9th International Food Data Conference
14-17 September, 2011. Norwich, UK

Nutritional composition of minor indigenous fruits: cheapest nutritional sources in the rural peoples of Bangladesh

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9th International Food Data Conference
Biodiversity and Sustainable Diets
September 14 – 17, 2011, NBI Conference Centre,
Norwich, United Kingdom
14 September, 2011. Time: 15.25-15.40

Introduction

❖ Sound health is very important for human survival, as there are different human health related problems due to diets lacking sufficient vitamins and minerals.

❖Like other developing countries, micronutrients such as ascorbic acid, vitamin A, and minerals are limiting in Bangladeshi diet.

❖Malnutrition is a severe problem in Bangladesh and more than 80 percent of the peoples are suffering from malnutrition (BBS, 2006)

Introduction (contd.)

❖In Bangladesh about 10 million children`s become completely/ partially blind every year (BBS, 2006)

❖In order to overcome nutritional problem, much attention has been centered staple food as well as on the exploitation and utilization of unusual plant materials also for food (Marfo, *et.al.*, 1988).

❖Minor fruits:

Minor fruits are not cultivated with much care and not largely or commercially due to less commercial values. It is also called underutilized fruits. Its total production is negligible.

Introduction (contd.)

❖These minor fruits can be good source of micronutrients.

❖ Underutilized fruits can be used as alternative sources to combat hidden hunger such as vitamin A deficiency (Bioversity International, 2004).

❖Now-a-day, increased minor/ underutilized fruits substantially contributing to overcome the malnutrition in Bangladesh. (Rahim *et. al*., 2008).

Objectives

This experiment was carried out as a part of the development of new food composition database for Bangladesh.

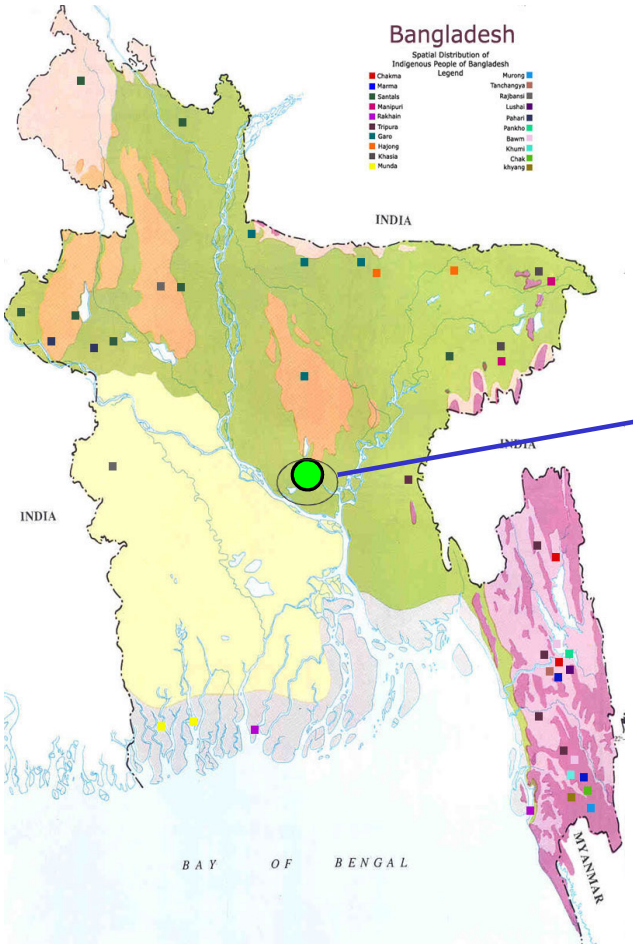
❖To analyze the ascorbic acid carotenoids and minerals content of different indigenous minor fruits of Bangladesh.

