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Nutritional Composition of Wild Edible Fruits in Meghalaya State of India and Their Ethno-botanical Importance

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ABSTRACT

This study was carried out to analyze the nutritional value of some wild edible fruits like of *Morus indica* Linn. (Moraceae), *Myrica nagi* Thunb (Myricaceae), *Myrica esculenta* Buch-Ham ex D. Don. (Myricaceae), *Parkia roxburghii* G. Don (Mimosaceae), *Prunus nepalensis* Ser (Steud) (Rosaceae) and *Terminalia bellerica* Roxb (Combretaceae), by determining proximate and phytochemical composition using standard method of food analysis like AOAC. The present study revealed that for different plant species the crude fat content ranged between 1.36±0.04-5.07±0.05%. The crude protein content was determined highest in the fruits of *P. roxburghii* (19.75±0.03%) while the available carbohydrate content was highest in *M. indica* (84.04±0.12%). The nutritive value ranged from 366.57±0.62-395.04±0.54 kcal/100 g in the various wild edible fruits. Among the various macronutrients estimated in the plant samples of different wild edible plants potassium was present in the highest quantity (7.28±0.10-12.73±0.12 mg g^{-1}) followed by calcium (4.23±0.07-9.75±0.11 mg g^{-1}) and sodium (0.395±0.005-1.01±0.01 mg g^{-1}). Micronutrients, such as iron, zinc, copper, manganese and chromium were analyzed in the different plant specimens. The result indicates that nutritional values and mineral contents of these wild fruits under investigation were richer than that of the commercial fruits and very much comparable with the various wild fruits reported earlier. The present study also gives an account of ethnobotanical importance of the wild fruits under investigation.

Key words: Wild edible fruits, nutritional composition, mineral contents, traditional use

INTRODUCTION

The present communication deals with the evaluation of nutritional potential of six wild edible fruits like *M. indica* , *M. nagi*, *M. esculenta*, *P. roxburghii* , *P. nepalensis* and *T. bellerica*, collected from different market of Meghalaya state, India. The main target of our research was to find out the nutritional potential of these wild edible fruits. The traditional use and ethnobotanical importance of these plant has also been mentioned.

Morus indica Linn known as Soh Lyngdkhur (Khasi) in Meghalaya state, belongs to the family Moraceae. Ripe fruits are black in colour and eaten by the local people and used in the treatment of fever. The decoction of the leaves are used as gargle in inflammation of vocal cords (Chopra *et al*., 2006).

Myrica nagi Thunb is known as Sohphie (Khasi) in Meghalaya state, belongs to the family Myricaceae. The fruits of this plant are eaten raw and also used for as pickle (Kayang, 2007). The stem bark is taken in powdered form against dysentery (Maikhuri and Gangwar, 1993).

Myrica esculenta Buch.-Ham. ex D. Don, belongs to the family Myricaceae, is a popular, potentially income-generating wild edible in the Indian Himalaya and commonly known as Soh

Phienam (Khasi) in Meghalaya state. The fruits of this plant are edible and used to prepare the refreshing drink. The Bark is astringent, carminative, antiseptic and decoction used in asthma, fever, chronic bronchitis, lung infections, dysentery and in toothache. The leaf, fruit, root and bark are used for worms, jaundice, dysentery (Laloo *et al*., 2006).

Parkia roxburghii G. Don. belongs to family Mimosaceae, locally known as Zong Tan in Mizoram and Jong Sak in Manipuri . In Manipur it is considered as the most costly vegetable. Both flowers and pods are eaten as vegetable. The Manipuri takes this vegetable as raw in preparation of "Singju", a typical Manipuri salad. Sometime this may be mixed with fish and in preparation of typical delicious curry the "Iromba". Mizos, Garos, Kacharis, Nagas, Mikirs are also consuming the pods as vegetables. In Malaya, both seeds and pods are valued in medicine. Pods pounded in water are also used for washing the head and face. Bark and the leaves are employed in making lotion for skin diseases and ulcer (Bhuyan, 1996).

