

Use of Medicinal Plant and Its Vulnerability Due to Climate Change in Northern Part of Bangladesh

Sadhan Kumar Roy¹, Dipak Kumar Roy²

¹Department of Geography and Environmental Science, Faculty of Life and Earth Sciences, Begum Rokeya University, Rangpur, Bangladesh

²Department of Public Health, School of Health & Life Sciences, North South University, Dhaka, Bangladesh

Email: roysadhanges@gmail.com, dipakroyu@gmail.com

How to cite this paper: Roy, S.K. and Roy, D.K. (2016) Use of Medicinal Plant and Its Vulnerability Due to Climate Change in Northern Part of Bangladesh. *American Journal of Plant Sciences*, 7, 1782-1793.
<http://dx.doi.org/10.4236/ajps.2016.713166>

Received: August 1, 2016

Accepted: September 13, 2016

Published: September 16, 2016

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Abstract

Medicinal plants are playing an important role to human livelihood. Bangladesh is well recognized of medicinal plants wealth as unique and globally rich. The studies demonstrate about the value of traditional systems of medicine as economically useful plants and possible effects of climate change on medicinal plants. It is true that climate change is causing noticeable effects on life cycles and distribution of the plant species. However, climate change effects on medicinal plants are widely unclear in Bangladesh. At present, a huge number of populations in Bangladesh are directly dependent on the healthcare treatment by medicinal plants that is why it is an emerging concern in Bangladesh. It is a crying need to improve our understanding the effects on medicinal plants by various researches is stressed in the present article. To know the present condition of medicinal plants and effects of climate change on medicinal plants in northern part of Bangladesh an attempt is being taken here. The study also added the optimum use of medicinal plants and their conservation in northern part of Bangladesh.

Keywords

Climate Change, Drought, Medicinal Plants, Conservation

1. Introduction

A medicinal plant is any plant which in one or more of its organs contains substance that can be used for therapeutic purposes or which are precursors for synthesis of useful drugs. Nowadays, man has always been interested in floral drugs to alleviate sufferings

and diseases where it was started at the very beginning of human civilization. Because they are considered green medicine is always supposed to be safe. Total 80% of the world populations rely on traditional health care system [1]-[3]. The villagers maintain traditional knowledge of medicinal plants that they use for first aid remedies [4]. Medicinal plants serve as therapeutic agents as well as important raw materials for the manufacture of traditional and modern medicine. The system of ethno-medicine is safe and is a low cost therapy for treating various ailments [5]. The formal systems of plant medicine development are particularly found in China, India, Arabia, Egypt and Europe. Ayurveda system of herbal medicine in India, Sri Lanka and Southeast Asia used 8000 and Unani system in Pakistan is also largely plant based about 5000 out of China's total flora of 30,000 species are used in traditional Chinese medicine. Around 35,000 - 70,000 of the 250,000 species of higher plant has been used for medicinal purposes [3]. Medicinal plant constitutes an important natural wealth of a country and plays a significant role of an economy of a country. They make an essential contribution to human health care provide livelihood to tribal and rural people. Moreover, they are also being used as raw materials in pharmaceutical industries. The primary health care of more than 60% population of Bangladesh especially of tribal and rural people and livelihoods depends greatly on medicinal plants wealth.

Climatic variables are strong environmental control of plant [6] [7]. Like all living members of biosphere, climate change is affects the life cycle and distributions of medicinal and aromatic plants (MAPs). These changes are likely to affect plant ecology e.g. drought and heat wave effects on photosynthesis, respiration, transpiration etc. [8]-[10] and increase plant mortality and extinction risk in many areas [10]. Species Distribution Modeling (SDM) is widely used for ecological applications [11] predicting and estimating potential effects of climatic change and guiding for conservation planning [12] [13]. Some studies demonstrated that temperature and wind action affecting precipitation factors which can affect the medicinal plant growth and activity as a result of ongoing climate change, many plant species are predicted to respond by shifting their ranges [14] or extinct in near future [15]. Due to climate change, some medicinal plants move to higher latitude and some medicinal plant becomes extinct [16].