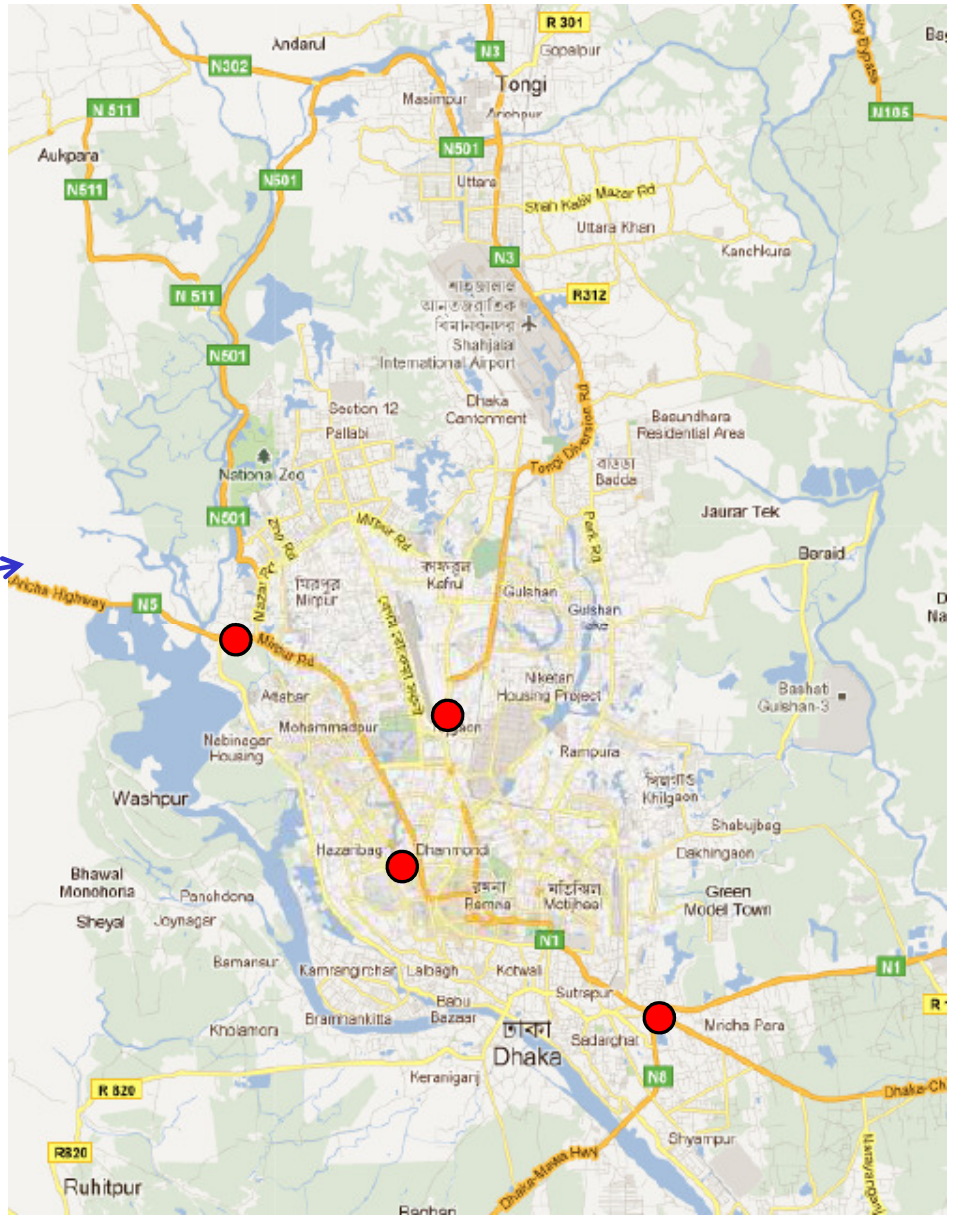
❖ To create people awareness of the nutrient composition of indigenous fruits that they should intake it to keep them healthy, and

❖ To create awareness to grow more indigenous fruits tree and to save the minor indigenous fruits tree from extinction

MATERIAL AND METHODS

SL. No.	Bengali name	English name	Scientific Name	Family
01.	Dewa	Monkey jack	*Artocarpus lakoocha*	Moraceae
02.	Lotkon	Burmese grape	*Pirardia sapida*	Phyllanthaceae
03.	Orboroi	Orboroi/Star goose berry	*Phyllunthus acidus*	Euphorbiaceae
04.	Karamcha	Karanda	*Carisa carundus*	Apocynaceae
05.	Kawfal	Mangosteem	*Garcinia mangostana*	Clusiaceae
06.	Bel	Wood apple	*Aegle mermelous*	Rutaceae
07.	Kalo jam	Black berry	*Syzygium cumini*	Myrtaceae
08.	Payla /paniala	Flacourtia	*Flacourtia jangomas*	Flacourtiaceae
09.	Chokai	Roselle	*Hibiscus sabdariffa*	Malvaceae
10.	Nunia	--	--	--


Bangladesh
Spatial Distribution of Indigenous People of Bangladesh
Legend
Chakma
Marma
Santals
Manipuri
Rakhain
Tripura
Garo
Hajong
Khasia
Munda
Murong
Tanchangya
Rajbansi
Lushai
Pahari
Pankho
Bawm
Khumi
Chak
Khyang
INDIA
INDIA
INDIA
BAY OF BENGAL
MYANMAR


Andarul
Tongi
Gopalpur
Masimpur
Aukpara
Uttara
Uttara Khan
Kanchkura
Shahjalal International Airport
Dhaka Cantonment
Section 12
Pallabi
Basundhara Residential Area
National Zoo
Badda
Jaurar Tek
Beraid
Mirpur
Kafru
Gulshan
Niketan Housing Project
Bashati Gulshan-3
Asadar
Mohammadpur
Nabinagar Housing
Rampura
Khilgaon
Washpur
Shabujbag
Hazaribag
Dakhingaon
Bhawal Monohona
Panchdona
Sheyal
Joynagar
Green Model Town
Bamansur
Kamrangirchar
Lalbagh
Kotwal
Sutrapur
Brahmankitta
Babu Bazaar
Khilamora
Dhaka
Sadarghat
Nricha Para
Keranigarj
Shyampur
Ruhitpur
Aricha Highway
Mirpur Rd
Tongi Diversion Rd
Park Rd
Dhaka-Mawa Hwy
N3
N302
N511
N501
R301
R312
N105
R820
N1
N6

