A Survey of Non-conventional Plants Consumed During Times of Food Scarcity in Three Adjoining Villages of Narail and Jessore Districts, Bangladesh

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ABSTRACT

The majority of the population of Bangladesh resides in rural areas, which comprises of around 86,000 villages spread throughout the country. About 40% of the total population of Bangladesh has been estimated to have incomes below the poverty level, which is defined as having income of less than US$ 1 per day. The staple food of the people of Bangladesh is rice, which when the price is high cannot be afforded by the poverty-stricken people to the extent necessary for maintenance of good nutrition and sound body health. In addition to that, rice also becomes scarce during floods, which is a yearly occurrence in Bangladesh. This staple food also becomes costly during the lean period before the harvest. As a necessity, the poor people then have to rely on non-conventional plant food items in lieu of rice for most of the time during any given year. This is more so for the rural population, especially the landless people. The objective of this study was to conduct a survey in three adjacent villages of Narail and Jessore district, Bangladesh to gather information on non-conventional plants consumed during times of food scarcity by the poorer sections of the village population. A total of eight plants distributed into eight families were observed to be consumed by the people during times of food scarcity. These plant species were not consumed at all or rarely consumed during times when rice was available and the price of rice was within the affordable range of the population. The eight plant species were Alternanthera philoxeroides, Aponogeton echinatus, Colocasia esculenta, Pithecollobium dulce, Artocarpus heterophyllus, Musa balbisiana, Nelumbo nucifera, and Nymphaea pubescens. Since there is an absence of reports on food scarcity-induced deaths in the villages surveyed, it is presumed that consumption of the above plant species can meet at least the minimum nutritional needs of the people. These plant species, therefore, present considerable potential for further studies as to their nutritional analysis and use as regular food crops.

Key words: Non-conventional plants, famine food, Narail, Jessore, Bangladesh.

Introduction

Bangladesh is a small country with an area of about 55,000 square miles and a burgeoning population of more than 160 million. Agriculture forms the main economy of the country and the majority of the population resides in the 86,000 villages, which are spread throughout the country. Agriculture and agricultural laborer forms the mainstay of the landed and landless village people, respectively, in the villages. It has been estimated that about 40% of the total population are below the poverty level, which has been defined as incomes of US$ 1 per day. The staple food of the people of Bangladesh is rice, which is consumed with vegetables and pulses by the poorer sections of the population, and with vegetables, pulses, fish and meat by the affluent sections of the population. The amount of rice produced in the country is barely sufficient to meet the yearly needs, and the country is partially dependent on rice imports.

The overall climate of Bangladesh can be divided into two parts – the dry months and the rainy months because of the advent of the monsoon rains. The dry winter months last from about November till about February. This is followed by the dry hot months from March till around May; the rainy or monsoon months of June to around August, followed by the dry and less hot months of September and October.

Since most of the country is a deltaic plain and lie only up to 50 feet above sea level, during the monsoon...
season, the country almost every year is inundated with flood. During this time of inundation with flood, nothing can be grown in the flood-submerged areas and the people suffer from acute food shortages along with prevalence of flood-borne diseases.

In the fertile regions of the country, where the rural cultivators can afford irrigation and flooding does not occur, three crops of paddy (rice) can be grown every year. However, if the above conditions are not met, the number of crops of paddy grown per year comes down from one to two. Demand for agricultural labor peaks during two times of paddy cultivation – during plantation and during harvesting. At other times, the demand for agricultural labor is low, and due to absence of any other forms of employment in the villages, the landless people (who form the rural majority) suffer from acute shortage of income with consequent limited or no buying capacity for their main diet, rice. During this period, the population, as a necessity, has to rely on non-conventional food plants, which may be aquatic as well as non-aquatic, to meet their nutritional and hunger requirements.