Prunus nepalensis Ser (Steud) belongs to family Rosaceae locally known as Soh Iong in Khasi hills of Meghalaya. The fruits are edible and also used to make fruit juice called as Um Soh-Iong in khasi. Fruits are astringent, leaf are diuretic and used in dropsy (Agrahar-Murugkar and Subbulakshmi, 2005).

Terminalia bellirica Roxb. belongs to family Combretaceae locally known as Humra guti in Meghalaya. The seeds are eaten by local people for curing gastric problem and stomach disorders. The fruits of this plant are used in piles, dropsy, leprosy, biliousness, dyspepsia and headache (Chopra *et al*., 2006). The fruit possesses antibacterial properties and myocardial depressive activity (Herbal Monograph, 2002, Himalaya herbal health care, The Himalaya Drug Company).

In developing countries, wild plants are exploited as sources of food and other life supporting commodities and thus provide an adequate level of nutrition to the human beings (Aberoumand and Deokule, 2010). These wild plants serve as an indispensable constituent of human diet supplying the body with minerals, vitamins and certain hormone precursors, in addition to protein and energy (Akubugwo *et al*., 2007). The wild edible plants with high diversity are widely distributed in mountain forests and are valuable source of food and medicines for domestic and commercial purposes. Presently many people are using mostly of ancient lineage ones as major crops. There has been hardly single food crop domesticated in modern times which leads to less diversity in human diets. It has been observed that various types of nutritional ailments occur in the zones where there plenty of wild edible fruits and leafy greens with rich nutritive potential are available. These underutilized plants apart from their rich nutritive potential, provide variety to our diets (Pradheep *et al*., 2003). It has also been observed that edible fruits contain tannins which serve as a natural defense mechanism against microbial infections. Tannins have also been reported to exert other physiological effects, such as to accelerate blood clotting, reduce blood pressure, decrease the serum lipid level, produce liver necrosis and modulate immunoresponses (Bele *et al*., 2010).

Meghalaya is a small state in north-eastern India. About one third of this state is forested. The Meghalaya subtropical forests ecoregion encompasses the state; its mountain forests are distinct from the lowland tropical forests to the north and south (Mao *et al*., 2009). The forests of Meghalaya are notable for their biodiversity of mammals, birds, and plants (Kayang, 2007). A large part of the region is botanically under-explored or even unexplored. In the hilly regions, population density is very low. Most of the area lacks industrialization and communications and, consequently, is under-developed. The local inhabitants subsist on limited agriculture and local products of plant and animal origin. The area is, thus, very interesting ethnobotanically (Jain and Dam, 1979). The

forests of Meghalaya provide a large number of plants whose fruits, seeds tubers, shoots etc make an important contribution to the diet of the local people. These plants also provide some useful products like medicine, fibre, fodder, dyes etc. (Kayang, 2007). The study of wild edible plants is important not only to identify the potential sources which could be utilized as alternative food but also to select promising types for domestication.

MATERIALS AND METHODS

Plant materials: The six wild edible fruits e.g., *M. indica, M. nagi, M. esculenta, P. roxburghii, P. nepalensis* and *T. bellerica* were purchased from different market of Meghalaya state, India on March 2010 and authenticated in our office. The voucher specimens were preserved in the Plant Chemistry department of our office under registry No. BSITS 26, BSITS 27, BSITS 28, BSITS 29, BSITS 30 and BSITS 31, respectively. The plant parts were shed-dried, pulverized and stored in an airtight container and proximate composition and mineral contents were carried out in our laboratory.

Estimation of ash: Five gram of each sample was weighed in a silica crucible and heated in muffle furnace for about 5-6 h at 500°C. It was cooled in a desiccator and weighed. It was heated again in the furnace for half an hour, cooled and weighed. This was repeated consequently till the weight became constant (ash became white or grayish white). Weight of ash gave the ash content (Indrayan *et al*., 2005).

