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MORPHOLOGICAL STUDIES OF SOME MEDICINAL PLANTS GROWN IN BANGLADESH

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ABSTRACT

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The present study focuses the knowledge on morphological features of medicinal plants for their authentic identification. The medicinal plants were also grown with a view to popularize the cultivation and its necessity and also for future scientific study and sustainable uses. Twelve (12) medicinal plants were studied in order to understand the morphological characters as well as their useful information. The lowest growth rate was recorded 6.5 cm in country mallow and the highest was 97 cm in nutmeg plant. The highest number of primary branches (22), secondary branches (60) in asparagus and tertiary branches (25) in country mallow were recorded. The growth habit of majority of the plants were erect and some were of spreading and erect spreading. The canopy diameter was the lowest 2 cm and 4 cm in snake plant and the highest was 50 cm and 120 cm in rose flower fragrant during planting and after six months of planting respectively. The lowest planting density (03) in life plant and the highest (70) in asparagus were recorded. The lowest stem diameter was found 0.57 cm in asparagus and the highest was 2.55 cm in snake plant. Various colour was recorded like green, light green and greyish. Snake plant showed stem hairs, but other plants had no stem hairs. The density of stem hair was abundant in snake plant. The shape of leaf, leaf apex, leaf base and leaf margin were observed and found different shapes e.g. cordate, lanceolate, obtuse, linear, subulate etc. The highest length of leaf was recorded 15.6 cm in cattle bush, but the lowest 3.9 cm in country mallow. The leaf width was found highest 8 cm in nutmeg plant, but the lowest 0.3 cm in asparagus. The highest length of petiole was 7.6 cm in nutmeg plant, but the lowest 0.1 cm in rosy flowered leadwort. The leaves, roots, stems, barks, flowers, fruits and seeds of the studied plants are used as medicine to control different diseases. Tree size, type and nature were also recorded to identify the plants.

Key words: morphological characters, medicinal plants, medicinal values, diseases, potency

INTRODUCTION

Medicinal plant is an important source of medicine and plays a significant role in world health (Sandberg and Corrigan, 2001). According to World Health Organization (WHO), many countries in the world that is two-thirds of the world's population depend on herbal medicine for their primary health care (Akerle 1992; Hossain 2003 and Ghani 2003). The reasons for this dependence is due to their better cultural acceptability, better compatibility and adaptability with the human body and assert lesser side effects. It was found that most of the used drugs contain plant extracts. Some contain bioactive components or substances (active ingredients) which are obtained from medicinal plants. Medicinal plants contain substances in one or more of its organs that are used as medicine concerned with the treatment of disease and the action of remedial agents. In the present era, plants are used as a range of treatments to physical problems of the human body. In China 40% of medication comes from plants and in Asian countries it is 80%. Recently, WHO surveyed that 80% of the world population depends on natural medicines at some stages of their primary health care concerns (Jhansi 2016). This implies the use of medicinal plants not only for the treatment of diseases, but also as potential materials for sustaining good health and conditions.

Yusuf *et al.* (2009) reported that 747 medicinal plants growing in Bangladesh have therapeutic value. The dependence on remedies from medicinal plants is particularly important in developing countries like Bangladesh where modern medicine is often absent or simply too expensive. The use of medicinal plant species is threatened by habitat destruction and by the unsustainable harvesting of plants from the nature. As a result, the raw materials of medicinal plants would be shortage in future. This is a valuable indicator of the current status of medicinal plant species in the nature and is a critical warning sign that action needs to be taken now, to reduce pressure on these diminishing populations.

Herbal medicines can be considered safe alternative to modern medicines in some infectious disease in which the use has been established from time immemorial (Snigdha *et al.* 2018). The knowledge of herbal medicine is extensive and varies from one region of the country to another. It is hoped that this research will draw together a number of traditional healers to contribute knowledge and experience of Bangladesh Open University and local people. Their skills at identifying species and at monitoring the availability in the nature will be valuable asset to the research. The importance of medicinal plants cannot be taken lightly, because they have a significance to study the morphological characters in some of the medicinal plants commonly used in Bangladesh.