Anthropogenic climate change effects on species and ecological communities around the world [17] and the cultivated medicinal plants also replaced many native ones. In the northern part of Bangladesh, people use different types of medicinal plants to treat different disease. Climate change is one cause for losing medicinal and aromatic plants in the northern part of Bangladesh. The region is also being negatively affected by deforestation and water scarcity unwise exploitation of land and rapid population growth.

2. Data and Methodology

Use of Medicinal Plant and its Vulnerability Due to Climate Change in Northern Part of Bangladesh is assessed based on the field observation, plant sample collection, questionnaire survey and formal and informal dialogue among the respondents in the selected area.

2.1. Study Area

Kurigram district is situated in northern part of Bangladesh shown in **Figure 1**. Total area of this district is 2296.10 square kilometers and total land cover is about 276.45 square kilometers [18]. It is surrounded by Coach Bihar, West Bengal and Assam of India in North and East part. Gaibandha, Rangpur and Lalmonirhat district of Bangladesh is situated in South and Western part. Absolute location of this district is 25°23'N to 26°14'N latitude and 89°28'E to 89°54'E longitude shown in **Figure 1**. It is 13 meter height from the mean sea level and here flows many small and big rivers. The climate of this district is tempered where there maximum temperature is 32.3°C and minimum 11.2°C (National Encyclopedia of Bangladesh, 2007). Her total annual rainfall is recorded is at about 2931 mm. due to this type of climate here found various kinds of medicinal plants.

2.2. Data Collection

Since deforestation, environmental pollution, modern civilization and migrations of traditional medicinal healer to other jobs knowledge connected to ethno medicinal treatment are being seriously depleted and that could ultimately result in the rapid erosion of this rich knowledge. Moreover the knowledge on traditional practice of medi-

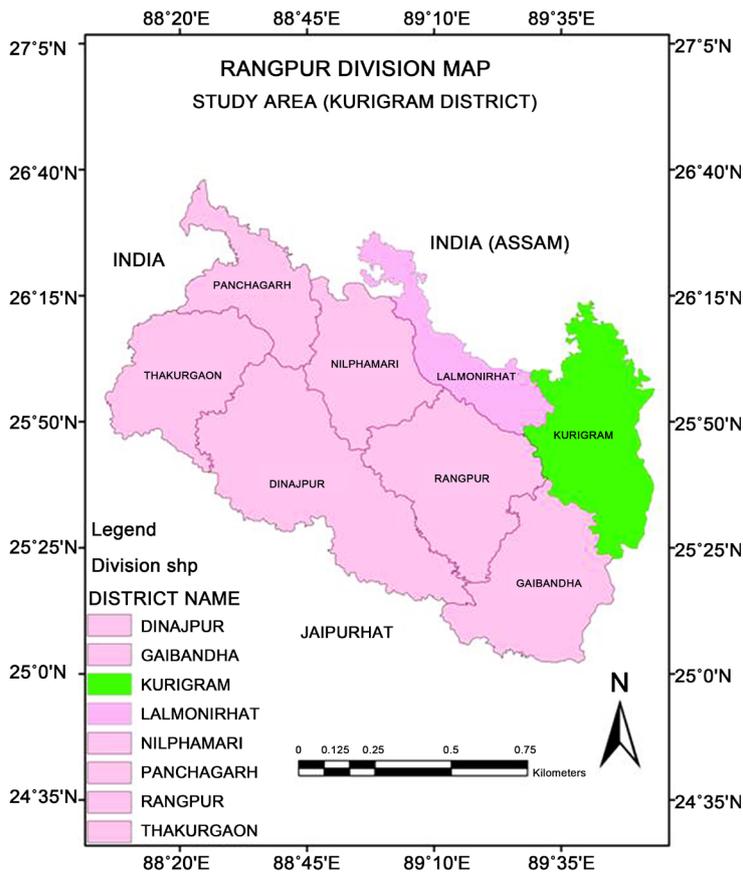


Figure 1. Study area map of kurigram district.

cial plants has been passed from one generation to next only verbally and most of the cases the written documents of this rich knowledge have not been available.