Estimation of moisture: Two gram of each sample was taken in a flat-bottom dish and kept overnight in an air oven at 100-110°C and weighed. The loss in weight was regarded as a measure of moisture content (Indrayan *et al*., 2005).

Estimation of crude fat: Two-gram moisture free of each sample was extracted with petroleum ether (60-80°C) in a Soxhlet apparatus for about 6-8 h. After boiling with petrol, the residual petrol was filtered using Whatman No. 40 filter paper and the filtrate was evaporated in a preweighed beaker. Increase in weight of beaker gave crude fat (AOAC, 1990).

Estimation of crude fibre: Two gram of moisture and fat-free material of each sample was treated with 200 mL of 1.25% H_2SO_4. After filtration and washing, the residue was treated with 1.25% NaOH. It was the filtered, washed with hot water and then 1% HNO_3 and again with hot water. The washed residue was dried in an oven at 130°C to constant weight and cooled in a dessicator. The residue was scraped into a pre-weighed porcelain crucible, weighed, ashed at 550°C for two hours, cooled in a dessicator and reweighed. Crude fibre content was expressed as percentage loss in weight on ignition (AOAC, 1990).

Estimation of crude protein: The crude protein was determined using micro Kjeldahl method. The total protein was calculated multiplying the evaluated nitrogen by 6.25 (AOAC, 1990).

Estimation of available carbohydrate: Percentage of available carbohydrate was given by: 100-(percentage of ash+percentage of fat+percentage of protein + percentage of crude fibre) (AOAC, 1990).

Estimation of nutritive value (energy): Nutritive value of each plant samples were determined by multiplying the values obtained for protein, fat and available carbohydrate by 4.00, 9.00 and 4.00, respectively and adding up the values (Guil-Guerrero *et al*., 1998).

Estimation of minerals in plant material: Plant material was taken in a precleaned and constantly weighed silica crucible and heated in a muffle furnace at 400°C till there was no evolution of smoke. The crucible was cooled at room temperature in a desiccator and carbon-free ash was moistened with concentrated sulphuric acid and heated on a heating mantle till fumes of sulphuric acid ceased to evolve. The crucible with sulphated ash was then heated in a muffle furnace at 600°C till the weight of the content was constant (~2-3 h). One gram of sulphated ash obtained above was dissolved in 100 mL of 5% HCl to obtain the solution ready for determination of mineral elements through atomic absorption spectroscopy (AAS) (AA 800, Perkin-Elmer Germany). Standard solution of each element was prepared and calibration curves were drawn for each element using AAS (Indrayan *et al*., 2005).

Statistical analysis: All assays were carried out in triplicate and values were obtained by calculating the average of three experiments using Excel programme (Microsoft Excel v. 2007) and data are presented as Mean±SEM.

RESULTS AND DISCUSSION

The edible parts of six fruits e.g., *M. indica*, *M. nagi*, *M. esculenta*, *P. roxburghii*, *P. nepalensis* and *T. bellerica* collected from different places of Meghalaya market have a relatively high moisture content when compared to ash, crude protein, crude fat, crude fibre and available carbohydrate content and it is shown in Table 1.

The edible parts of all plants contain minerals like sodium, potassium, calcium, manganese, chromium, iron, zinc and copper in varying concentration with potassium having highest concentration and it is shown in Table 2. The proximate composition of some commercial and wild fruits are given in Table 3 and 4, respectively and mineral contents of the same are given in Table 5 and 6, respectively.

The proximate analysis of the nutritive contents of six plants are depicted in Table 1. The ash content which is an index of mineral contents, ranged from 1.91±0.03% (in *M. nagi*) to 8.73±0.02% (in *M. indica*) and these compare favourably with the values reported for some commercial fruits (range 1.0-6.9.%, Table 3) (Gopalan *et al*., 2004) and the ash content reported for some wild edible fruits like *Baccaurea sapida* (3.85%), *Terminalia chebula* (3.91%) were also similar with the investigated fruits (Table 4) (Sundriyal and Sundriyal, 2004).