Considering the above background, the study on twelve (12) important medicinal plants were therefore undertaken- (1) to obtain information on morphological features which would help in their identification and authentication, (2) to conserve for sustainable uses and future scientific study and (3) to popularize their cultivation and necessity.

MATERIALS AND METHODS

Experimental Site

Twelve medicinal plants were grown in Bangladesh Open University (BOU) campus for the study at a latitude of 90°31'N, longitude of 24°22'S at the elevation of 50 m above the sea level. The reason of growing those plants was to encourage local people and BOU employees to set up their own medicinal plant gardens.

Soil

The land was high and the soil was sandy loam with good internal drainage system. The site belongs to Madhupur tract under the Agro-ecological zone (AEZ) number 28.

Collection of Plant Materials

The sexual or asexual seedlings of twelve medicinal plants were collected from the nurseries situated from different locations of Bangladesh which are most commonly used by local people of Bangladesh as medicine.

Plantation and Intercultural Operations

After preparing the allotted land, the collected seedlings were planted. Each significant plant was labelled mentioning their Bangla, English, scientific and family names. The care was taken after plantation of seedlings like watering, manuring, earthing up, protection measures, weeding etc.

Data Collection

Data was taken from primary sources e.g. field temperature, relative humidity (RH), growth rate, number of branches, growth habit, canopy diameter, branch density, stem diameter, stem colour, stem hair, stem hair density, shape of leaf, leaf apex, leaf base and leaf margin, color, length and width of fully grown leaf, length of petiole etc. Data was also collected from secondary sources e.g. relevant books, magazines, journals, term papers, papers, proceedings, periodicals, essays, reports and internet information etc. The secondary sources were used to know the medicinal parts and values of the plants. Detailed records were kept that enabled thorough analysis to cultivate these medicinal plants.

Growth Rate

Initial height of each of the medicinal plants was measured using tape just after planting in the field. Their growth rate was recorded at every two months interval.

Number of Branches

The number of branches of every medicinal plant were counted in two times. One counting was done at planting time and another one was after six months of planting. Three types of branches like primary, secondary and tertiary were recorded.

Measurement of Canopy Diameter of a Tree

Canopy diameter of a tree is an important attribute of the size of the tree that influences the benefits e.g. cooling that a tree provides. The diameter of the tree's crown (canopy) i.e. the distance from one edge to the other was measured for the determination of canopy width. For the consistent and reducing subjectivity of the canopy, straight along the cardinal directions (north, east, south, and west) was measured. To identify the edge of the canopy, walked to its edge, and looked up imagining the drip line off its leaves. If a tree were to function as an umbrella, the drip line would be the edge of the canopy where the water would run off. The distance was measured from the trunk to the drip line in each of the four cardinal directions using measuring tape.

Measurement of Stem Diameter of a Tree

The stem of a tree above the ground level was wrapped using a specially calibrated diameter tape around the outside (circumference) of a tree. It was made sure that the string was straight and tight around the trunk and marked or cut the circumference on the string/rope. Then the length of string was measured. This indicated the total circumference of the tree. Now the circumference was divided by 3.14 to convert the circumference measurement to diameter. This diameter means the diameter of a tree with bark. For getting the diameter of a tree without bark, the circumference has to divide by 4.

