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A Survey of Non-Conventional Plant Items Consumed During Food Scarcity in Two Randomly Selected Villages of Kurigram District, Bangladesh

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ABSTRACT

The northern districts of Bangladesh have generally lagged behind in the economic sense compared to the rest of the country. Industrial development is poor, there are no large urban areas, and the main occupations of the rural people are agriculture and agricultural laborer. Whereas in other areas of Bangladesh, the cultivators can produce up to three crops per year, the weather pattern and the poor condition of land in the northern districts enable only one, and only in certain areas, up to two crops per year. Agricultural labor demands peak during two periods, the period of sowing and the period of harvesting. In the interim periods, due to lack of other forms of unemployment, there develops an acute scarcity of food, which affects mostly the poor households. As a consequence, the people of the northern districts of Bangladesh suffer from seasonal famine during two periods of the year. This seasonal famine is locally called Monga and peaks twice per year during the Bengali months of Kartik (mid-October till mid-November) and Chaitra (mid-March till mid-April). During Monga, the people has to depend on consumption of non-conventional food items (usually plant derived) to satisfy their hunger and nutritional requirements. Since death due to Monga does not occur, there is sufficient reason to believe that these non-conventional plant items can be of enough nutritional value, and as such, they can with proper scientific investigation, be used as regular food items, particularly in regions of the world, where adverse weather or soil condition exists. Notably, these non-conventional plants are grown or collected from the wild, where they have been found to survive in poor soil and at times of the year like Kartik and Chaitra, when the weather is hot and dry. The objective of the present survey was to document the non-conventional plant items consumed by the poor households during times of food scarcity in the months of Kartik and Chaitra. The study was conducted in two randomly selected villages, namely Chargujimari and Kumar Para in the district of Kurigram, which is a northern district of Bangladesh and is yearly affected by Monga. Interviews were conducted among the poor households (income level less than US$ 30 per month) with the help of a semi-structured questionnaire. Detailed information about the mode of consumption of non-conventional plants was noted down and plant specimens brought to Bangladesh National Herbarium at Dhaka for identification. A total of 25 plants were found to be consumed by the poor households during the two Monga periods. The plants were distributed into 18 families; the Poaceae family provided 4 plants, while the Amaranthaceae family provided 3 plants. The staple food of Bangladeshis is rice, which is consumed with vegetables and pulses (by poor households) and with vegetables, pulses, fish and meat (by affluent households). It was observed that during periods of Monga (when staple diet of rice falls short), vegetables may form the main dish, with carbohydrate-rich sources like tubers or fruits of plants substituting for the role of rice. Rice is derived from paddy (*Oryza sativa*) seeds, which belongs to the Poaceae family. It was further noted that seeds of 4 other plants belonging to the Poaceae family were consumed during Monga periods, the seeds of all 4 plants being consumed as substitutes for rice. At a time of rising world hunger due to increases in

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population, and chronic food shortages in various parts of the world, the plants documented in the present survey can play a role in providing much needed nutrition to the hungry people.

Key words: Non-conventional food, food scarcity, Kurigram, Bangladesh.

Introduction

The northern region of Bangladesh comprising several districts in Rangpur division suffers twice every year from a seasonal famine or shortage of staple food items, which is locally known as Monga. The most affected areas are the districts of Gaibandha, Nilphamari, Kurigram, Rangpur, and Lalmonirhat. Monga usually occurs twice a year; the greater Monga (boro Monga) occurs during the lean season preceding the 'aman' harvest of paddy in the Bengali months of Ashwin and Kartik (mid-September to mid-November), and the smaller Monga (choto Monga) occurs during the lean season preceding the 'boro' harvest of paddy in the Bengali months between Chaitra and Jaistha (mid-March to mid-June). Greater Monga peaks during the month of Kartik, while the lesser Monga peaks during the month of Chaitra.