Plants and plant products have from time immemorial have formed the major items of food consumption of people throughout the world, and even today the staple diet of the majority of the world population is limited to rice, wheat, maize and potatoes, which are consumed with various vegetables. During times of famine or other factor-related food scarcity, plants, especially non-conventional plants form the major edible product for consumption. In an earlier survey, we have reported on the non-conventional plant items consumed by the people of the northern districts of Bangladesh during Monga – a seasonal famine in those districts (Jahan, 2010). Quite often, these non-conventional edible food plants have been found to be nutritionally superior to conventional edible food plants (Grivetti, 2000). The traditional diet of the Australian Aboriginal hunter-gatherers have been shown to be high in fiber but low in carbohydrates leading to lesser susceptibility of the people against diseases like diabetes, heart disorders, and obesity (Brand-Miller, 1998). The Kusiume, Derashe, and Gamo ethnic groups of South Ethiopia are known to consume wild edible plants during times of food shortages (Balemie, 2006). The inhabitants of the Sahel region of Africa are accustomed to eating wild plants when cereal staples are in short supply. A number of these plants have been shown to be quite rich in proteins, amino acids, minerals, and essential fatty acids (Cook, 2000; Freiberger, 1998; Sena, 1998).

Most wild edible plants can grow under conditions of stress like poor soil conditions, drought or water submergence. The world is going through a global climatic change and it has been speculated that Bangladesh may become one of the worst victims of these climate changes. Under these circumstances, it is doubly of importance to document the wild edible plants of Bangladesh, for not only they can form future food resources under conditions of a change of climate, but also because they are able to mitigate the current needs of the poor people under conditions of food scarcity. It was the objective of the present study to document the use of non-conventional plants consumed by the poor population of three adjoining villages in Narail and Jessore districts of Bangladesh at times of food shortages or when purchase of the staple food items is not possible because of financial distress.

**Materials and methods**

The present survey was conducted in three adjoining villages of Narail and Jessore districts, Bangladesh. Of the three village populations surveyed, Bamonhat and Mulia villages was in Narail district, while Aamtola fell in Jessore district. The majority of the population in the three villages surveyed was landless or with very little land, the output from which was not sufficient to meet the yearly rice requirements of the households. Agriculture and agricultural laborer formed the main occupations of the village people. The landless people and the people with very little land served as agricultural laborers to the landed households. The demand for such labor was crop-dependent, peaking mainly in the two periods of crop plantation and crop harvesting. Paddy was the major crop grown with winter vegetables added as a side-crop.

A preliminary survey was conducted among the population of the three villages to identify households whose incomes were not sufficient to meet their basic needs of the staple diet, rice. Particular attention was paid to identify households who rely on non-conventional plant items to meet their daily nutritional and hunger satiating needs virtually throughout the year. The actual survey was conducted with the help of a semi-structured questionnaire and lengthy interviews. Participants were requested to provide detailed information on the plants or plant parts consumed, mode of consumption, and the availability of non-conventional plants during the year. Interviews were conducted in the Bengali language, which was spoken by both the interviewers as well as the local population. Plant specimens as shown by the local people were collected and dried in the field. All plant specimens were identified by Mr. Manjur-ul-Kadir Mia, ex-Curator and Principal Scientific Officer of the Bangladesh National Herbarium at Dhaka.
Results and discussion

A total of eight plant species were reported by the inhabitants of the three villages surveyed as to be consumed during times of food scarcity. The results are shown in Table 1. The eight plant species belonged to eight different families. The eight plant species were Alternanthera philoxeroides, Aponogeton echinatus, Colocasia esculenta, Pithecollobium dulce, Artocarpus heterophyllus, Musa balbisiana, Nelumbo nucifera, and Nymphaea pubescens.

The staple food of the people of Bangladesh is rice, which depending on the income status of the population, is consumed with vegetables, lentils, fish, and meat. Rice is usually eaten following boiling in water till the grains are soft, followed by discarding the remnant of the water. Vegetables, pulses, fish and meat cooking follow a general pattern. Oil is heated in a pan with the addition of salt and various spices, depending on the type of food item, i.e. vegetables, pulses, fish or meat to be cooked. The major spices used are turmeric, ginger, cumin, onions, and hot peppers. When the spices have been fried for a little time, the item to be cooked is added along with sufficient water for the item to be boiled till soft. As the food item softens and gets cooked, water is evaporated over a low flame leaving the main food item in oil or in oil with a small amount of water. An exception to this general mode of cooking and which is particularly followed with vegetables is that the vegetable is boiled in water till soft. Salt, onion slices, hot peppers and a little oil is then added and the vegetables taken in a mashed form with the added items. Sometimes, particular varieties of fish are also consumed in the mashed form following cooking and then mashing them after separating the bones from the flesh.

