samples were washed thoroughly to remove any attached soil and other impurities and were blotted dry. Various standard methods as mentioned below were followed for analyzing the nutrient parameters.

Moisture: The moisture content of the samples was determined by using moisture balance (Anamed Make).

Total carbohydrate: The sample extract was prepared by hydrolyzing the test sample in 2.5N HCl for three hours in boiling water bath, followed by neutralizing it with sodium carbonate. It was then centrifuged and the supernatant was collected for analysis. The analysis was carried out following method of Hedge and Hofreiter (1962).

Sugars: The extract was prepared by taking 0.5 g of fresh pulp and extracting the same with 80% ethanol by centrifuging three times. The supernatant was collected and measured quantity of distilled water was added to it, and heated until all ethanol got evaporated. Then volume of sample was made up to 150 mL by adding distilled water.

Table 2: Proximate analysis

Fruit	Moisture (%)	Carbohydrate (%)	Total Sugar (%)	Protein (%)	Ascorbic Acid (mg/100 g)
Bridelia tomentosa	78.54±1.02	16.26±0.83	15.75±0.95	3.17±0.39	22.22±1.37
(Banana)	(74.91)	(22.84)	(12.23)	(1.09)	(8.7)
Carissa spinarum	73.2±1.37	12.43±0.39	8.37±0.40	3.64±1.04	ND
(Mango)	(81.71)	(17)	(14.8)	(0.51)	(27.7)
Eugenia rothii	66.32±2.43	19.01±0.89	18±0.34	0.65±0.02	18.52±0.50
(Guava)	(81.7)	(14.3)	(ND)	(2.54)	(228.4)
Glycosmis pentaphylla	61.7±0.34	4.3±2.1	1.35±0.07	0.8±0.13	15.77±0.69
(Apple)	(84.6)	(13.81)	(10.39)	(0.26)	(4.6)
Mimusops elengi	55.11±3.19	18.15±0.80	15.9±01	0.61±0.07	25.22±1.65
(Pomegranate)	(78)	(17.17)	(16.57)	(0.95)	(6.1)
Morinda tinctoria	78.34±0.83	4.86±1.17	4.3±0.34	0.23±0.04	18.92±0.79
(Litchi)	(81.76)	(16.5)	(15.23)	(0.8)	(72)
Phyllanthus acidus	86.7±1.86	4.81±0.54	4.5±0	0.25±0.07	36.7±0.52
(Lemon)	(90.73)	(9.32)	(2.5)	(1.1)	(53)
Polyalthia suberosa	64.76±3.91	4.25±0.43	4.3±0.34	1.96±0.35	15.72±1.11
(Strawberry)	(91.66)	(7)	(ND)	(0.61)	(56)
Solanum torvum	59.51±0.47	11.9±0.36	9.52±0.48	1.46±0.23	37.4±3.64
(Grapes)	(81.3)	(17.15)	(16.25)	(0.63)	(4)
Streblus taxoidies	84.61±3.72	4.75±0.66	1.35±0.09	0.68±0.13	19.32±1.37
(Pineapple)	(87.8)	(11.82)	(10.8)	(0.4)	(39)
Terminalia citrina	75.45±2.02	3.1±0.19	2.6±0.70	0.92±0.11	53.52±4.94
(Papaya)	(88.83)	(9.81)	(5.9)	(0.61)	(61.8)
Toddalia asiatica	63.47±1.78	ND	7.2±0.37	1.15±0.12	22.02±1.53
(Orange)	(88.3)	(11.54)	(9.14)	(0.7)	(45)
Ziziphus mauritiana	87.41±0.81	15.49±0.40	12.9±0	0.46±0.05	36.01±1.48
(Cherry)	(82.25)	(16.01)	(12.82)	(1.06)	(7)
Ziziphus oenoplia	57.12±2.76	17.13±3.40	6.15±0.25	0.7±0.07	17.65±0.57
(Pears)	(88.25)	(10.65)	(7.05)	(0.5)	(3.8)
Ziziphus rugosa	60.83±1.46	ND	20.7±1.67	0.58±0.09	21.26±0.74
(Sapota)	(73.7)	(ND)	(21.4)	(0.7)	(6)