2.3. Sampling of Informants

During June 2014 to August 2015 the ethno pharmacological survey was conducted in the study area. Five days were conducted for consisting per field visit. Different community's interviewees were selected for the study purpose. The primary observation suggested that number distinct groups of people are involved and practiced medicinal plant to cure disease and traditional healing process in the study area as follows

- People of study area who are traditionally use medicinal plants by their indigenous knowledge getting from their previous generation.
- Local traditional health practitioners (*Kobiraz* literally in Bangla) who have practical and empirical knowledge on medicinal plant.
- A group of people or health practitioners having no formal education such as *Bede*, *Sapure/Ojha*, and *Dome* etc. most of them are Hinduism.

2.4. Determination of Sample Size

In order to appropriate result of the study potentially significant group was sampled according to a sampling plan to that type of population. In this study sample size refers the number of subjects. These were sampled according to 95% confidence intervals using a Population Proportionate to Size (PPS) stratified plan considering study subjects. This suggested a sample size of the present study. On the basis of PPS sample size was allocated in various categories and sample was redistribution to ensure the minimum sample size required for any group. For fulfilling this purpose total 55 people were chosen from the selected group were interviewed. Gender, age, educational background and experience on use of traditional medicinal plants were taken into consideration during the selection of informants. Here was also collected the ethnographic data using observation, formal and informal dialogue and third person listening techniques. The formal interviews were prearranged, but informal opportunities were taken, at times and place were the participant's interest could be obtained and retained.

2.5. Ethno-Medicinal Data Collection

This study the explanation and written consent was obtained by interviewers from each informant. The people who are familiar with traditional healers and who could communicate with local communities are considered as participating respondent. To ensure confidentiality each informant was interviewed singly among them.

To collect knowledge and practice of medicinal plants in the study area a number of FGDs were also organized participated by 13 to 20 respondents who had given consent. Open ended and semi structural questionnaire was used for the purpose [19]. The record questionnaires used demographical information including age, sex, educational background and experiences of the healing related to medicinal plant and their practice including the local name of the plants, plants parts used, the methods of preparation,

nature of plant materials, relative abundance at the area, habitat of the plant species, mode of applications and medicinal use of particular plants. Informants were asked to collect the plants they used for the treatment of various ailments. These specimens were pressed preserved and later identified. Some ethno medicinal data were collected from research articles, books and others were also studied. The compounds that were frequently found in the reported plant species were also documented.

3. Result and Discussion

3.1. Informants

At about 65 interviewees were done in the study area where the most of the informants were male and 70.8%. There 48.8% informant's age was at about 55 - 65 years old. They were followed by informants with 45 - 55 years old and total percentage is 35.29%. All of them are lived in the rural region and majority of them have no formal education. The rate of literacy of those people was lower 32.5% than other population in Bangladesh is 56.8% (BBS, 2012; CIA fact book, 2012). Majority of the respondents has 10 - 25 years practical and empirical knowledge about the medicinal plant use and practice.

3.2. Medicinal Plant Recorded

During the study a total of 85 plant species belonging to 46 plant families were identified with medicinal values used by subject population in the study area. There Astera-ceae family represents highest number of species more than 7, followed by Apocyna-ceae family represent only 6 species and Euphorbiaceae and Fabaceae only 5 species.

3.3. Medicinal Plants in Bangladesh

List of the medicinal plants of Bangladesh is below **Table 1**.

3.4. Medicinal Plants Habitat of the Study Area

In the current survey, 34% species were herb, 20.42% were shrub and 17.86% were tree. Among these plants 36.1% species grew in Plain land and crop land and 20.83% species were grown in surrounding the path of home. The habitat of plat species is shown in **Table 2**.