The Moisture content was found highest in the fruits of *M.indica* (90.36±0.14%) and least in *T. bellirica* (56.30±0.16%) and these figures are similar to commercial fruits like apple (84.6%), mango ripe (81%) (Table 3) and wild edible fruits such as *Eleagnus latifolia* (87.31%), *M. alba* (84.10%) and *T. chebula* (53%) (Table 4).

The crude protein contents ranged from 1.04±0.05% in *M. indica* to 19.75±0.03% in *P. roxburghii*. The crude protein content in *P. roxburghii*. (25.49±0.10%) was found to be almost similar to commercial fruits like almond (20.80%), cashenut (21.20%) and higher than walnut (15.60%) (Table 3). The analysis also showed that the protein content in *M. nagi* (9.28±0.08%), *M.esculenta* (9.62±0.03%) and *T. bellirica* (8.74±0.04%) were higher than those of

Table 1: Nutritional parameters of the plants collected from meghalaya

Name of the Plant	Local name at Meghalaya	Parts used	Ash (%)	Moisture (%)	Crude fat (%)	Protein (%) (6.25x % of N)	Crude fibre(%)	Available (%) Carbohydrate	Nutritive value (kcal/100 g)
Morus indica	Soh Lyngdkhur	Fruits	8.73±0.02	90.36±0.14	5.07±0.05	1.04±0.05	1.10±0.03	84.04±0.12	386.00±0.30
Myrica nagi	Soh Phienam	Fruits	1.91±0.03	71.40±0.27	4.93±0.05	9.28±0.08	7.53±0.22	76.33±0.26	386.88±1.25
Myrica esculenta	Soh Phienam	Fruits	2.18±0.02	72.38±0.23	4.93±0.06	9.62±0.03	5.22±0.08	78.03±0.14	395.04±0.54
Parkia roxburghii	Zongtan , Jong Sak	Fruits	4.23±0.05	73.56±0.21	2.96±0.05	19.75±0.03	4.24±0.02	68.81±0.08	380.93±0.29
Prunus nepalensis	Soh Iong	Fruits	4.83±0.04	67.34±0.14	1.36±0.04	6.00±0.05	5.22±0.08	82.57±0.17	366.57±0.62
Terminalia bellirica	Humra Guti	Fruits	4.07±0.05	56.30±0.16	3.55±0.03	8.74±0.04	4.90±0.06	78.72±0.04	381.87±0.23

Each value in the table was obtained by calculating the average of three experiments and data are presented as Mean±SEM

Table 2: Mineral value of plants collected from meghalaya

			Minerals present mg g^{-1}							
Name of the Plant	Local name at Meghalaya	Parts used	Na	K	Ca	Mn	Cu	Fe	Cr	Zn
Morus indica	Soh Lyngdkhur	Fruits	1.01±0.01	10.86±0.10	9.75±0.11	0.102±0.0002	0.007±0.0001	0.309±0.0015	NT	0.326±0.0016
Myrica nagi	Soh Phienam	Fruits	0.75±0.01	7.63±0.11	4.23±0.07	0.041±0.0002	0.005±0.0002	0.417±0.0017	NT	0.317±0.0017
Myrica esculenta	Soh Phienam	Fruits	0.81±0.013	7.75±0.11	4.63±0.06	0.032±0.0001	0.004±0.0002	0.404±0.0021	NT	0.216±0.0016
Perkia roxburghii	Zongtan, Jong Sak	Fruits	0.72±0.014	12.73±0.12	9.26±0.10	0.089±0.0003	0.005±0.0002	0.068±0.0001	NT	0.383±0.0011
Prunus nepalensis	Soh Iong	Fruits	0.395±0.005	11.75±0.09	7.30±0.11	0.049±0.0002	0.005±0.0002	0.213±0.0001	NT	0.258±0.0015
Terminalia bellirica	Humra Guti	Fruits	0.46±0.014	7.28±0.10	5.26±0.12	0.016±0.0001	0.008±0.0002	0.823±0.0011	NT	0.114±0.0007