Paddy is the major staple cereal of most of the people of Bangladesh; and Monga occurs in the above-mentioned districts due to a combination of factors - dependency of the population primarily on agriculture and agricultural laborer, growth of only one to two crops of paddy per year (versus three in most other regions of Bangladesh), and a low per capita income in the above districts versus the national average. This is more so, because these districts do not have a good industrial base, making the population almost solely dependent on agriculture and agricultural laborer, which is again dependent on cultivation of paddy, which is the major and occasionally only crop grown in various areas of these districts. Agriculture laborer, i.e. not owning any land by himself and depending on a landed cultivator's needs for labor is not only a hard labor job but also peaks only during two periods of paddy cropping. The first is when crops are sown, and the second is when the crops are harvested. As a result, during the interim period, the people suffer from lack of employment, and as both stored food and money gets to be in short supply, the poorer households particularly cannot afford their staple diet, rice (which is derived from paddy through de-husking paddy) and so has to depend on non-conventional plant items for survival and provision of basic dietary needs. The poorest households during Monga are pushed into distressed conditions and because of the absence of their main food item paddy, is compelled to eat other non-conventional plant items for basic survival.

Death, as a result of food shortage arising from Monga, has scarcely been observed. It may be concluded just from the above fact, that the various non-conventional plant items consumed by the Monga-stricken population are adequate for survival, even if they may not meet adequately the total calorie and protein requirements. As such, documentation of these non-conventional plants is of value, because these plants often grow in wild or fallow lands and can grow in adverse weather conditions, making them suitable for growth in many arid and poor soil conditions regions of the world. It is to be noted that the peak periods of Monga in the northern districts of Bangladesh are Kartik and Chaitra, both months being dry and hot, so the conditions are adverse for regular crop cultivation for lack of water. We have documented in previous reports, the non-conventional plant items consumed by the people during times of food scarcity in Lalmonirhat and Bagerhat districts of Bangladesh (Paul *et al*., 2011; Jahan *et al*., 2010). The objective of the present study was to conduct a survey in two randomly selected villages of Kurigram district, Bangladesh to document the non-conventional plant items that they consume particularly during greater and lesser Monga, and in general during times of food scarcity.

Materials and Methods

A survey of the various villages in Kurigram district was conducted, which identified a number of villages as the worst-affected Monga areas. Two villages, namely, Chargujimari and Kumar Para were randomly selected for detailed survey work. The main occupations of the people of these villages were agriculture and agriculture laborer. Agricultural laborer refers to people who work in other people's land in exchange of a certain amount of money; agriculture refers to farmers working on their own land. Other forms of occupation were virtually absent. A preliminary survey of the village households was conducted to identify the most at-risk, during Monga. Households having below level poverty income of less than US$ 1 (equivalent Bangladesh Taka 73) per day (mainly agricultural laborers and marginal farmers) were selected for extensive interviews. Interviews were conducted with the help of a semi-structured questionnaire through which information was gathered about the household members, their economic statuses and particularly the food items that they consumed during Monga when supply of rice in the households was non-existent or below subsistence levels. One spokesperson from Kumar Para village (Md. Majid Miah) and three spokespersons from Chargijimari

village (Rajena Begum, Md. Mansur Ali, and Chan Mia) were selected to maintain a continuous liaison between village households and the interviewers. Major attention was given to wild plants consumed during Monga. Information was obtained about the local names of plants, plant parts consumed and the mode of consumption, i.e. how those plant parts were cooked and eaten. Identification of plant specimens were done at the Bangladesh National Herbarium at Dhaka.

Results and Discussion

Paddy is the main crop cultivated throughout Bangladesh. In more fertile regions, three crops of paddy can be cultivated in any given year, and are known as the 'aus', 'aman', and 'boro' paddy crops. In less fertile regions, i.e. with adverse weather or soil conditions or lack of proper irrigation facilities, one to two crops of paddy can be grown in any given year. The two surveyed villages of Kurigram district fell in the latter category. This factor brought down the income level, and in fact, most households surveyed reported income levels of less than US$ 0.5 per day. As a result, the general conditions of the people were poor, and food scarcity was present virtually throughout the year, but which became more intense during the two periods of Monga, which peaked during the Bengali months of Kartik and Chaitra [note that the Bengali calendar starts with the month of Baisakh (mid-April to mid-May), followed respectively by Jaistha, Ashar, Sraban, Bhadra, Aswin, Kartik, Agrahayan, Poush, Magh, Falgun, and Chaitra]. During especially these two months, the poorer households had no other recourse than to eat non-conventional food items because of serious shortage of money and previously stored food, if any.

The staple diet of Bangladeshis is rice (de-husked paddy seeds), which is generally consumed following boiling in water. Along with rice, vegetables and lentil soup is consumed by the poor households, while the affluent households consume fish and meat. The dietary pattern of the surveyed population on the two villages indicated that the staple diet was rice (when it was not in short supply), 2-3 times daily (in the morning, afternoon, and evening). Vegetables and lentil soup would be consumed if affordable otherwise, rice would be consumed with the addition of a little salt, onions, and hot pepper. Rice formed the major source of carbohydrates, while lentil (s) formed the major source of proteins. Vegetables would provide vitamins and other necessary micro-nutrients.