Values expressed as mean ± standard deviation

Table 3: Proximate analysis

Fruit	Reducing Sugar (%)	Non-reducing Sugar (%)	Phenol (%)	Acid content (%)	Carotenoid (mg/g)
Bridelia tomentosa	2.04±0.24	13.72±0.84	0.5±0.06	0.3±0.01	17.6±2.25
(Banana)	(ND)	(ND)	(ND)	(ND)	(ND)
Carissa spinarum	8.2±0.29	0.17±0.16	0.72±0.16	0.2±0.02	ND
(Mango)	(ND)	(ND)	(ND)	(ND)	(ND)
Eugenia rothii	2.4±0.12	15.67±0.46	1.3±0.14	0.32±0.03	92±5.26
(Guava)	(ND)	(ND)	(ND)	(ND)	(ND)
Glycosmis pentaphylla	0.58±0.08	0.77±0.15	0.5±0.06	0.12±0.01	17.23±2.45
(Apple)	(ND)	(ND)	(ND)	(ND)	(ND)
Mimusops elengi	0.8±0.04	15.1±0.04	3.1±0.14	0.27±0.02	88.52±4.45
(Pomegranate)	(ND)	(ND)	(ND)	(ND)	(ND)
Morinda tinctoria	0.04±0	4.26±0.34	0.3±0.06	0.14±0.01	27.4±5.69
(Litchi)	(ND)	(ND)	(ND)	(ND)	(ND)
Phyllanthus acidus	0.04±0	4.46±0	0.6±0.14	0.45±0.04	16.05±0.28
(Lemon)	(ND)	(ND)	(ND)	(ND)	(ND)
Polyalthia suberosa	0.57±0.17	3.77±0.63	0.9±0.08	0.19±0.01	128.49±8.9
(Strawberry)	(ND)	(ND)	(ND)	(ND)	(ND)
Solanum torvum	3±0.21	6.48±0.44	0.2±0.07	0.034±0.01	33.29±1.32
(Grapes)	(ND)	(ND)	(ND)	(ND)	(ND)
Streblus taxoidis	0.5±0.08	0.84±0.15	0.3±0.07	0.24±0	21.97±3.9
(Pineapple)	(ND)	(ND)	(ND)	(ND)	(ND)
Terminalia citrina	1.2±0.02	1.45±0.69	3.04±0.63	0.09±0.01	64.46±1.67
(Papaya)	(ND)	(ND)	(ND)	(ND)	(ND)
Toddalia asiatica	1.44±0.32	5.59±0.08	1.6±0.07	0.09±0.01	139.49±6.57
(Orange)	(ND)	(ND)	(ND)	(ND)	(ND)
Ziziphus mauritiana	0.84±0.12	12.06±0.12	0.21±0.03	0.78±0.01	16.72±1.61
(Cherry)	(ND)	(ND)	(ND)	(ND)	(ND)
Ziziphus oenoplia	0.7±0.30	5.46±0.55	1.2±0.24	0.5±0.02	21.86±0.85
(Pears)	(ND)	(ND)	(ND)	(ND)	(ND)
Ziziphus rugosa	0.58±0.09	19.13±1.72	0.3±0.01	0.12±0	13.91±0.93
(Sapota)	(ND)	(ND)	(ND)	(ND)	(ND)

Total sugar (TS): The TS was estimated using anthrone's reagent (Rangana, 1979). 1 mL of alcoholic extract was taken in a test tube and chilled. After a while 4 mL of anthrone's reagent was carefully run down the walls of the test tube. The test tubes were thereafter immersed in ice water. The tubes were brought to ambient temperature and boiled in water bath for 10 min. After proper cooling, the absorbance was measured at 625 nm.

Reducing Sugar (RS): RS was estimated using Dinitrosalicylic acid (DNS) reagent (Miller, 1972). 3 ml of DNS reagent was added to 3 mL of sample in a lightly capped test tube. The mixture was heated at 90°C for 5-15 minutes to attain a red brown color. Then 1 mL of Rochelle's salt solution was added to stabilize the colour. After cooling to room temperature in cold water bath, absorbance was recorded at 575 nm.