Each value in the table was obtained by calculating the average of three experiments and data are presented as Mean±SEM, NT = Not traceable

Table 3: Nutritional parameters of some commercial fruits

Name of the plant	Ash (%)	Moisture (%)	Crude fat (%)	Protein (%) (6.25x % of N)	Available carbohydrate (%)	Crude fibre (%)	Nutritivevalue (kcal/100 g)
Almond	-	5.20	58.90	20.80	10.50	1.70	655.00
Apple	1.2	84.60	0.30	0.20	13.70	3.40	58.00
Cashenut	-	5.90	46.90	21.20	22.30	1.30	596.00
lichi	1.0	84.10	0.20	1.10	13.60	0.50	61.00
Mango ripe	1.1	81.00	0.40	0.60	16.90	0.70	74.00
Papaya ripe	1.3	90.80	0.10	0.60	7.20	0.80	32.00
Walnut	-	4.50	64.80	15.60	11.00	2.60	687.00
Wood apple	6.9	64.20	3.70	7.10	18.10	5.00	134.00

Table 4: Nutritional parameters of some wild edible fruits

Name of the plant	Ash (%)	Moisture (%)	Crude fat (%)	Protein (%) (6.25x % of N)	Available carbohydrate (%)	Crude fibre (%)	Nutritive value (kcal/100 g)
Baccaurea sapida	3.85	35.59	0.73	5.58	51.90	20.40	236.50
Eleagnus latifolia	3.16	87.31	0.52	7.80	74.06	9.30	332.10
Hippophae rhamnoides	2.50	80.50	9.33	10.32	32.53	5.06	208.70
Prunus cerasoides	3.11	83.00	0.59	3.50	84.07	7.32	355.60
Morus alba	2.10	84.10	0.21	5.50	87.55	2.15	374.10
Terminalia chebula	3.91	53.00	3,90	1.25	80.61	7.10	362.50

Table 5: Mineral contents in some commercial fruits

	Minerals present (mg/100 g)							
Name of the plant	Na	K	Ca	Mn	Cu	Fe	Cr	Zn
Almond	-	-	230	1.88	0.97	5.09	0.161	3.57
Apple	28	75	10	0.14	0.10	0.66	0.008	0.06
Cashenut	-	-	50	1.42	1.66	5.81	0.163	5.99
Lichi	24.9	159	10	-	0.30	0.70	-	
Mango ripe	26	205	14	0.13	0.11	1.30	0.006	0.27
Papaya ripe	6	069	17	-	0.20	0.50	-	-
Walnut			100	2.62	1.67	2.64	0.101	2.32
Wood apple	-	-	130	0.18	0.21	0.48	0.006	0.46

Table 6: Mineral contents in some wild edible fruits

	Minerals present (mg/100 g)							
Name of the plant	Na	K	Ca	Mn	Cu	Fe	Cr	Zn
Baccaurea sapida	35	730	158	-	0.076	75	-	0.60
Eleagnus latifolia	51	910	1470	-	0.046	180	-	1.186
Hippophae rhamnoides	-	-	166	-	0.023	56	-	0.880
Prunus cerasoides	23	470	204	-	0.011	211	-	0.201
Terminalia chebula	78	1270	811	-	0.042	31	-	0.442

some lesser known wild fruits such as *Hippophae rhamnoides* (10.32%), *E. latifolia* (7.80%), *B. sapida* (5.58%) and *Morus alba* (5.50%) (Table 4) (Sundriyal and Sundriyal, 2004). An appreciable quantity of crude protein also present in fruits of *P. nepalensis*. In the present study it could be stated that the plants analysed for their nutritive values are richer than the cultivated

and lesser known wild edible fruits in the point of protein contents and will go a long way in meeting the protein requirement of the local people.