It was our observation that this normal dietary pattern changed considerably during times of food scarcity, like Monga. A total of 25 plants or plant parts were observed or reported to be consumed during times of food scarcity. These 25 plants were distributed into 18 families. The Poaceae family (to which paddy or *Oryza sativa* belongs) contributed 4 plants, followed by the Amaranthaceae family with three plants. The results are shown in Table 1. There appeared to be a reversal of the basic pattern of food consumption in the sense that while in normal times, rice would be the main dish while vegetables formed the side-dish, during times of food scarcity, vegetables formed the main and occasionally only dish. In fact, out of the 25 non-conventional plants consumed during times of food scarcity, 19 plants were consumed as vegetables. This is also reflected in using the Bengali term 'shak' as part of the name of a number of plants given in Table 1. The Bengali word for vegetable is 'shak'.

Amaranthaceae family plants are both cultivated as well as found in the wild and fallow areas, depending on the species. These family plants are usually quite rich in macro-nutrients, micro-nutrients and vitamins. For instance, *Amaranthus spinosus* has been reported to contain b-carotene, ascorbic acid, niacin, riboflavin, and thiamin besides calcium, iron, phosphorus, potassium, and sodium. Three Amaranthaceae family species were reported by the villagers to be consumed during times of food scarcity. Of them, only *Amaranthus tricolor*, which has a vivid red color of both leaves and stems, was cultivated. This plant can be easily grown, and when fields are lying idle (as during the Monga months) is cultivated. Plants can attain maturity within less than a month, and being a good source of vitamins and micro-nutrients in addition to possessing a good taste, is well-prized by the poor farmers as a food source. The other two plants of the Amaranthaceae family, namely *Amaranthus spinosus* and *Amaranthus viridis*, are found in the wild with a certain degree of abundance, and so are collected for consumption during times of food scarcity. In normal times, when food is available, these two plants are not eaten. However, it is to be noted that since a number of the poor households suffer from food scarcity throughout the year and not only during Monga, these plants are collected from the wild and consumed by the poor households and consumed throughout the year. It is to be emphasized that while the two Monga periods represent times of extreme food scarcity for a larger number of households, the poor households suffer from varying degrees of food scarcity throughout most of the year. As a result, famine-like conditions are a daily reality for them, and there is a continuous struggle to bring home enough consumable food items to satiate their hunger. Thus the plants presented in Table 1, while representing plants mostly eaten during Monga periods by larger number of households, are also eaten throughout the year by a number of the poorest households for whom food scarcity does not only occur during Monga but is present year round.

The deficiency of carbohydrates, occurring during times of food scarcity, that is, absence of rice, is met with consumption of four other plant parts belonging to the Poaceae family, to which rice itself belongs. These plants are *Echinochloa colona*, *Hordeum vulgare* (barley), *Paniculum miliaceum*, and *Setaria italica*. The seeds of all four plants are consumed as substitutes for rice and are prepared in the same way for consumption like rice, in the form of boiling in water till the seeds are soft and then partaking of the boiled seeds along with any vegetable(s) available. Of the four plants, barley, although consumed by necessity during times of food scarcity, is not at all consumed by the villagers in other times. During normal times, barley may be given in the form of porridge to sick children to regain health, or fed to cattle. We have not found any evidence of *Echinochloa colona* to be consumed other than the northern districts of Bangladesh, possibly because this plant does not grow elsewhere. However, paradoxically, the seeds of the other two plants *Paniculum miliaceum* and *Setaria italica* are prized food items among even affluent sections of the people in Bangladesh, where porridges prepared from the seeds of these two plants are often consumed during festive occasions or as special treats.

Other sources of carbohydrates include the swollen roots of *Ipomoea batatas*. The roots are specifically rich in carbohydrates (Duke, 1992), besides containing a-linolenic acid, ascorbic acid, b-carotene, calcium, copper, iron, magnesium, phosphorus, potassium, proteins, sodium, as well as a number of amino acids. As such, the roots of this plant can be considered to be an exceptional source of major and minor nutrients, and can be considered to be promoted for regular consumption instead of only consumption during times of food scarcity. Like *Amaranthus spinosus*, *Ipomoea batatas* can be seriously studied for introduction in other parts of the world, where the population is suffering from malnutrition due to non-availability of food or due to lack of purchasing power in procurement of food. Plants like these can definitely help the poorer people throughout the world, if conditions permit the cultivation of these plant species.