3.5. Information Regarding the Preparation as Medicine

Sometimes whole plants but many of the cases different parts of the same plants are used to produce medicine. The plant parts including producing various ailments are leaf, bark, root, flower, rhizome, seed, tuber, bulb and fruit. Most use of that part is leaf at about 59%, followed by root 52%, bark 13.1% and fruit 7.4% shown in **Figure 2**. Various preparation methods are used for administering medicinal plants as their traditional practice including infusion, past, pills, syrup, smoke, juice, decoction and raw.

The major mode of preparation is juice 58.6% followed by decoction 37.8%. Infusion is done by suspending plant material in either cold or pre-armed water and decoction is done by boiling or heating of plant material in water. Powder is obtained by finely

Table 1. Available medicinal plant in Bangladesh.

Scientific name	Local name	Scientific name	Local name
<i>Carica papaya</i>	Papaya	<i>Euryale ferox</i>	Talmakhna
<i>Cassia fistula</i>	Bandarlathi	<i>Cordia latifolia</i>	Sapestan
<i>Piper betle</i>	Pan	<i>Curcuma zeodaria</i>	Akangi
<i>Terminalia chebula</i>	Horitoki	<i>Areca catechu</i>	Supari
<i>Aegle marmelos</i>	Bel	<i>Cinnamomum tamala</i>	Tejpata
<i>Rosa damascene</i>	Golap	<i>Curcuma longa</i>	Holud
<i>Cocos nucifera</i>	Narkel	<i>Rauvolfia serpentine</i>	Sorpogondha
<i>Zingiber officinale</i>	Ada	<i>Punica granatum</i>	Dalim
<i>Aloe barbadensis</i>	Ghritokumari	<i>Berberi saristata</i>	Daruharudra
<i>Trachysperm umammi</i>	Jayno	<i>Nardostachys jatamansi</i>	Jatamanshe
<i>Phyllanthus emblica</i>	Amloki	<i>Chrozophora prostate</i>	Nilkonthe
<i>Cassia angustifolia</i>	Sunapata	<i>Strychnos nuxvomixa</i>	Kuchila
<i>Glycyrrhiza glabra</i>	Shastimadu	<i>Lagenaria sicararia</i>	Kodu
<i>Nymphaea nouchali</i>	Shapla	<i>Cydonia vulgar</i>	Bihidana
<i>Terminalia belerica</i>	Bohera	<i>Bambusa arundinacea</i>	Banshalochan
<i>Cinnamom umverum</i>	Darchini	<i>Trigonella foenumgraceum</i>	Methi
<i>Swerita chirata</i>	Chirota	<i>Eclipta alba</i>	Vringoraj
<i>Allium sativum</i>	Rosun	<i>Tamarindus indica</i>	Tetul
<i>Cichorium intybs</i>	Kashimul	<i>Helicteres isora</i>	Atamura
<i>Cichorium intybus</i>	Kashibij	<i>Gymnema sylvestre</i>	Gurmarbuti
<i>Elettaria cardamomum</i>	Chotoalas	<i>Cinnamomum cassia</i>	Taj
<i>Saraca indica</i>	Ashok	<i>Sesamum indica</i>	Sadatil
<i>Cyperus rotundus</i>	Mutha	<i>Cuscuta reflexa</i>	Sornolota
<i>Fumaria officinalis</i>	Shahtara	<i>Linum usitatissimum</i>	Tisi
<i>Andrographis paniculata</i>	Kalomegh	<i>Melia azedarach</i>	Ghoraneem
<i>Smilax aristalochaefolia</i>	Oshaba	<i>Lawsonia alba</i>	Mehedi
<i>Foeniculum vulgare</i>	Mouri	<i>Daucus carota</i>	Gagar
<i>Withania somnifera</i>	Asshogondha	<i>Rubia cordifolia</i>	Mangishta
<i>Adhatoda vasica</i>	Basok	<i>Plumbago zeylanica</i>	Chitamul
<i>Citrus aurantifolia</i>	Lebu	<i>Nigella sativa</i>	Kalogia
<i>Coriandrum sativum</i>	Dania	<i>Salmalia malabarica</i>	Mochras
<i>Solanum nigrum</i>	Futibegun	<i>Ipomoea paniculatum</i>	Voikumra
<i>Syzygiumcumini</i>	Kalajam	<i>Amomum subulatum</i>	Boroalas
<i>Zingiber officinale</i>	Adashut	<i>Mesuaferrea</i>	Nageshar
<i>Sphaeranthus indicus</i>	Mundi	<i>Menthaferrea</i>	Kachapudia
<i>Ocimum sanctum</i>	Tulsi	<i>Punica granatum</i>	Dalim
<i>Tamarindus indica</i>	Tetul	<i>Raphanus sativus</i>	Mula
<i>Azadirachta indica</i>	Neem	<i>Vitex negundo</i>	Nishenda
<i>Cuminun cvminum</i>	Gira	<i>Liysea sebifera</i>	Meda
<i>Holarrhena antidysenteria</i>	Kurchi	<i>Cardiospermum nelicaebum</i>	Bankali
<i>Vetiveria zezanioides</i>	Ksh	<i>Aegle marmelos</i>	Bel
<i>Asparagus racemosus</i>	Sotomuli	<i>Mentha arvensis</i>	Pudina
<i>Eugenia caryophyllus</i>	Lobongo	<i>Dalbergia sissoo</i>	Shishu
<i>Centella asiatica</i>	Thankuni	<i>Boer haaviadiffusa</i>	Punornova
<i>Tinospora cordifolia</i>	Guloncho	<i>Tephrosia purpurea</i>	Sarjuka
<i>Cassia occidentalis</i>	Kalkasunda	<i>Tribulus terrestris</i>	Gokshor
<i>Solanum xanthocarpum</i>	kontikari	<i>Ipomoea turpethum</i>	Teuri