Non Reducing Sugar (NRS): NRS was calculated by subtracting the amount of reducing sugar from that of total sugars.

Protein: Protein was estimated following the method of Lowery *et al*. (1951).

Phenol: Phenol was estimated following the method of Swain and Hills (1959) and Basak *et al.* (1996).

Acidity: The acidity of fruit pulp was determined by titration of a known weight of sample with NaOH using Phenophthalein indicator. The value was calculated with reference to percent tartaric acid (Rangana, 1979).

Ascorbic acid: Ascorbic acid was estimated following titration method developed by Harris and Ray (1935).

Carotinoids: Carotenoid was evaluated following standard method of Arnon (1949)

Mineral elements: Some 0.5 g of fine powdered sample of each fruit was digested following wet digestion procedures using conc. HNO_3 and 30% H_2O_2. The digested samples were used for elemental analysis. Iron (Fe), Copper (Cu), Manganese (Mn) and Zinc (Zn) was determined using Atomic Absorption Spectrophotometer and Sodium (Na), Potassium (K), Calcium (Ca) using Flame photometer.

RESULTS

The research findings pertaining to the following parameters are presented in Table 2 and 3.

Proximate analysis: Mimusops elengi observed to be the fruit with lowest moisture content and *Ziziphus mauritiana* with the highest (87.41%). For other species, this value varied between 59-84%. Highest carbohydrate percentage was recorded in *Eugenia rothii* and lowest in *Terminalia citrina* (3.10%). Total sugar content, was found to be abundant in *Ziziphus rugosa* (20.7%) followed by *Eugenia rothii* (18%) and *Mimusops elengi* (15.9%). Least total sugar was seen in *Glycosmis pentaphylla* and *Streblus taxoides* (1.35%) (Table 2). Lower sugar content in *Streblus taxoides* explains why it is suitable to be used in making curry. Reducing sugar ranged between 0.04% to 8.20%, *Carissa spinarum* containing highest concentration. (Table 3)

Amount of non-reducing sugar ranged from 0.17% in *Carissa spinarum* to 19.13% in *Ziziphus rugosa.* Similarly, the protein content varied from 0.23% to 3.64%. The lowest amount of protein was recorded in *Morinda tinctoria* and the highest in *Carissa spinarum* followed by *Bridelia tomentosa* and *Polyalthia suberosa* (Table 2). The presence of acidity contributes to the sour taste of fruit. Out of 15 wild edible fruits studied, highest total acid content was recorded for *Ziziphus mauritiana* (0.78 %) and the lowest in *Terminalia citrina* and *Toddalia asiatica* (0.09%). Highest ascorbic acid (Vit-C) content was registered for *Terminalia citrina* (53.52 mg/100 g) and the lowest in *Glycosmis pentaphylla* (15.77 mg/100 g). Phenols, one of the antioxidants found in nature, was also abundant in some of these species. Highest phenol content was recorded in *Mimusops elengi* (3.10%) followed by *Terminalia citrina* (3.04%) and *Toddalia asiatica* (1.60%). The least phenol content was recorded in *Solanum torvum* (0.20%). Carotinoids, the tetraterpenoid compounds that are responsible for fruit colour are also rich source of antioxidants. Carotenoid content ranged between 13.90 to 139.00 mg/g; the highest being in *Toddalia asiatica* and the lowest in *Ziziphus rugosa* (Table 3).

Micronutrient analysis: The micronutrients in studied wild fruits were appreciably high. The highest iron content was recorded in *Glycosmis pentaphylla* (5.28 mg/100 g) and the lowest in *Ziziphus mauritiana* (1.04 mg/100 g). Amongst studied wild fruit species, maximum Copper and Zinc were noted in *Terminalia citrina*, i.e., 11.22 mg/100 g and 41.93 mg/100 g respectively. *Ziziphus oenoplia* registered highest Manganese content of 42.53 mg/100 g while *Ziziphus mauritiana* showed the lowest 0.52 mg/100 g. Sodium level varies between 5.03 mg/100 g (*Ziziphus mauritiana)* and 52.97 mg/100 g (*Mimusops elengi)*. Similarly, Potassium content was found to be highest in *Eugenia rothii* (2009.9 mg/100 g) and lowest in *Streblus taxoides* (256.39 mg/100 g). Maximum Calcium content was observed for *Mimusops elengi* (1975.16 mg/100 g) while lowest in *Ziziphus mauritiana* (15.73 mg/100 g) (Table 4).