Another good source of carbohydrates is the fruits of *Disocorea bulbifera*. The fruits are known as air yam in English, and as in the case of yams, these fruits are also rich in starch and other carbohydrates. They can serve as effective substitute for potatoes, and in fact the Bengali name for this plant as well as the fruit is ‘gach alu’, which translated into English means ‘tree potato’. The fruits of *Cucurbita maxima* are also rich in carbohydrates, having a sweetish taste, being exceptionally rich in vitamins and micro-nutrients. The swollen roots of *Colocasia esculenta* are also rich in carbohydrates and substitute for potatoes to the poor households. They are boiled and consumed in the mashed form, as is done often with potatoes by the villagers. However, unlike potatoes, which are also consumed following addition to other vegetables or meat dishes (besides being taken in the mashed or fried form), the swollen roots of *Colocasia esculenta* are consumed by themselves in the mashed form with rice or rice substitutes.

The villagers mentioned two other food preparations, which have not been given in Table 1. The first involved powdered dried fish. Fish, especially small fish species abound in the water bodies of Bangladesh, and are more available in small ponds and marshy areas, as well as paddy fields, which need standing water for the paddy plants to grow. As these small ponds and paddy fields dry up during the non-monsoon months (including Kartik and Chaitra), as well as when paddy starts ripening, small fish species are caught in quite large numbers. The poor households of the villages surveyed collect these fish species and powders them following drying in the sun. The powdered dry fish is then mixed thoroughly with stems of *Alocasia macrorrhizos* (Family: Araceae, can be found in both wild as well as sometimes cultivated) along with adequate amounts of oil, powdered peppers, and dried turmeric powder. The mixture is again dried and can be kept in storage for 2-3 months. This preparation is mostly consumed during the Chaitra month Monga. A second preparation involved collecting numbers of wild edible ‘shaks’ and leaves of *Moringa oleifera*. They are then wrapped in a large leaf of *Alocasia macrorrhizos*, sliced into small pieces, and cooked in water following addition of baking soda and a few cloves of *Allium sativum* (Family: Liliaceae), the last being used as a spice.

Table 1: Plants consumed during times of food scarcity by the poor households of Chargujimari and Kumar Para villages of Kurigram district, Bangladesh.

Plant name (local name)	Family	Description and Habitat	Parts eaten	Collection, preparation and mode of consumption
Amaranthus spinosus L. (Kanta khuria) English name: Prickly amaranth	Amaranthaceae	Small plant. Small spines are present in the plant. Grows in the wild and by roadsides and on fallow lands.	Leaves	Cooked and eaten as vegetable. Not normally consumed, bur during times of food scarcity is widely consumed by the poor people because of its ready availability. Good source of proteins, vitamins and iron.
Amaranthus tricolor L. (Laal shak) English name: Elephant-head amaranth	Amaranthaceae	Small plant of red color. Cultivated for domestic consumption as well as sold commercially.	Whole plant	Cooked and eaten as vegetable. Consumed mostly during the month of Kartik. Normally, a farmer would cultivate the plant for selling. But during times of food scarcity, the plant is reserved for home consumption. The plant can be easily cultivated, even on poor soil. Good source of proteins and vitamins.
Amaranthus viridis L. (Khuria shak) English name: Slender amaranth	Amaranthaceae	Small plant. Found in the wild.	Leaves, young stems	Cooked and eaten as vegetable. Good source of proteins, vitamins and micro-nutrients. Because it can be found in large amounts in the wild, it is a common item consumed during times of food scarcity.
Colocasia esculenta (L.) Schott. (Jongli kochu) English name: Green taro	Araceae	Grows to 2-3 feet in height. Bears flower. Grows in the wild.	Leaves, stems, swollen roots	Leaves are cooked and eaten as vegetable. The same applies to stems and swollen roots. Swollen roots are used in lentil soup in lieu of potatoes when potatoes cannot be afforded or are scarce. Swollen roots are also boiled in water and consumed in the mashed form.