Crude fat contents of the plants investigated varied between 1.36±0.04% (*P. nepalensis*) and 5.07±0.05% (in the fruits of *M. indica*) and the crude fat content of these plants were more than the reported values (0.1-3.7%) for some wild and commercial fruits such as apple (0.3%), wood apple (3.7%), *B. sapida* (0.73%), *E. latifolia* (0.52%), *T. chebula* (3.90%), consumed in India (Table 3, 4) (Gopalan *et al*., 2004; Sundriyal and Sundriyal, 2004).

The fruits of *M. indica* , *M. nagi*, *M. esculenta*, *P. roxburghii* , *P. nepalensis* and *T. bellerica* with high content of available carbohydrates (84.04±0.12%, 76.33±0.26%, 78.03±0.14%, 68.81±0.08% , 82.57±0.17% and 78.72±0.04% respectively), compared well to that reported for some well known fruits like almond (10.50%), apple (13.7%), wood apple (18.1%) (Gopalan *et al*., 2004) and fruits of some wild plants like *B. sapida* (51.90%), *E. latifolia* (74.06%), *P. cerasoides* (84.07%), *M. alba* (87.55%) and *T. chebula* (80.61%) (Table 4) (Sundriyal and Sundriyal, 2004) and these could be a supplements in feed formulations.

The fruits of *M. nagi* contained the highest amount of crude fibre (7.53±0.22%) and *M. indica*, the lowest content (1.10±0.03%) and similar to commercial fruits like apple (3.4%), almond (1.70%), cashenut (1.30%), *E.latifolia* (9.30%), *T. chebula* (7.10%), *M. alba* (2.15%) (Table 3, 4) (Sundriyal and Sundriyal, 2004; Gopalan *et al*., 2004). Adequate intake of dietary fibre can lower the serum cholesterol level, risk of coronary heart disease, hypertension, constipation, diabetes, colon and breast cancer (Rao *et al*., 1998; Ishida *et al*., 2000). The RDA of fibre for children, adults, pregnant and lactating mothers are 19 – 25, 21-38, 28 and 29 g, respectively (Jimoh *et al*., 2011).

The results obtained from analytic chemical analysis of all six wild edible fruits establishes that nutritive value of the fruits of *M. esculenta* was maximum (395.04±0.54 kcal/100 g) followed by *M. nagi* (386.88±1.25 kcal/100 g), *M. indica* (386.00±0.30 kcal/100 g) and *T. bellirica* (381.87 ±0.23 kcal/100 g). The calorific value of the plants under investigations are well compared to the commercial and wild edible fruits (Table 3, 4). It indicates that these plants could be an important source of dietary calorie. High calorific content of the plants could be attributed to high carbohydrate and protein contents.

The mineral composition in edible parts of the plants are shown in Table 2. High concentrations of sodium (Na) were present, ranging from 39.5±0.5 mg/100 g (*P. nepalensis*) to 101±1.00 mg/100 g (*M. indica*). The sodium levels of some commercial fruits vary between 6-28 mg/100 g (Table 5) (Gopalan *et al*., 2004) and for some wild fruits ranged from 23-78 mg/100 g (Table 6) (Sundriyal and Sundriyal, 2004) The potassium (K) content was higher in the fruits of *Parkia roxburghii* (1273±12.00 mg/100 g) and least in *T. bellirica* (728±10.00 mg/100 g). Na and K take part in ionic balance of the human body and maintain tissue excitability. Na plays an important role in the transport of metabolites and K is important for its diuretic nature. The ratio of K/Na in any food is an important factor in prevention of hypertension and arteriosclerosis, with K depresses and Na enhances blood pressure (Saupi *et al*., 2009). The ratio of K/Na were significant in the fruits of *P. nepalensis* (29.74), *P. roxburghii* (17.68), *T. bellirica* (15.82) and compared well with some wild fruits such as *B.sapida* (20.85), *E.latifolia* (17.84) and *T. chebula* (16.28). Therefore consumption of these plants would probably reduce high blood pressure diseases because their K/Na is greater than one (FND, 2002).