A major finding of the survey was that the above consumption mode for different types of vegetables, pulses, fish or meat cannot be followed by the low-income population because they could scarcely afford buying oil or various spices. Pulses, fish and meat, because of their cost, also could not be afforded by the low-income population. However, because of the presence of marshes and during flood times, the low-income population could eat some fish, which they caught by themselves from marshy lands or flooded areas. Essentially, these fish contributed to their animal protein consumption throughout the year. The mode of cooking and consumption of the non-conventional plant items during times of food scarcity differed significantly from the usual pattern of cooking and consumption during times of food availability, as described in Table 1 and subsequent sections on the consumption pattern of individual plants.

Alternanthera philoxeroides grows in marshy or semi-marshy habitat. Since this type of habitat was present in all three villages surveyed, the plant was available throughout the year, and could serve the nutritional needs of the people all year long. The leaves and stems were consumed. When it can be afforded, the leaves and stems were cooked with a small amount of rice, rice powder, wheat powder or pulses and a little oil. If such items could not be afforded, then the leaves and stems were simply boiled in water till soft, and then consumed in a mashed form. During times of acute food shortages in combination with practically zero income, the swollen bases (locally called motha) of Aponogeton echinatus were also consumed in the form of a thick soup following boiling in water. However, if it can be afforded, the dried and powdered moths were cooked with a little oil, salt, and spices.

Colocasia esculenta is another non-conventional plant eaten by the people during times of food scarcity. The plant possesses two advantages. It grows in the wild and on fallow lands and can be collected throughout the year. Moreover, various parts of the plant can be consumed, including the leaves, stems and the corm. Because of its ready availability and because three of the plant parts can be consumed through a variety of cooking methods (see Table 1 for further details), the plant is a popular item of choice among the needy people of the villages. However, the plant suffers from one deficiency, which is that it can cause allergic reactions among people who are consuming it. The plant has been reported to be a good source of amino acids like alanine, arginine, aspartic acid, cystine, glutamic acid, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, and valine (Duke, 1992). The plant has also high carbohydrate, minerals, and protein content.

Although the fruits of Pithecollobium dulce are sweet and edible when ripe, they are not sold in the markets of Bangladesh, because consumption of the ripe fruits lead to formation of gas in the stomach with consequent abdominal discomfort. The tree is also not seen widely throughout Bangladesh; however, it can be observed growing in the wild or around homesteads in Narail and Jessore districts. Since a mature tree can bear hundreds of fruits, one tree is sufficient to meet the nutritional needs of several families over a period of one to two weeks. Furthermore, the tree can withstand a certain amount of stress like medium-scale drought and a few days submergence of the base under flood water. This makes the tree a useful tree during times of food scarcity. On the other hand, the fruits are seasonal, and so the tree is not able to meet the nutritional needs of the people throughout the year. The fruits of Artocarpus heterophyllus are extremely rich in protein (Duke, 1992) indeed, the fruits are known in Bangladesh as the “poor man’s protein”.
When available, the fruits enjoy high consumer demand because of their sweet taste, low prices and high protein content. Generally, the ripe fruits are consumed. But in times of food scarcity, cooked unripe fruits form the main diet in the poor households. The seeds are rich in protein and fat and can also be consumed following just roasting over a fire, which make this plant an attractive and ready source of food during times of food scarcity. However, the major disadvantages of this plant are that the fruits are seasonal, and the plant can be found only on higher grounds beyond the reach of flood waters. The villagers were observed to often have one or more trees around their homesteads, which served as a good food source during times of food scarcity. Since the fruits enjoy considerable consumer demand and is considered the national fruit of Bangladesh fruits are also sold by the households to buy staple items like rice.