Table 1: Continue

Eclipta prostrata L.(Kalo keshari shak) English name: False daisy	Asteraceae	Small plant. Can be found in the wild.	Leaves	Cooked and eaten as vegetable. Not consumed in normal times but only during times of food scarcity.
Basella alba L. (Puin shak) English name: Indian spinach	Basellaceae	Climbing plant, spreading quickly, if given the room to spread.	Leaves, young stems	Leaves and young stems are cooked and eaten as vegetable. The plant is cultivated for commercial purposes and is regarded as the tastiest vegetable in Bangladesh. However, it can be grown very easily, and practically every rural homestead has a few plants in their homes, which they allow to grow over the thatched roofs of homes. Because of its ready availability throughout the year, the plant forms an important part of the diet during times of food scarcity. Consumed during the months of Kartik and Chaitra. Good source of proteins, vitamins and micro-nutrients.
Raphanus sativus L. (Mula shak) English name: Leafy daikon	Brassicaceae	Small plant. Swollen base underneath the soil is known as radish.	Young plants, radish	Young plants are cooked and eaten as vegetable. Radish is fried or cooked with pulses and consumed.
Chenopodium album L. (Bothua shak) English name:Common lamb's-quarters	Chenopodiaceae	Grows to a height of 5-6 feet. Found in the wild.	Leaves, young stems	Cooked and eaten as vegetable.
Ipomoea aquatica Forssk. (Kolmi shak) English name: Swamp morning glory	Convolvulaceae	Small plant. Grows in water in swampy areas. Found in the wild but also sometimes cultivated.	Leaves	Cooked and eaten as vegetable. The plant is found abundantly in swampy areas and marsh lands. Occasionally it is cultivated. It is consumed as a vegetable throughout Bangladesh but does not enjoy wide-spread popular demand. It is one of the cheapest vegetables in the city markets but is not always available because of low consumer demand among the affluent people.
Ipomoea batatas (L.) Lam. (Mishti alu) English name: Sweet potato	Convolvulaceae	Vinous plant spreading over the soil. Found in the wild.	Swollen roots	Swollen roots are boiled or roasted and taken in the mashed form as substitute for rice. Good source of carbohydrates.
Brassica campestris L. (Shorisha shak) English name: Field mustard	Cruciferae	Small plant. Bears flowers and fruits. Flowers are yellow colored.	Young plants	Cooked and consumed as vegetable. The plant is cultivated for commercial purposes and home consumption. Although it does not enjoy good consumer demand, it is still cultivated especially by the poor people for its nutritious leaves.
Cucurbita maxima Duch. (Mishti kumra) English name: Melon pumpkin	Cucurbitaceae	Vinous plant. Bears flowers and fruits. Flowers are orange colored. Plant is cultivated.	Young leaves, stems, fruits	Young leaves and stems are cooked and eaten as vegetable. Fruits are either cooked and eaten as vegetable or boiled and consumed in the mashed form. Good source of carbohydrates and vitamins.
Dioscorea bulbifera L. (Gach alu) English name: Air yam	Dioscoreaceae	Vinous plant. Bears fruits.	Fruits	Fruits are boiled, mashed and eaten with the addition of a little salt. In this form, the mash resembles mashed potatoes, hence the Bengali name - gach alu, which translated into English means "tree potato". Fruits are also consumed in the fried form, as vegetable, and often boiled with pulses in water and taken as soup.
Diplazium esculentum (Retz.) Sw.(Dheki shak) English name: Vegetable fern	Dryopteridaceae	Small plant. Found in the wild.	Whole plant	Cooked and eaten as vegetable. Can be found throughout the year. Not normally eaten, but during times of food scarcity serves as a common food for the poor people.