DISCUSSION

A comparison was attempted relating to nutritional status of 15 most popular and commonly consumed fruits

Table 4: Micronutrient analysis

Fruit	Iron (mg/100 g)	Sodium (mg/100 g)	Potassium (mg/100 g)	Calcium (mg/100 g)	Copper (mg/100 g)	Manganese (mg/100 g)	Zinc (mg/100 g)
Bridelia tomentosa	ND	ND	ND	ND	ND	ND	ND
(Banana)	(0.26)	(1)	(358)	(5)	(0.078)	(0.27)	(0.15)
Carissa spinarum	ND	ND	ND	ND	ND	ND	ND
(Mango)	(0.13)	(2)	(156)	(10)	(0.11)	(0.027)	(0.04)
Eugenia rothii	4.29	25.67	2009.9	60.8	0.48	9.29	13.57
(Guava)	(0.26)	(2)	(417)	(18)	(0.23)	(0.15)	(0.23)
Glycosmis pentaphylla	5.28	31.03	675.78	88.87	1.87	4.04	2.95
(Apple)	(0.07)	(0)	(90)	(5)	(0.027)	(0.035)	(0.04)
Mimusops elengi	4.71	52.97	808.02	1975.16	0.51	8	2.1
(Pomegranate)	(0.30)	(3)	(236)	(10)	(0.15)	(0.11)	(0.35)
Morinda tinctoria	2.33	17.11	363.88	49.16	0.67	5.37	1.42
(Litchi)	(0.31)	(1)	(171)	(5)	(0.14)	(0.05)	(0.07)
Phyllanthus acidus	2.43	17.55	223.44	163.22	0.2	1.31	1.63
(Lemon)	(0.03)	(1)	(124)	(7)	(0.02)	(0.008)	(0.05)
Polyalthia suberosa	4.19	25.09	845.76	62.72	1.33	5.35	2.25
(Strawberry)	(0.22)	(37)	(292)	(22)	(ND)	(ND)	(ND)
Solanum torvum	5.22	31.98	745.01	146.57	1.37	7.51	3.41
(Grapes)	(0.29)	(2)	(191)	(14)	(0.04)	(0.71)	(0.04)
Streblus taxoidis	2.92	18.16	256.39	30.93	0.48	1.93	0.196
(Pineapple)	(0.29)	(1)	(109)	(13)	(0.11)	(0.92)	(0.12)
Terminalia citrina	3.11	18.65	1460.72	44.28	11.22	10.07	41.93
(Papaya)	(0.10)	(3)	(257)	(24)	(0.016)	(0.011)	(0.07)
Toddalia asiatica	3.36	27.47	599.09	66.48	0.33	5.84	1.35
(Orange)	(0.20)	(1)	(200)	(11)	(0.044)	(0.014)	(0.05)
Ziziphus mauritiana	1.04	5.03	327.34	15.73	0.17	0.52	0.49
(Cherry)	(0.20)	(7)	(146)	(12)	(0.086)	(ND)	(0.1)
Ziziphus oenoplia	4.28	26.15	720.38	94.76	1.3	42.53	2.57
(Pears)	(0)	(0)	(121)	(4)	(0.05)	(0.06)	(0.02)
Ziziphus rugosa	ND	ND	ND	ND	ND	ND	ND
(Sapota)	(1.25)	(5.9)	(269)	(ND)	(ND)	(ND)	(ND)