Source: Anup Sadi 2012.

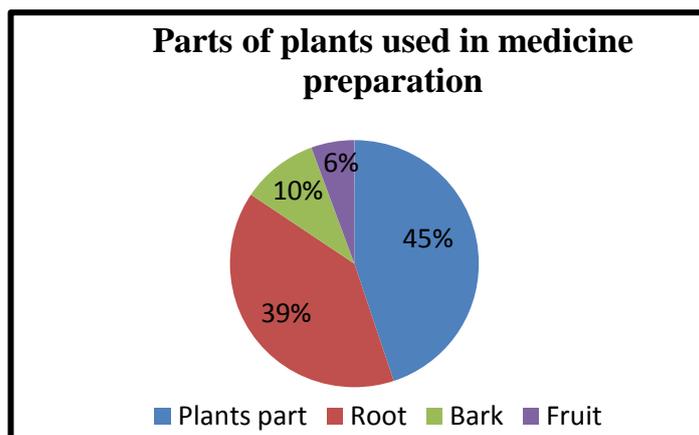


Figure 2. Parts of plants used in medicine preparation.

Table 2. The list of medicinal plants grows in different habitat in the study area.

Plant group	Habitat	Local name of the plant
Plain land and crop land plant	Plain land, cultivate land	Kanibashi, Ghatekochu, Ghagra, Khadnli, Shialkhata, Dondokolosh, Kalomegh etc.
Surrounding the home	Having no water	Bashok, Bohera, Akondo, Tharkrri, Talecochu, Chalta, Tulsi, Kuch, Punorvoba, Amloki etc.

grinding the plant parts to be used, after drying them. Juices are extracted from succulent plants. Most preparation is made with water as solvent. Other preparation are made by honey, ice soaked water and milk. Sometimes people used black pepper, salt, sugar, garlic, ghee, butter, banana leaf, turmeric, *neem* leaf, jackfruit leaf etc. as adjuvant with different solvents. For the preparation of paste or ointment they often used castor oil, coconut oil, ginger, mustard oil and *neem*. Oral ingestions were the most common mode of administration 93.4%. Topical applications were also frequently employed; accounting for 54.6%. For topical purpose, the most important methods used were direct application of paste. There found one inhalation.