SAMPLING PROTOCOL

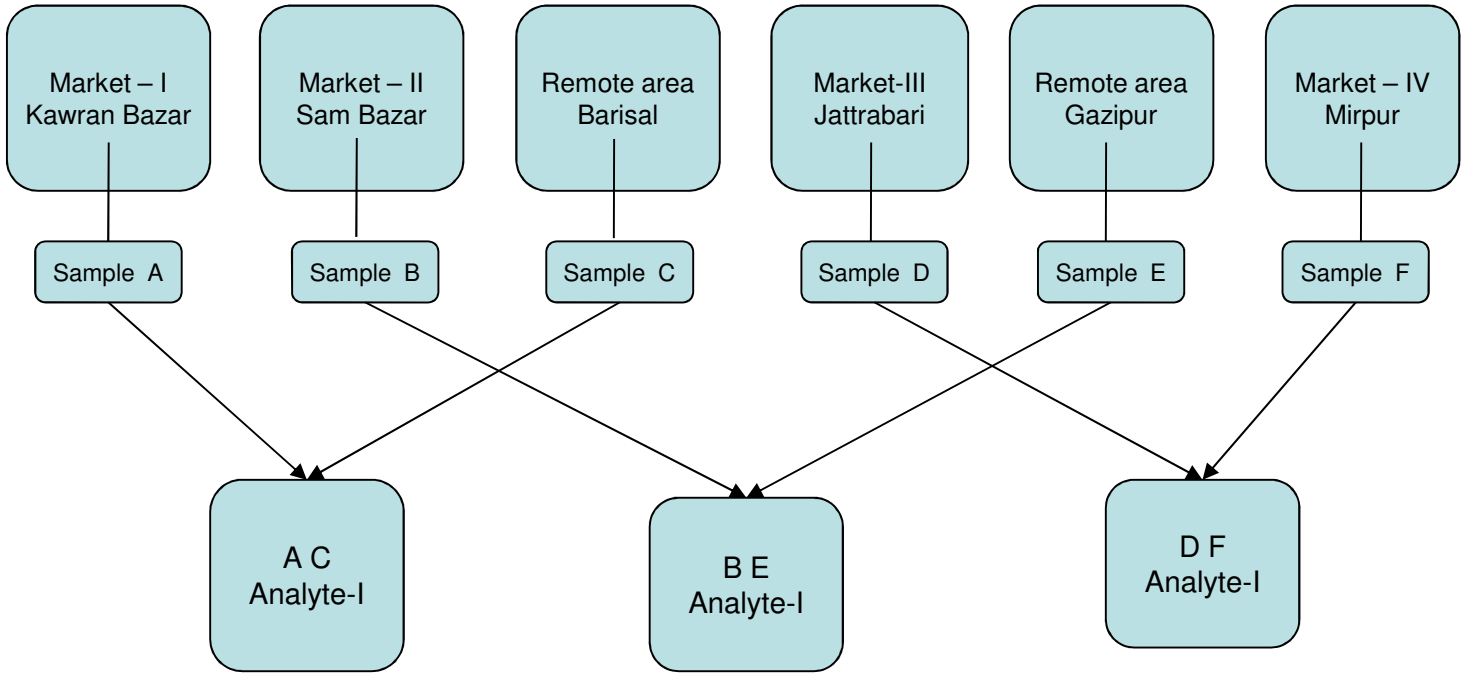


Fig.1. Multi-regions sampling plan

Ripen *Artocarpus lakoocha*

Open *Artocarpus lakoocha*

Orboroi (*Phyllanthus acidus*) tree with fruits

Orboroi in the laboratory

Lotkan tree with fruits (*Baccaurea ramiflora)*

Karamcha *(Carisa carundus)*fruits In the laboratory

Mangosteen (*Garcinia mangostana*) fruits

Branch of bael (*Aegle marmelous*) tree with fruit

Black berry (*Syzygium cumini*) fruits

Paila (*Flacourtia jangomas)* fruits to be analyzed

Roselle (*Hibiscus sabdariffa)*

Bunch of Nunia/Takituki fruit in the laboratory

Methods of analysis

Ascorbic acids and carotenoids -analyzed by spectrophotometric measurement (AOAC , 1998)

Macro minerals (Ca, Mg, K and P) were analyzed by flame photometric and spectrophotometric procedures

Trace elements (Fe, Mn, Zn and Cu) were analyzed by atomic absorption spectrophotometry.

Data were processed by using Latentix 2 software (Latent5, Denmark, 2005-2008) for Principal component analysis.