Unripe fruits of *Musa balbisiana* fruits are occasionally consumed by the people of Bangladesh following cooking. When consumed in this way, the fruits are considered to have therapeutic value both in the prevention as well as the treatment of gastrointestinal disorders like diarrhea and dysentery. The fruits of a related species, *Musa sapientum*, are consumed widely when ripe, in Bangladesh because of their sweet taste and easy digestibility. On the other hand, since the fruits of *Musa balbisiana* are heavily seeded, consumption of fruits is rare except during times of food scarcity. The cluster of flowers (mocha) and the inner whitish portion of the trunk (thore) of both species used to be consumed by both the affluent as well as the poor sections of the Bangladesh population not too long ago. However, in recent times, with the advent of a remarkable number of non-indigenous vegetables and a change of consumer taste, mochas and thores are rarely observed in the city markets. Since the plant can grow to around ten feet high, a single thore can provide a substantial amount of nutritious food to a large number of people. The other advantage of this plant is that they can grow under quite stressful conditions and often can be found by the roadsides. It is a yearly plant and dies after fruiting. From the roots, a number of new plants emerge following death of the mother plant, so ultimately it forms a grove. During times of food scarcity, a grove of this plant can provide sustenance to a number of needy homesteads. And although the plant provides more sustenance after flowering, since both mochas and thores can be obtained from the same plant besides fruits, the thores can be obtained throughout the year and so can provide nutritious food if food scarcity occurs at any time of the year.

Both *Nelumbo nucifera* and *Nymphaea pubescens* can be found growing in water bodies, which may be village ponds, marshy lands, or ditches. Of the two species, *Nymphaea pubescens* is the more common species. A typical village of Bangladesh may have anywhere from five to twenty ponds besides a huge number of ditches. Since the village houses are mostly made of soil and since this soil needs to be replenished regularly because of constant weathering, practically every homestead has one or more ditches from where the soil is extracted. During the rainy season, these ditches get filled up with water, which remains also during the dry season, if the ditch is deep enough. A typical ditch may be 3–4 feet deep, and *Nymphaea pubescens* can be found growing profusely in these ditches. The leaves and flowers lie on the surface of the water, and the deeper the ditch, the more is the length of the flower stalk. During the flood season, as more land becomes submerged under water, the plant can be found growing profusely in the flooded regions. This is advantageous to the people, for food scarcity arises during the flood season because crops cannot be cultivated and the plant can then provide a ready source of sustenance. Since at least three parts of the plant are consumed, namely the seeds, stalk of flowers, and the swollen base of the plant, taken together, one plant can provide sustenance for at least a day to one homestead. The plant is usually found in thick clusters, so one cluster can provide several families with food during times of food scarcity. The flower stalks are consumed, but less often, when there is availability of rice. On those occasions, the flower stalks are cooked and eaten as vegetable.

Appropriate nutritional analysis is yet to be done on most of the non-conventional plants consumed by the people of the surveyed area during times of food scarcity. Such studies are essential, for previous experiences in other parts of the world suggest that the non-conventional plants can often provide more nutritive value than conventionally consumed plant parts (Grivetti, 2000).

Moreover, if scientific studies can provide justification as to the nutritive value of these non-conventional edible plant parts, the people may be encouraged more to systematically cultivate them, even if on fallow land, by the roadsides, and in marshy areas. It will provide greater impetus to the people for their conservation. For instance, the gatherers of *Nelumbo nucifera* and *Nymphaea pubescens* will be encouraged not to dig up the whole plant to collect the swollen base, a procedure which destroys the plant, but instead collect flower stalks and seeds. At the same time, scientific evidence of the nutritional value of the non-conventional plants will encourage more consumption by the general population instead of rice. Such a change of consumer taste and demand will reduce the demand for rice, the cultivable area of which is shrinking day by day due to growth of human habitat.
References