3.6. Medicinal Plant and Their Utility

In the study area a large number of medicinal plants have identified by the ethno pharmaceutical survey. **Table 3** shows the medicinal plants are found in the study area with mentioned their local and scientific name, usable part and use for disease cure and healing process.

3.7. Formulation of the Medicine and Uses

The study also identified the formulation of the medicine from the medicinal plants and their uses which will helpful for the natural healing process shown in **Table 4**.

3.8. Nearly Extinct Medicinal Plants in the Study Area

There are a number of extinct medicinal plants have been identified in the study area. Some of them are presented in the **Table 5**.

Table 3. List of identified medicinal plants in study area their using parts and use to control diseases.

Scientific name	Local name	Parts use to produce medicine	Using those medicine to control diseases
<i>Aegle marmelos</i>	Bel	Fruit	Diarrhea and dysentery
<i>Aloe barbadensis</i>	Ghritokumari	Extract of leaf	Fever, sexual disease, headache
<i>Phyllanthus emblica</i>	Amloki	Root of plant and fruit	Scurvy and dandruff
<i>Glycyrrhiza glabra</i>	Shastimadu	Leaf, flower and fruit	Throat pain, ulcer, liver disease, cold and hormonal disease
<i>Terminalia bellerica</i>	Bohera	Fruit	Heart disease, piles, gastric, fever, diarrhea and cough
<i>Swerita chirata</i>	Chirota	Extract of leaf	Stomach disease
<i>Saraca indica</i>	Ashok	Seeds and bark	Dysentery and blood refine
<i>Andrographis paniculata</i>	Kalomegh	Whole plants	Metabolic problem, worm killer, strengthen, gastric, fever, liver disease and dysentery
<i>Citrus aurantifolia</i>	Lebu	Fruit and extract of leaf	Anti-vomiting, tooth disease and scurvy
<i>Syzygium cumini</i>	Kalajam	Fruit and seed	Diabetics and dysentery
<i>Ocimum sanctum</i>	Tulsi	Leaf and seed of plants	Cough, asthma, cold and blood refine
<i>Azadirachta indica</i>	Neem	Root and leaf	Anti-vomiting, tooth disease, skin disease, jaundice antiviral
<i>Holarrhena antidysenteria</i>	Kurchi	Bark and seeds	Diarrhea and dysentery, worm killer and intestinal weakness
<i>Asparagus racemosus</i>	Sotomuli	Leaf and root	Fever and dysentery
<i>Centella asiatica</i>	Thankuni	Whole plant	Metabolic problem, ulcer, chronic dysentery and anti-coughing
<i>Vitex negundo</i>	Nishenda	Root and leaf	Arthritis, asthma and fever
<i>Curcuma longa</i>	Holud	Root	Metabolic problem and skin disease
<i>Terminalia arjuna</i>	Arjun	Bark	Tuberculosis, piles, and heart disease
<i>Calotropis procera</i>	Akanda	Bark, root, leaf and flower	Ulcer, tooth pain, dysentery, cold and asthma
<i>Datura metal</i>	Dhutura	Root, leaf and seed	Pain killer, worn killer and poisonous
<i>Adhatoda vasica</i>	Basok	Leaf and root of plant	Cough, asthma, cold blood refine and tuberculosis
<i>Abroma augusta</i>	Ulotkombal	Root, bark and leaf	Sexual disease, vaginal pain impotence, and snakebite antidote.
<i>Paedaria foetida</i>	Gondhovadule	Leaf	Arthritis and metabolic disease
<i>Ananas comosus</i>	Anarose	Fruit and leaf	Jaundice
<i>Cynodon dactylon</i>	Durba	Leaf	Bleeding control and skin disease

3.9. Endangered Plant in the Study Area

There are a number of endangered medicinal plants have been identified in the study area. Some of them are presented in the **Table 6**.