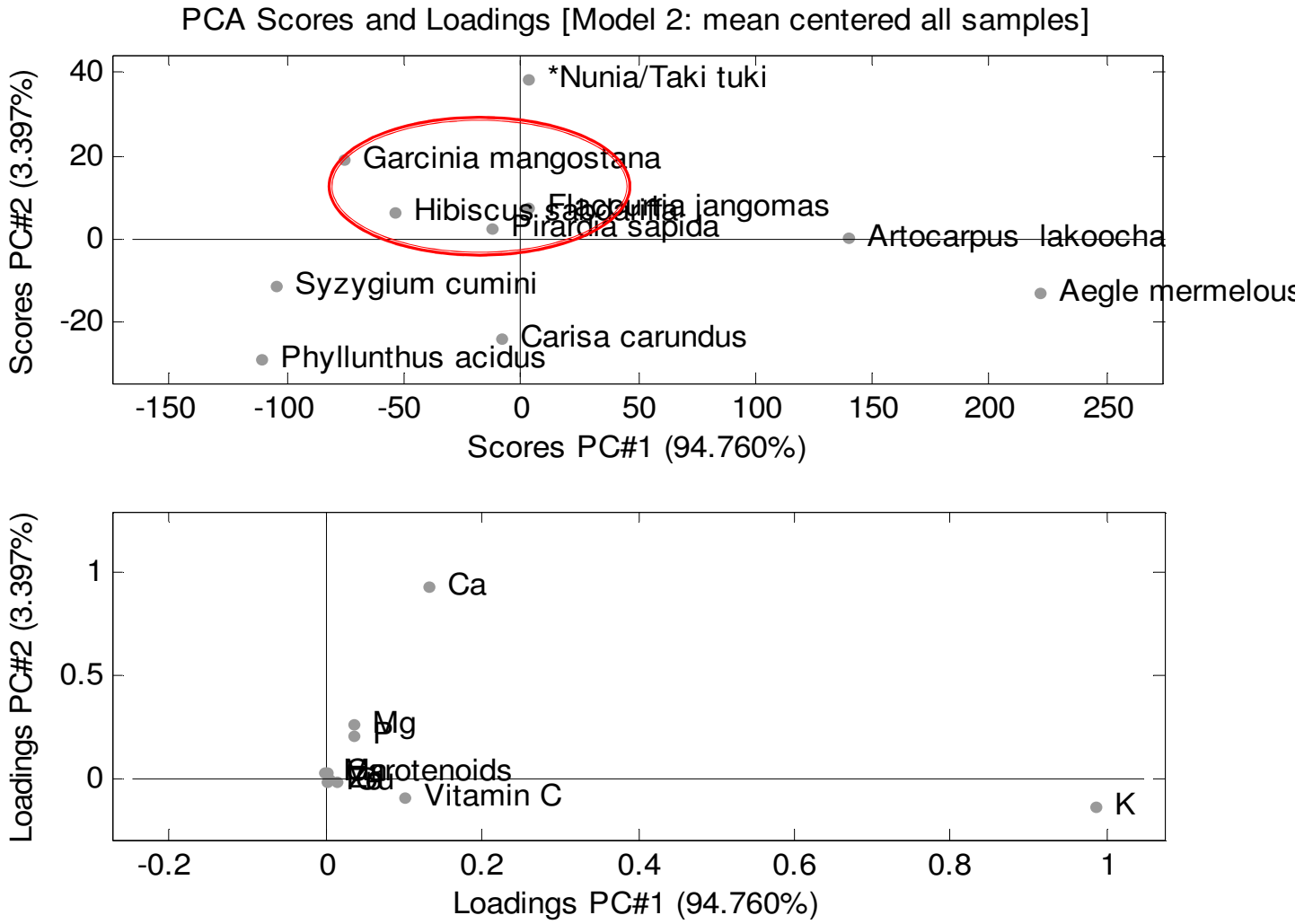
AOAC- Association of Official Analytical Chemists

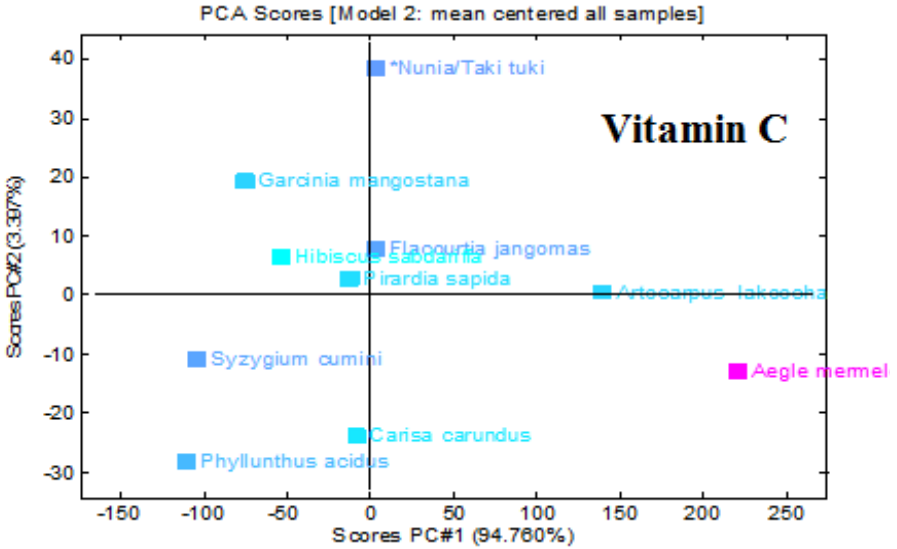
RESULTS AND DISCUSSION

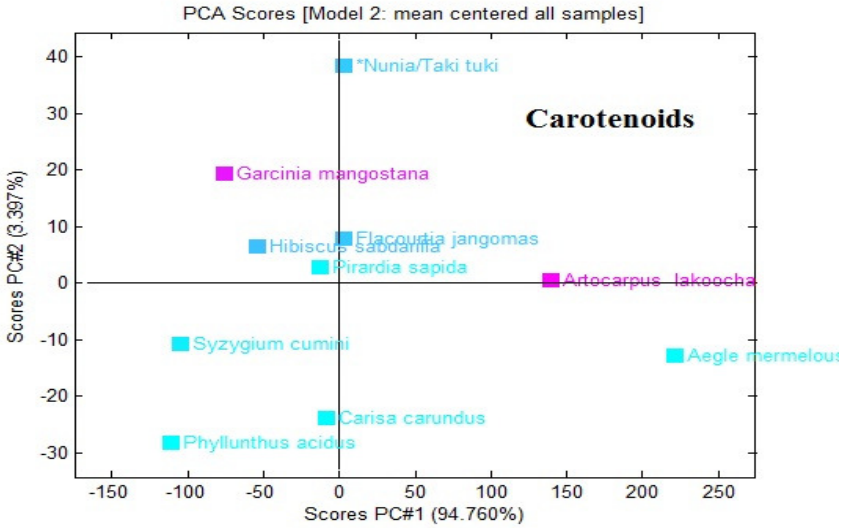
Edible portion and dry matter of analyzed fruits samples