The calcium (Ca) content was highest in the fruits of *M.Indica* (975.0±11.0 mg/100 g) followed by in *P. roxburghii* (926.0±10.00 mg/100 g), *P. nepalensis* (730.0±11.00 mg/100 g), *T. bellirica*

(526.0±12.00 mg/100 g). An appreciable amount of calcium is present in the fruits of *M. esculenta*, and in *M. nagi*. The calcium levels of some commercial fruits vary between 10.0-230.0 mg/100 g (Table 5) (Gopalan *et al.*, 2004) and in case of some wild fruits the calcium level ranged between 158-1470 mg/100 g (Table 6) (Sundriyal and Sundriyal, 2004). Ca constitutes a large proportion of the bone, human blood and extracellular fluid (Indrayan *et al.*, 2005). So intake of these plants are very much required for the normal functioning of the cardiac muscles, blood coagulation, milk clotting and the regulation of cell permeability.

Copper is another trace element essential in human body where it exists as an integral part of copper proteins ceruplasmin, the enzyme that catalyzes the oxidation of iron ion (Saupi *et al.*, 2009). The sufficient amount of Copper (Cu) was present in the fruits of *T. bellirica* (0.8±0.02 mg/100 g) and in *M. indica* (0.7±0.01 mg/100 g).

An appreciable quantity of Zinc (Zn) was found to be present ranging from 11.4±0.07 mg/100 g (*T. bellirica*) to 38.3±0.11 mg/100 g (*P. roxburghii*) and compares favourably to most values reported for commercial and wild fruits (Table 5, 6). Zn is a co-factor for a number of enzyme including some enzymes which play a central role in nucleic acid metabolism. In addition, Zn is a membrane stabilizer and a stimulator of the immune response. Its deficiency leads to growth failure and poor development of gonadal function (Indrayan *et al.*, 2005; Gopalan *et al.*, 2004).

The Manganese (Mn) concentrations of the plants studied varied between 1.6±0.01 to 10.2±0.02 mg/100 g. The highest Mn values was found in the fruits of *M. indica* and appreciable amount of this element were observed in all other plants and our results were in the limits. This element is very much essential for haemoglobin formation (Indrayan *et al.*, 2005). Manganese is one of the most important minerals for human physiology and daily requirement for healthy person is 4.50 mg (Sekeroglu *et al.*, 2006).

High concentration of iron (Fe) were present in the fruits of *T. bellirica* (82.3±0.11 mg/100 g), *M. nagi* (41.7±0.17 mg/100 g) and in *M. esculenta* (40.4±0.21 mg/100 g) and very good amount of iron present in *M. indica* (30.9±0.15 mg/100 g) and in *P. nepalensis* (21.3±0.01 mg/100 g). So the mineral findings of all these plants obtained from present study were similar and comparable to the commercial and wild fruits (Table 5, 6) (Gopalan *et al.*, 2004; Sundriyal and Sundriyal, 2004).

CONCLUSION

The study showed that the wild edible fruits collected from Meghalaya State in India were rich in protein, available carbohydrate, crude fibre and minerals investigated and the results suggests that consumption of these plants in sufficient amount could be used for nutritional purpose of human being and adequate protection may be obtained against diseases arising from malnutrition. This type of study could contribute to educate the tribal people about their importance and improve food scarcity in tribal areas. These wild fruit plants can be incorporated in commercial crop plants and This will also improve the tribal economy.

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