Identifying a Tree Using the Shape of Leaf, Leaf Apex, Leaf Base and Leaf Margin

The fully grown leaves of different medicinal plants were seen. Because the shape of leaf, leaf apex, leaf base and leaf margin are the discriminating features for identifying plant species. There are basically three main parts of a leaf-stalk or petiole, leaf blade or lamina and stipules. The stalk or petiole is the thin section joining the base to the lamina, it is generally cylindrical or semicircular in form. In some of the plants the stalk is absent. Such types of leaves are called sessile. The leaf blade is consisted by base, midrib, veins, margin and apex. The connecting point from stem to leaf blade is called base point. Every leaf has got a mid-vein, which starts from leaf base and extends to the length of the leaf. The mid-vein of the leaf is not necessarily straight and bends towards left or right. For symmetric leaf, the mid-vein is straight and length of the mid-vein corresponds to

length of the leaf. The asymmetric leaves have mid-vein bent towards right or left. The lamina or leaf blade is the widest part of the leaf. The stipules are small structures located on either sides of the base of the petiole. Not every species produces leaves with all of these structural components. In certain species, paired stipules are not obvious or are absent altogether. A petiole may be absent, or the blade may not be laminar (flattened). There are large varieties exist in leaf structures. Hence, leaf blade was considered as a peculiar feature for recognition and classification.

Leaf shape of medicinal plants can vary considerably. The different leaf shapes based on base angle, base shape, tip angle, tip shape and margin like cordate (heart shaped, stem attaches to cleft with wide and has broader base than apex), lanceolate (pointed at both ends), obtuse (rounded point, angle base), linear (parallel margins, elongate), cuneate (wedge shaped, acute base), subulate (tapering point, awl shaped), elliptic (leaves with acute angle at both base and apex and having widest part at centre), aristate (with a spine like tip), oval oblong (egg shaped with base and apex obtuse, but has equidistant parallel edges at the centre part of the leaf), acute (leaf or leaflet margins taper gradually or abruptly to a point at the apex), pointed (leaf base and tip incisive or angular less than 90°), rounded (without a pointed apex), cuneate (wedge shaped acute base), oblique (a leaf twisted or inclined from the normal position), serrate (margin has a series of tooth like pointed teeth around the entire leaf edge), entire (margin is even and smooth around the entire leaf edge), serrulate (with fine serration), light serrate (light teeth forward-pointing) etc. were found in the research.

Low rainfall and moderately high temperature were the climatic characteristics of Gazipur district in Bangladesh. The research area was surrounded by heavy industrial areas. Weekly meteorological aspects in respect of air temperature and relative humidity during the period of research were recorded by thermometer and hygrometer respectively.

RESULTS AND DISCUSSION

Field study were carried out on different aspects of medicinal plants for one year (2017-2018) and various data were taken. The research was studied at temperature ranged from 8.7 to 36°C with mean 24.63±0.68°C and relative humidity 67.29 to 92.07 per cent with mean 79.28±1.10 per cent.

Conservation of Medicinal Plants

The seedlings of different medicinal plants were collected from the various corners of Bangladesh and planted in a piece of land in the Bangladesh Open University Campus. Land preparation and management practices were done properly. The allotted plot was maintained by twelve medicinal plants (Table 1). Each of the medicinal plants was indicated with scientific name including their local, English and family name in the field.

Table 1. List of collected medicinal plants grown at Bangladesh Open University Campus

Sl. no.	Local name	English name	Scientific name	Family name
1	RaktaJoba	China rose	<i>Hibiscus rosa-sinensis</i>	Malvaceae
2	Nayantara	Periwinkle	<i>Catharanthus roseus</i>	Apocynaceae
3	Shetberela	Country-mallow	<i>Sida cordifolia</i>	Malvaceae
4	Pithraj	Pithraj tree	<i>Aphanamixis polystachya</i>	Meliaceae
5	Lalchita	Rosy-flowered leadwort	<i>Plumbago indica</i>	Plumbaginaceae
6	Patharkuchi	Life plant	<i>Bryophyllum rinnatum</i>	Crassulaceae
7	Parul	Rose flower fragrant	<i>Stereospermum suaveolens</i>	Bignoniaceae
8	Gadila/Gumbi	Cattle bush	<i>Pittosprum angustifolium</i>	Pittosporaceae
9	Shatamuli	Asparagus	<i>Asparagus racemosus</i>	Liliaceae
10	Jolpai	Rugged oil fruit	<i>Elaeocarpus floribundus</i>	Elaeocarpaceae
11	Snake cactus	Snake plant	<i>Acanthocereus tetragonus</i>	Asparagaceae
12	Joipal	Nutmeg plant	<i>Jaiphal javitri</i>	Myristicaceae

Twelve medicinal plants have been conserved at the campus of Bangladesh Open University. Every plant was marked mentioning their local, English, scientific and family name so that one can identify the plant easily.