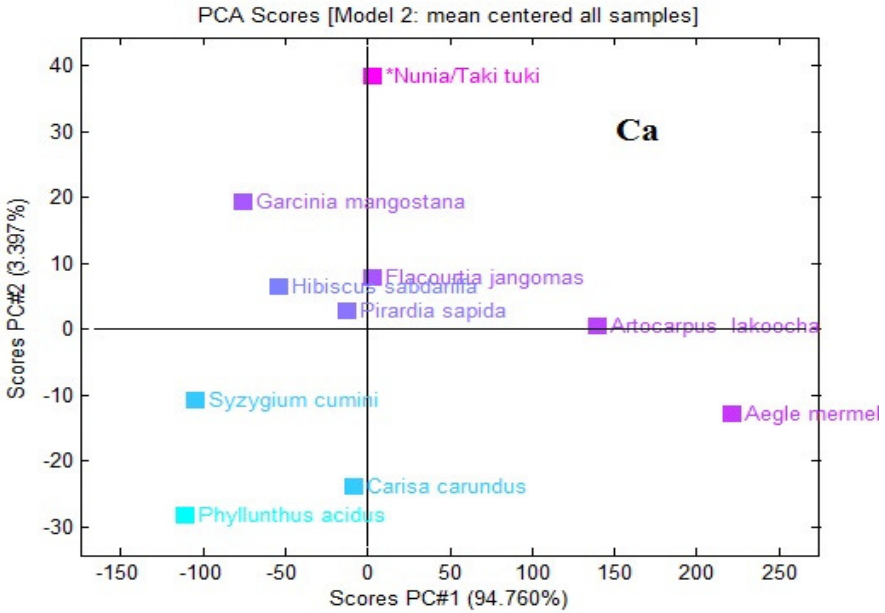
Scientific Name	% Edible portion	% Non-edible portion	% Dry matter
Artocarpus lakoocha	70.60	29.40	39.26
Baccaurea ramiflora	44.50	55.50	9.46
Phyllunthus acidus	92.50	7.50	7.74
Carisa carundus	92.30	7.70	11.43
Garcinia mangostana	37.50	62.50	17.33
Aegle mermelous	71.45	28.55	37.06
Syzygium cumini	81.30	18.70	13.63
Flacourtia jangomas	100	00	14.73
Hibiscus sabdariffa	43.50	66.50	8.27
Nunia * (SN not found)	100	00	26.27

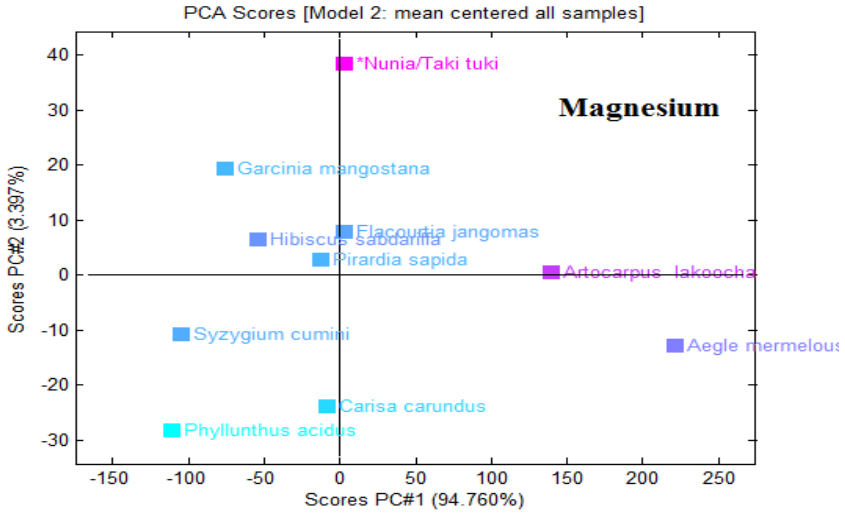
Principal component analysis of minor fruits




PCA Scores [Model 2: mean centered all samples]
Vitamin C
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermel
Carisa carundus
Phyllunthus acidus
Scores PC#2 (3.397%)
Scores PC#1 (94.760%)


PCA Scores [Model 2: mean centered all samples]
Carotenoids
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermelous
Carisa carundus
Phyllunthus acidus
Scores PC#2 (3.397%)
Scores PC#1 (94.760%)


PCA Scores [Model 2: mean centered all samples]
Ca
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermel
Carisa carundus
Phyllunthus acidus
Scores PC#2 (3.397%)
Scores PC#1 (94.760%)