Cajanus cajan (L.) Millsp. (Arhor kalai) English name: Pigeon pea	Fabaceae	Medium height plant, which attains height of 5-7 feet. Bears flowers and fruits. Flowers are yellow-colored.	Seeds	Seeds are fried and eaten. Seeds are also boiled and eaten. Seeds are also cooked as lentils and consumed in the soup form. Good source of proteins.
Lathyrus sativus L. (Khesari dal) English name: White pea	Fabaceae	Shrub like plant bearing flowers and fruits. Flowers are of a sky-blue color. Fruits contain seeds. Sown in the month of Agrahayan and harvested in the month of Chaitra.	Seeds,	Seeds are dried and crushed to separate seed coat. They are then boiled in water and consumed. Seeds are also boiled in water in the manner of gram seeds and consumed following addition of salt, peppers, and onions. They can also be consumed with the addition of salt only. Young leaves are cooked and eaten as vegetable. Consumed during the months of Chaitra and Kartik. Good source of proteins.
Leucas aspera (Willd.)Spreng. (Kansisha, Dome kolosh) English name: White dead nettle	Lamiaceae	Small plant. Bears white flowers. Grows in the wild and on fallow lands.	Leaves, young stems	Leaves and young stems are cooked and consumed as vegetable. The plant has medicinal value and is sometimes cultivated, because it is reputed that consumption of cooked plants can relieve pain. It is a bitter tasting plant, and while cooking, initially the plant is boiled in water and the water discarded to get rid of the bitterness. The remaining portion is then normally cooked as vegetable.
Malva verticillata L. (Napa shak) English name: Cluster mallow	Malvaceae	Small plant which grows to a height of 2-3 feet. Bears flowers and fruits.	Whole plant	Cooked and eaten as vegetable. Consumed during the month of Kartik.
Moringa oleifera Lam. (Shojina shak) English name: Horseradish tree, Drumstick tree	Moringaceae	Large plant bearing flowers. and fruits. Fruits are long and thin in shape	Leaves, fruits	Leaves are cooked and eaten as vegetable. Fruits are also cooked and eaten as vegetable. Fruits enjoy enormous consumer demand. They are fibrous and often cooked as vegetable or in combination with pulses after cutting them into small pieces. Because of the high fiber content, they are chewed following cooking and then discarded following swallowing the juice. Fruits reputedly have medicinal properties. Leaves are not normally consumed except during times of food scarcity.
Musa paradisiacal L. (Aanti kola) English: Plantain	Musaceae	Plant grows to 5-6 feet tall. Bears flowers and fruits.	Inner portion of trunk, flower cluster	Inner portion of trunk is sliced, cooked and eaten as vegetable. Flower cluster is sliced, fried and eaten as vegetable. Since the plant is available throughout the year, inner portion of trunk and flower cluster is consumed even in normal times but more so during times of food scarcity. Good source of carbohydrates and proteins.
Echinochloa colona (L.) link (Boro dubla, Moina ghas) English name: Jungle rice	Poaceae	Plant resembles paddy plant and grows to 2-3 feet in height.	Seed	Seeds are dried like paddy and then cooked in the form of rice. Serves as an effective rice substitute, but is not consumed or rarely consumed during times of rice availability.
Hordeum vulgare L. (Para) English name: Barley	Poaceae	Grows to about 2 feet in height, similar appearance to wheat plant, seeds are sown in the month of Kartik and harvested in the month of Chaitra. Grown in sandy embankments of a river.	Seeds	Seeds are collected and pounded in a dheki (local pounding process where a hole is made in the ground and anything to be pounded is done so with a wooden contraption, which can be raised and lowered with legs) following mixing with a little water. The powder is then dried to form a flour. Rutis (unleavened bread) are made from the flour and eaten. The powder is also sometimes cooked in the form of rice and eaten. Barley is eaten mostly during the Monga occurring between the months of Chaitra till Jaistha. Good source of carbohydrates.