Growth Rate

It was found that the least height was 8.5 cm in snake plant and the highest was 48 cm in rose flower fragrant during planting. But the lowest growth rate was recorded 6.5 cm in country mallow and the highest was 97 cm in nutmeg plant (Table 2).

Growth rate of various medicinal plants was found different. It was recorded that the growth rate of nutmeg plant was 14.92 times more than that of country mallow. It might be due to the favor of the environment.

Table 2. Growth rate of planted seedlings of medicinal plants after every two months

Medicinal plants	Height of medicinal plants at planting time (cm)	Height of planted medicinal plants measured after every two months (cm)			Height increased from the transplanting time (cm)
		1	2	3	
China rose	40.0	50.0	55.0	90.0	50.0
Periwinkle	20.0	32.0	36.0	56.0	36.0
Country-mallow	27.5	29.5	30.2	34.0	6.5
Pithraj tree	30.0	34.0	37.0	50.3	20.3
Rosy-flowered leadwort	26.0	33.0	35.5	90.0	64.0
Life plant	28.0	34.0	38.0	60.2	32.2
Rose flower fragrant	48.0	65.0	72.6	140.0	92.0
Cattle bush	27.0	28.5	29.0	40.3	13.3
Asparagus	25.0	35.0	39.0	90.6	65.6
Rugged oil fruit	23.0	28.0	32.0	70.0	47.0
Snake plant	8.5	10.0	10.5	20.3	11.8
Nutmeg plant	23.0	33.0	40.0	120.0	97.0

Number of Branches

Some of the medicinal plants had no any type of branches during planting time e.g. pithraj tree, life plant, rose flower fragrant, cattle bush, rugged oil fruit, snake plant, nutmeg plant. But the different types of branches were found after six months passed. The highest number of primary branches (22), secondary branches (60) in asparagus and tertiary branches (25) in country mallow were recorded (Table 3).

Table 3. Number of branches per medicinal plant at planting time and after six months

Medicinal plants	Number of branches at planting time			Number of branches after six months		
	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
China rose	02	08	-	02	12	15
Periwinkle	03	11	-	03	15	08
Country-mallow	01	04	-	01	04	25
Pithraj tree	-	-	-	01	02	01
Rosy-flowered leadwort	02	-	-	02	06	12
Life plant	-	-	-	03	-	-
Rose flower fragrant	-	-	-	03	04	09
Cattle bush	-	-	-	-	-	-
Asparagus	03	-	-	10	60	-
Rugged oil fruit	-	-	-	18	06	-
Snake plant	-	-	-	01	02	-
Nutmeg plant	-	-	-	22	-	-

'-' indicates no branches.

Branching capacity was found different in the plants. Some of the plants showed no any branches, but some showed primary, secondary and tertiary branches. Nutmeg plant showed the highest primary branches (22), asparagus showed highest secondary branches (60), but country mallow showed the highest tertiary branches (25). It might also be happened due to their growing nature.

Growth habit, Canopy Diameter and Branch Density

The growth habit, canopy diameter and branch density of different medicinal plants are shown in Table 4. The growth habit of majority of the plants were erect and some were of spreading and erect spreading. The canopy diameter of snake plant was the lowest (2 cm, 4 cm) during planting time and after six months of planting respectively. The highest was found 50 cm at planting time and 120 cm after six months of planting time. Some of the medicinal plants were found without branches and some were with branches. Cattle bush tree showed no any branches at six months passing of planting. Among the remaining plants, the lowest planting density (03) was recorded in life plant and snake plant and the highest (70) was in asparagus.