PCA Scores [Model 2: mean centered all samples]
Magnesium
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermelous
Carisa carundus
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Scores PC#2 (3.397%)
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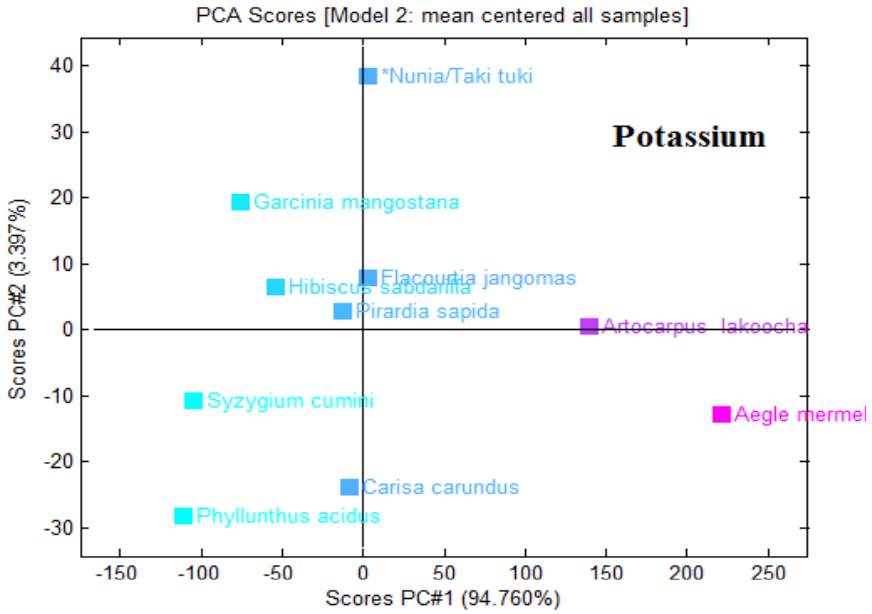
PCA Scores [Model 2: mean centered all samples]
Potassium
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermel
Carisa carundus
Phyllunthus acidus
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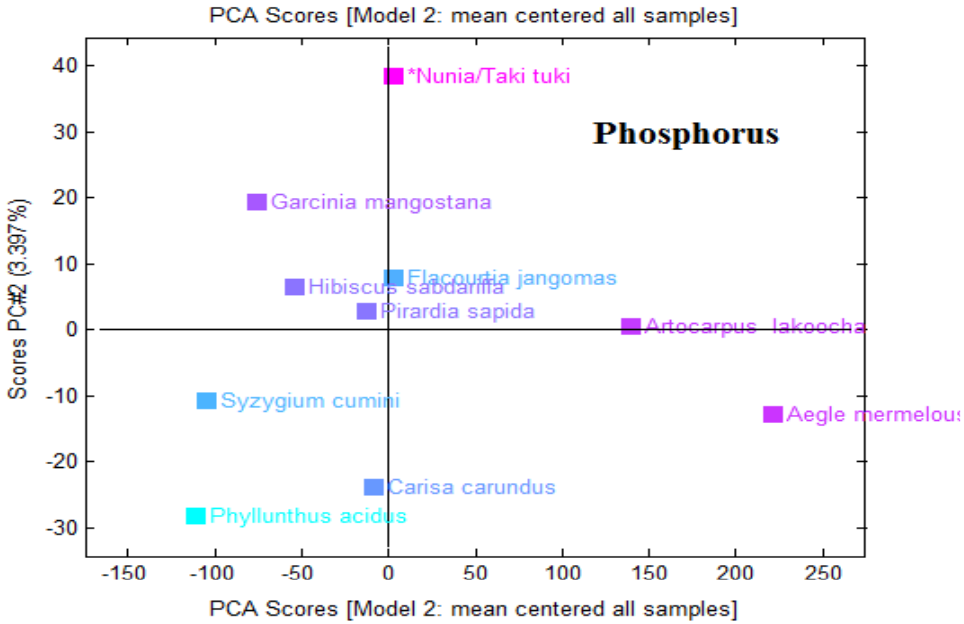
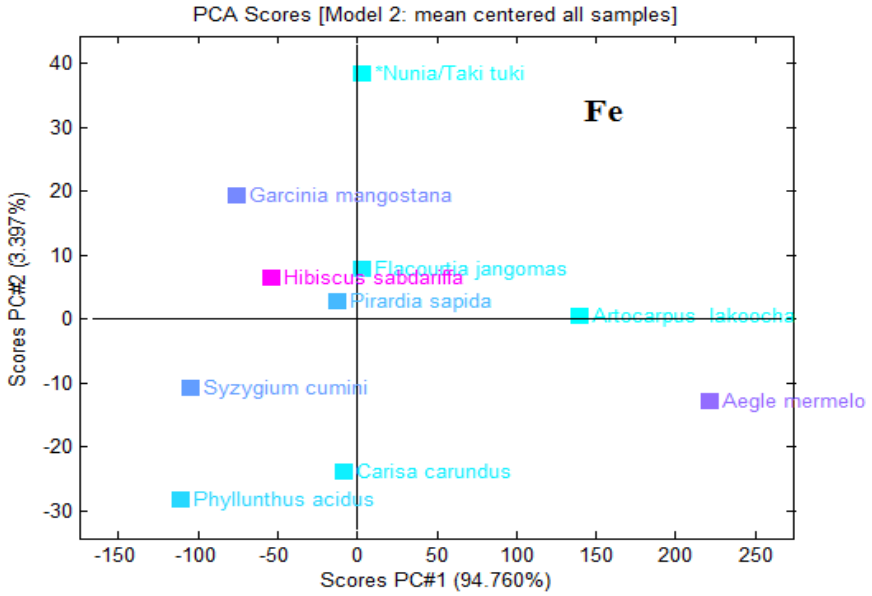

PCA Scores [Model 2: mean centered all samples]
Phosphorus
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermelous
Carisa carundus
Phyllunthus acidus
Scores PC#2 (3.397%)