Table 1: Continue

Paniculum miliaceum L. (Cheena) English name: Broomcorn millet	Poaceae	Grows to about 2 feet in height. Appearance similar to paddy plant. Sown in the months of Agrahayan till Poush and harvested in Chaitra.	Seeds	Seeds are boiled in water and dried in the sun. They are then pounded like paddy in a dheki. After separating the husk, it is then cooked and eaten in the form of rice. Mostly eaten during the months of Chaitra and Kartik. Good source of carbohydrates.
Setaria italica (L.) P. Beauv. (Kaun) English name: Foxtail millet	Poaceae	Grows to about 2-3 feet in height. Seeds are sown in the month of Magh and harvested during the month of Jaistha.	Seeds	Seeds are cooked and eaten in the form of rice. Consumption occurs both during Chaitra-Jaistha as well as Kartik Monga. Good source of carbohydrates.
Corchorus capsularis L. (Tita pat) English name: White jute	Tiliaceae	Grows to about 5-6 feet in height.	Young plants	Cooked and eaten as vegetable. Generally not consumed in normal times except rarely.

Consumption of non-conventional plants as food source during times of food scarcity or famine is not new and is being practiced in various regions of the world. The importance of edible wild plants has been reviewed and shown that these plants can often provide better nutritional quality than conventionally eaten plants (Grivetti and Ogle, 2000). The Australian Aboriginal hunter-gatherers used to have over 800 plant foods and their traditional diet may have been low in carbohydrates but high in fiber, leading to protection of the Aborigines from a genetic pre-disposition to insulin resistance (a physiological condition in which the natural hormone, insulin, becomes less effective in lowering blood sugars) and its consequences like diabetes mellitus, coronary heart disease, and obesity (Brand-Miller and Holt, 1998). A number of wild plants consumed by the inhabitants of Niger, when cereal staples are in short supply, have been shown to be of good or excellent quality, in their content of proteins, amino acids, minerals and essential fatty acids (Freiberger *et al*., 1998; Sena *et al*., 1998; Cook *et al*., 2000). The human population of the western Sahel has been reported to depend upon a number of wild plant foods, and this dependency increases during drought conditions (Cook *et al*., 2000). Numerous other reports are present in the scientific literature, which points out to not only the edibility of wild (in the sense of meaning non-conventional) plants, but also as to their efficiency in providing needed nutrition in a better manner than conventionally eaten species. Currently, the whole human race is dependent on only a few cereal crops for their sustenance and staple diets. This sort of dependency may prove disastrous for two reasons: the first being that the wide cultivation of a single crop can lead to emergence of pesticide-resistant insects and so make the crop production vulnerable, and the second being that the cereal crop concerned may not be suitable for growing in regions of the world with adverse weather and soil conditions. On the other hand, the non-conventional plants consumed during times of food scarcity have mostly proven their value from first-hand inferences in that they allow the consuming population to survive and not only satiate their hunger, but also meet nutritional needs. Moreover, these plants, just by virtue of their being growing untended in the wild are more resistant to insect pests, adverse weather, and poor soil conditions. From that view point, the plants documented in the present survey, which are consumed by villagers of two villages in Kurigram district, Bangladesh during times of food scarcity present potential for further studies and being introduced in other regions of the world as edible plant foods, especially regions where few or no crops can be grown under the present weather and soil conditions.

References

Brand-Miller, J.C. and H.A. Holt, 1998. Australian Aboriginal plant foods: a consideration of their nutritional composition and health implications. Nutrition Research Reviews, 11: 5-23.

Cook, J.A., D.J. VanderJagt, A. Pastuszyn, G. Mounkaila, R.S. Glew, M. Millson and R.H. Glew, 2000. Nutrient and chemical composition of 13 wild plant foods of Niger. Journal of Food Composition and Analysis, 13: 83-92.

Duke, J.A., 1992. Handbook of phytochemical constituents of GRAS herbs and other economic plants. Boca Raton, FL. CRC Press.

Freiberger, C.E., D.J. VanderJagt, A. Pastuszyn, R.S. Glew, G. Mounkaila, M. Millson and R.H. Glew, 1998. Nutrient content of the edible leaves of seven wild plants from Niger. Plant Foods for Human Nutrition, 53: 57-69.

Grivetti, L.E. and B.M. Ogle, 2000. Value of traditional foods in meeting macro- and micronutrient needs: the wild plant connection. Nutrition Research Reviews, 13: 31-46.

Paul, A.K., H.A. Arif, S. Seraj, A. Nahar, D. Nasrin, M.H. Chowdhury, F. Islam, R. Jahan, A.B.M. Bashar, R. Freedman and M. Rahmatullah, 2011. A survey of plant items eaten by the low income groups of the rural population of Talbunia village in Bagerhat district, Bangladesh with an account of their folk medicinal applications. American Eurasian Journal of Sustainable Agriculture (in press).

Jahan, F.I., M.T. Islam, M. Rajib-ul-Hasan, A.R. Chowdhury, S. Seraj, M.S. Aziz, R. Jahan, M.A. Khatun, R. Freedman and M. Rahmatullah, 2010. A Survey on Non-conventional Plant Parts Consumed during Monga-a Seasonal Famine which Affects the Northern Districts of Bangladesh. American Eurasian Journal of Sustainable Agriculture, 4: 230-236.

Sena, L.P., D.J. VanderrJagt, C. Rivera, A.T.C. Tsin, I. Muhamadu, O. Mahamadou, M. Millson, A. Pastuszyn, and R.H. Glew, 1998. Analysis of nutritional components of eight famine foods of the Republic of Niger. Plant Foods for Human Nutrition, 52: 17-30.