4. Executive Summary

It is established that medicinal plant and their sustainable use can cure disease, boost immunity and ensure better health of people of Bangladesh. Northern part of Bangladesh is rich in useful medicinal plants with a variety of medicinal plants. A total of 85 medicinal plants species belonging to 46 plant families were identified in the study area.

Table 4. Formulation of the medicine from the medicinal plants and their uses.

Scientific and local name of the medicinal plant	Medicinal uses in various disease	Formulation and doses to cure or prevention the disease
Scientific name: <i>Abroma augusta</i> Local name: Ulotkombal	Sexual disease, vaginal pain, impotence, and snakebite antidote.	Sexual disease: Extract of leaf given 3 - 4 times daily Vaginal pain: One spoonful juice whole plant is taken with honey 2 - 3 times daily for 3 - 7 days Snakebite antidote: Root juice is used in case of snakebite.
Scientific name: <i>Paedaria foetida</i> Local name: Gondho vadule	Arthritis and metabolic disease	Impotence: Two spoonful of root juice with honey twice daily Arthritis and Metabolic disease: Two spoonful extract of leaf is taken with honey before eating twice a day for three days
Scientific name: <i>Adhatodavastica</i> Local name: Basok	Cough, asthma, cold blood refine and tuberculosis	Cough, Tuberculosis and Asthma: One cup of boiling extract of leaf mixed with sugar and oil is taken before eating thrice a day for seven days
Scientific name: <i>Calotropis procera</i> Local name: Akanda	Malaria, Gastric, stomach ache and rheumatics	Rheumatics: Layer of hot leaf is given Gastric, stomach ache: Three pills of dried and grinded root bark is given thrice daily Malaria: Boiled extract of leaf and stem is prescribed
Scientific name: <i>Terminalia arjuna</i> Local name: Arjun	Tuberculosis, piles and heart disease	Piles and heart disease: Extract of bark is taken Tuberculosis: One cup of boiling extract of bark mixed with honey is taken before eating twice a day for five days
Scientific name: <i>Centella asiatica</i> Local name: Thankuni	Metabolic problem, ulcer, abdominal pain, wounds, chronic dysentery and anti-coughing	Metabolic problem, Ulcer, abdominal pain Chronic dysentery and Anti coughing: One spoonful of juice whole plant is taken with honey two or three times daily for three to seven days. Wounds: Leaf juice is used externally
Scientific name: <i>Azadirachta indica</i> Local name: Neem	Skin disease, fever and abdominal pain	Skin disease: Boiling extract of leaf is used to take bath Fever and abdominal pain: One pill of leaf past is taken daily for seven days
Scientific name: <i>Ocimum sanctum</i> Local name: Tulsi	Cough, asthma, cold and flood refine	Cough and Asthma: One cup extract of leaf mixed with sugar and oil is taken before eating thrice a day for seven days
Scientific name: <i>Swerita chirata</i> Local name: Chirota	Stomach disease	Stomach disease: Two spoonful extract of leaf is taken every morning before eating
Scientific name: <i>Terminalia belerica</i> Local name: Bohera	Heart disease, piles, gastric and fever	Heart disease, piles, gastric and fever: One cup water mixed with one spoonful grinded bohera fruit and is taken every morning and before sleeping for one week
Scientific name: <i>Phyllanthus emblica</i> Local name: Amloki	Scurvy and dandruff	Scurvy: Two or three fruit is taken to remove scurvy thrice a day for one week Dandruff: Boiling extract of fruit is cooled and then use
Scientific name: <i>Bombax ceiba</i> Local name: Shimul	Oligospermia	Oligospermia: Grinded and fried root is taken
Scientific name: <i>Catharanthus roseus</i> Local name: Nayantara	Diabetes and amenorrhea	Diabetes : Two gram of root past is boiled with four cup of water and then taken twice daily for fifteen to thirty days Amenorrhea: Root juice taken with water one to two times daily until menstruation
Scientific name: <i>Cassia alata</i> Local name: Sonalu	Eczema and skin disease	Eczema and skin disease: Layer of leaf past is given with salt once daily for seven days Paralysis: Leaf juice is given
Scientific name: <i>Clerodendrum viscosum</i> Local name: Ghetu or Bhat	Easy labor, paralysis, allergy malaria, skin disease, asthma chest pain, diarrhea, anthelmintic and abdominal pain	Allergy and skin disease: Boiling extract of leaf is used to take bath for seven days Easy labor: One to two spoonful of root juice is given once daily Diarrhea: Syrup of root juice is taken with salt for three days Abdominal pain, chest pain, anthelmintic and asthma: One or two spoonful of juice of leaf or root is taken with salt water two or three times daily for three to seven days
Scientific name: <i>Hibiscus abelmoschus</i> Local name: Mushakdana	Snakebite, pharyngitis, fever and coughing	Snakebite: Mash of leaf, fruit and seed is used on the infected area two or three times daily for two or three days Fever and coughing: Quarter cup of root juice is given with salt three to four times daily for three days Pharyngitis: Pills are made fried and grinded seed with salt and honey. Two pills are given twice daily for three days
Scientific name: <i>Clerodendrum indicum</i> Local name: Batraz	Fever, coughing and antidote	Fever and coughing: Three pills of grinded leaf and root is given thrice daily for five to seven days also act as antidote