PCA Scores [Model 2: mean centered all samples]
Fe
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermelo
Carisa carundus
Phyllunthus acidus
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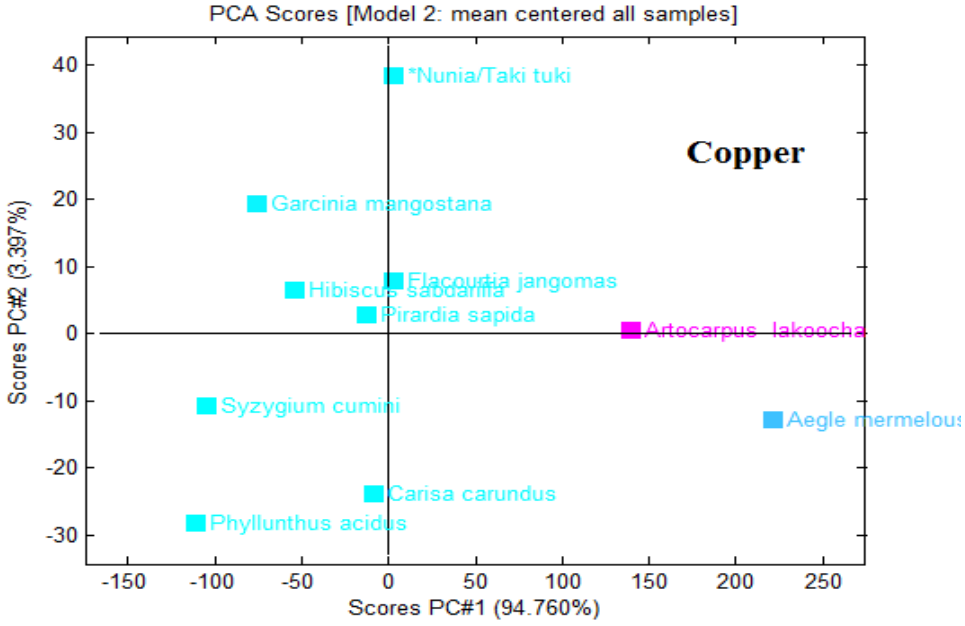
PCA Scores [Model 2: mean centered all samples]
Copper
*Nunia/Taki tuki
Garcinia mangostana
Flacourtia jangomas
Hibiscus sabdariffa
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermelous
Carisa carundus
Phyllunthus acidus
Scores PC#2 (3.397%)
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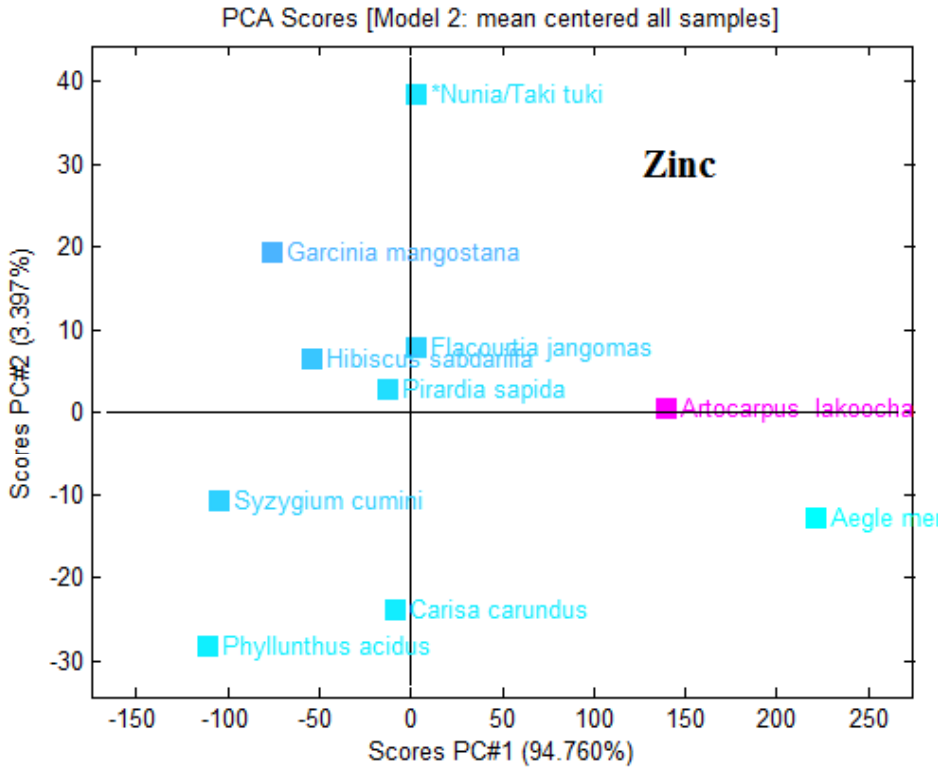
PCA Scores [Model 2: mean centered all samples]
Zinc
*Nunia/Taki tuki
Garcinia mangostana
Hibiscus sabdariffa
Flacourtia jangomas
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mer
Carisa carundus
Phyllunthus acidus
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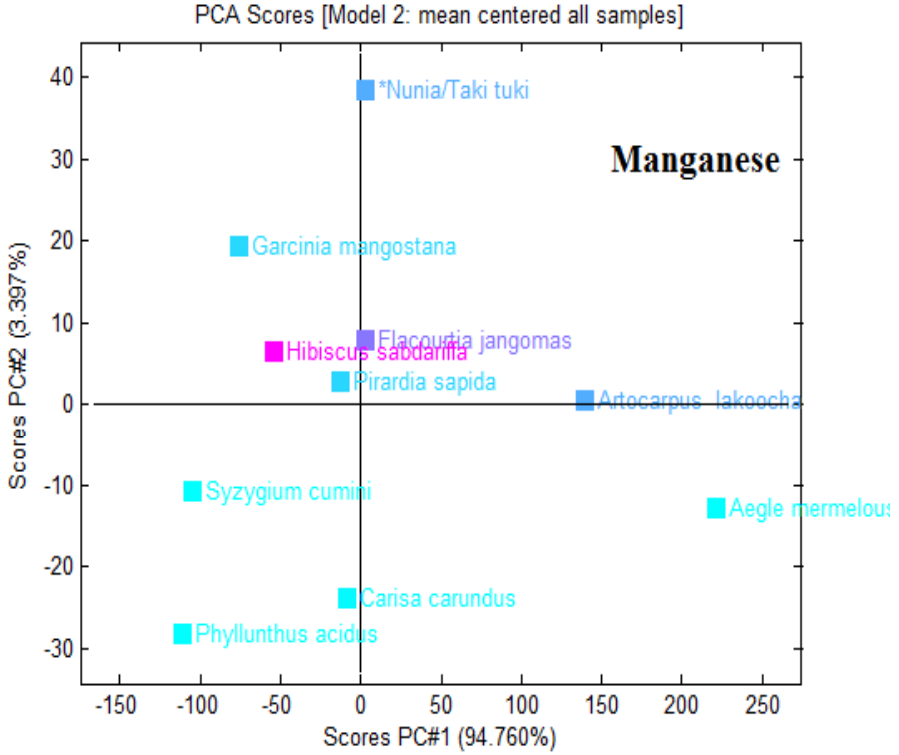
PCA Scores [Model 2: mean centered all samples]
Manganese
*Nunia/Taki tuki
Garcinia mangostana
Hibiscus sabdariffa
Flacourtia jangomas
Pirardia sapida
Artocarpus lakoocha
Syzygium cumini
Aegle mermelous
Carisa carundus
Phyllunthus acidus
Scores PC#2 (3.397%)
Scores PC#1 (94.760%)