(Anonymous, 2010; Rathore, 2009) and 15 selected wild edible fruits. It revealed that most of the wild fruits qualify as high nutrient and mineral content comparable to popular cultivated counterparts as Banana and Guava. The carbohydrate content for instance in *Eugenia rothii* (19.01%), *Mimusops elengi* (18.15%) and *Ziziphus oenoplia* (17.13%) are at par with fruits like mango (17.00%) and pomegranate (17.17%). Similarly, sugar content which characterizes the taste of a fruit was found abundant in *Ziziphus rugosa* (20.70%) which comes second if compared with cultivated fruits. *Bridelia tomentosa* (15.75%), *Eugenia rothii* (18.00%), *Mimusops elengi* (15.90%) also register high sugar content akin to cultivated fruits like sapota (21.4%), grapes (16.25%) and pomegranate (16.57%). *Bridelia tomentosa* (3.17%) and *Carissa spinarum* (3.64%) showed higher protein content among all the studied fruits as well as their cultivar counterparts. The study shows that all the wild edible fruits under investigation are good sources of ascorbic acid or vitamin *C. phyllanthus acidus*, *Solanum torvum*, *Terminalia citrina*, *Ziziphus mauritiana* are comparable to contemporary cultivars such as papaya and strawberry and richer in Vit-C content than banana, apple, pomegranate and mango. The comparative study also revealed wild edible fruits to be superior in respect of mineral element composition. Iron content of most of the wild edible fruits under investigation was higher then their cultivated counterparts with highest iron content like pomegranate (0.30 mg/100 g), banana (0.26 mg/100 g) and guava (0.26 mg/100 g). The wild edibles as *Mimusops elengi*, *Solanum torvum* and *Glycosmis pentaphylla* showed analogous sodium concentration with strawberry, the fruit with highest sodium content. Calcium, Magnesium and Potassium are essential for making good of worn out cells, building of red blood cells and maintaining body mechanisms (WHO, 1996). Their absence in diet might result in weak, stunted growth and poor bone development (Effiong and Udo, 2010). Potassium was the most abundant mineral element and was found many folds higher in the wild fruits like *Eugenia rothii* (2009.9 mg/100 g) and Terminalia citrina (1460.72 mg/ 100 g) than the popular cultivars like guava (417 mg/100 g) and banana (358 mg/ 100 g). The Calcium content too was found to be much higher in wild fruits such as *Mimusops elengi* (1975.16 mg/100 g) and *Phyllanthus acidus* (163.22 mg/100 g) than conventional fruits like guava (18 mg/100 g) and strawberry (22 mg/100 g). Other works have also noted presence of useful nutrient in wild fruits (Eromosele *et al*., 1991; Nazarudeen, 2010).

CONCLUSION

The result highlighted significance of wild fruit species as cheap source of nutrient for rural poor. The food value of many wild fruits compared well with domesticated popular fruits as mango, banana, guava, papaya, sapota, etc. in terms of protein, carbohydrate or

Vitamin content. The analysis of 15 wild edible fruits bring into focus the rich nutritional composition of indigenous fruits and the scope for their use as an alternative source of bio-nutrition. The present work identified superior/identical nutritional status in terms of carbohydrate, sugar and protein and mineral contents in non cultivated indigenous forest species, i.e., *Eugenia rothii*, *Mimusops elengi*, *Ziziphus oenoplia*, *Zizipus rugosa*, *Bridelia tomentosa* and *Carissa spinarum* comparable to the cultivated fruits like mango, pomegranate, sapota, grapes, guava, cherry, banana and lemon etc. The analysis indicate the scope of using wild edible fruits for dietary supplement since it has valuable ingredients as Iron, Sodium, Potassium and Calcium Many other fruits of forest therefore need to be analyzed which could help in selecting promising species for inclusion in agro and farm-forestry and reforestation programme which have so far focused only on timber species. Wild fruit plantation not only improves food base for humans it helps in sustaining wild animals particularly herbivore and bird population. Further research on anti- nutrients and antioxidants of wild species would be useful in selecting nutritious fruits from wild resources of eastern India. Of particular importance are *Eugenia rothii*, *Mimusops elengi*, *Ziziphus oenoplia*, *Zizipus rugosa*, *Bridelia tomentosa* and *Carissa spinarum* that had significant level of micronutrient and minerals which are promising species for promotion as backyard planting especially farming systems suffering from crop loss, food shortage and chronic malnutrition.

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