Table 5. List of the nearly extinct medicinal plants in the study area.

Plant group	Local name
Plain and crop land plant	Sadamorong, Sialkata, Kukra, Dondokolos, Kulekhari, Kulomegis, Noapata, Panicula, Futkikusumukul
Surrounding the path of home	Indrojob, Mohavringoraj, Chalta, Roktodron, Pitraj, Dumur, Bishfall, Hazarbeli, Nisinda

Table 6. List of endangered plant in the study area.

Scientific name	Local name	Scientific name	Local name
<i>Andrographis paniculata</i>	Kalomegh	<i>Dioscorea prazeri</i>	Mati alu
<i>Paedaria foetida</i>	Gondhovadule	<i>Terminalia citrine</i>	Horitoki
<i>Amomum costatum</i>	Bengal cardamom	<i>Zingiber roseum</i>	Bilati ada

Different parts of the plants are used as medicinal purposes. The effects of climatic change are apparent within ecosystems around the world, including medicinal and aromatic plant populations. Due to climatic changes medicinal and aromatic plants in the study area face challenges and local plants and plants genetic diversity losses. In the study area found nearly extinct 18 species and 6 endangered species **Table 5** and **Table 6**. Already extreme weather events impact the availability and supply of medicinal and aromatic plants on the global market and future increases in extreme weather are likely to negatively affect medicinal and aromatic plant yields even further. As a result research is emerging to protect the endangered medicinal and aromatic plants from the climate change effects. Although climate change may not currently represent the biggest threat to medicinal and aromatic plants, but it has the potential to become a much greater threat in future decades. The rural poor people of the world especially the developing countries likely the northern part of Bangladesh depends on medicinal plants not only for health care but also for source of income. The study concerns medicinal plants harvested for their essential use for oils, medicinal, fragrance, culinary and other daily purposes in the northern part of Bangladesh as well as the rural community in Bangladesh and their threat to climate change. The present study however, therefore refers all such plants under the widely used acronym MAPs in Bangladesh.

5. Conclusion

The potential loss of medicinal and aromatic plant species from effects of climate change is likely to have major ramifications on the livelihoods of large numbers of vulnerable populations across the world. Although climate change is more threats for medicinal and aromatic plants but the effects of climate change on medicinal plants has not been well studied. As this situation unfold climate change effects on medicinal plants may become a more pressing issue for the herbal community, users, producer and medicinal and aromatic plant species. An improved knowledge of climate change effects on medicinal plants responsible for such changes requires intensive and conti-

nuous field measurements at representative sites. Further research on this field and chemical production efficiency of threatened medicinal plants under climate change scenario is essential for developing conservation strategies of agro-technologies for cultivation.

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