Comparison

Minor fruits *Aegle marmelous* (65 mg/100g FW*)*,
Nunia (27.83mg/100g),
*Syzygium cumini (*25.65mg/100g*)*,
*Flacourtia jangomas (*25.64 mg/100g*)*
content higher amount of vitamin C than Jackfruit (11mg/100g), Mango (*Mangifera indica, 10.88mg/100g*) (Var. local) (FAO-NFPCSP, 2009).

Incase of carotenoids – *Artocarpus lakooch (4.62 mg/100g)* and *Garcinia mangostana (4.2mg/100g)* contained higher amount than mango *(*2.56mg/100g FW) jackfruits (0.71 mg/100g) ((FAO-NFPCSP, 2009)

Content of minerals are also higher in minor fruits than Mango and jackfruit.

CONCLUSION

If the peoples are aware of indigenous minor fruits then it could be fulfill their nutritional problems by intaking those fruits.

Therefore, indigenous fruits can play an important role in alleviating the poor nutritional status of human beings in Bangladesh.

They will grow more and more indigenous fruits tree and to protect the minor indigenous fruits tree from extinction and it will helpful for keeping biodiversity.

Further research

Genetically modification of the fruits like *Artocarpus lakkocha* and *Garcinia mangostana* then it could supply the requirements of micronutrients of the peoples of Bangladesh.

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S2.O4

Nutritional composition of Minor indigenous fruits: cheapest nutritional sources in the rural people of Bangladesh

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[1]University of Aarhus, Slagelse, Denmark, [2]Sher-e-Bangla Agricultural University, Dhaka, Bangladesh, [3]University of Dhaka, Dhaka, Bangladesh, [4]FAO National Food Policy Capacity Strengthening Programme, Dhaka, Bangladesh

As a part of the development of new food composition database for Bangladesh, a total number of 10 different minor indigenous fruits were collected from the four different wholesale markets located at entry points to Dhaka city and 2 remote areas in Bangladesh. After washing and drying to remove unwanted substances of the fruits, the edible portions (EP) were analyzed for ascorbic acid, carotenoid, dry matter (DM), calcium (Ca), magnesium (Mg), potassium (K), phosphorus (P), iron (Fe), zinc (Zn), copper (Cu) and manganese (Mn). Ascorbic acids and carotenoids in the fruits samples were analyzed by spectrophotometric measurement. Micro minerals (Ca, Mg, K and P) were analyzed by flame photometric and spectrophotometric procedures and trace elements (Fe, Mn, Zn and Cu) were analyzed by atomic absorption spectrophotometry. The results were compared with different literature and Indian food composition tables. Ascorbic acid content was the highest in *Aegle mermelous* 65.59 ± 4.62 mg/ 100g EP and the lowest 3.66 ± 0.531 mg/100 g EP in *Hibiscus sabdariffa*. *Artocarpus lakoocha* contains highest amount of carotenoids (4609.00± 923.58 µg /100g EP), DM (39.26%), zinc (3980.61±1.30 µg/100g DM) and copper (7974.29± 13.8 µg/ 100g DM). Highest amount of calcium (85.89 ± 4.36 mg/100g DM), magnesium (29.41 ± 1.53 mg/100g DM) and phosphorus (26.87 ± 2.82 mg/100g DM) were found in Nunia* (scientific name unknown).Highest amounts of iron (Fe) and manganese (Mn) content were found in *Hibiscus sabdariffa* (3300.69 ± 310.02 µg/100 g DM) and (5836.54 ± 254.54 µg/100g DM), respectively. The results from this study will help to create awareness of the rural peoples as well as urban people in Bangladesh to intake the minor/ underutilized fruits and to create awareness to grow more indigenous fruits tree and to protect the minor indigenous fruits tree from extinction for keeping biodiversity. *Key words:* nutritional compositions; minor indigenous fruits; rural people; Bangladesh

Acknowledgements

FAO- for part funding of this experiment

Ministry of Science, Information and Communication Technology, Govt. of the Peoples of Bangladesh-for part funding

Enayet Ullah Siddique- University of Dhaka, Bangladesh

Inge S. Fomsgaard PhD- Associate Professor, Aarhus University, Denmark

Hans Pedersen- PhD student, Aarhus University, Denmark

EuroFIR- For providing bursary to attend the conference

THANKS
TO ALL
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