Table 4. Growth habit, canopy diameter and branch density in different accession of medicinal plants after six months of planting time

Medicinal plants	Growth habit	Canopy diameter (cm)		Branch density	
		Planting time	After six months	Planting time	After six months
China rose	Erect	45	75	10	29
Periwinkle	Erect	26	70	14	26
Country-mallow	Spreading	25	50	05	30
Pithraj tree	Erect	15	52	-	04
Rosy-flowered leadwort	Spreading	16	70	02	20
Life plant	Erect	18	27	-	03
Rose flower fragrant	Erect- Spreading	50	120	-	16
Cattle bush	Erect	28	30	-	-
Asparagus	Spreading	23	25	03	70
Rugged oil fruit	Erect	16	40	-	24
Snake plant	Erect	02	04	-	03
Nutmeg plant	Erect	10	100	-	22

The growth habit of medicinal plants was erect, spreading and erect-spreading. These types of different habits might be occurred for their developing nature which have been supported by Hoque *et al.* (2014), Anonymous 2006. Rose flower fragrant showed 30 times more canopy diameter than that of snake plant after planting of six months. Each of the plants shows different canopy diameter. These kind of differences might be happened for their nature. Some of the medicinal plants grew in BOU campus without showing any branches. The asparagus plant showed 23.33 times more branch density than that of life and snake plant.

Stem of Medicinal Plants

The stems of medicinal plants with different characteristics like diameter, color, hair, hair density are summarized and shown in Table 5. All the stem characteristics were observed and recorded after six months of planting. The lowest stem diameter was found 0.57 cm in asparagus and the highest was 2.55 cm in snake plant. Various stem color was recorded like green, light green and greyish. Snake plant showed stem hairs but the other plants had no stem hair. The density of stem hair was abundant in snake plant.

It was found that 4.47 times more stem diameter was recorded in snake plant than asparagus. Some of the medicinal plants were found without hair, but some showed abundant hairs. Stem colour of various plants were found different. It might be occurred due to their rising nature.

Table 5. Main stem diameter, stem colour, stem hair and stem hair density of medicinal plants after six months of planting time

Medicinal plants	Main stem diameter (cm)	Stem colour	Stem hair	Stem hair density
China rose	1.59	Greyish	Absent	-
Periwinkle	1.50	Green	Absent	-
Country-mallow	0.89	Greyish	Absent	-
Pithraj tree	0.96	Greyish	Absent	-
Rosy-flowered leadwort	0.64	Green	Absent	-
Life plant	1.08	Light green	Absent	-
Rose flower fragrant	1.27	Greyish	Absent	-
Cattle bush	0.80	Green	Absent	-
Asparagus	0.57	Yellowish	Absent	-
Rugged oil fruit	1.02	Light green	Absent	-
Snake plant	2.55	Green	Present	Abundant
Nutmeg plant	1.59	Greyish	Absent	-

‘-‘ means stem hair not found

Shape of Leaf, Leaf Apex, Base and Margin of Medicinal Plants

Leaf shape, shape of leaf apex, base and margin in different medicinal plants are presented in Table 6. Various shape of leaves was found in medicinal plants. However, two medicinal plants showed lanceolate leaf shape, two showed obtuse leaf shape, one showed cordate leaf shape, one showed oval oblong leaf shape, one linear, one cuneate, one subulate and others showed different leaf shape like elliptic, aristate etc. Shape of leaf apex in most of the plants was pointed and other plants showed acute, obtuse and aristate. The rounded shape of leaf base was found (3) followed by cuneate (3) and acute (3) shape. Among the other plants oblique and cordate type leaf bases were also found. The highest number of leaf margin was 4 of entire shape followed by serrate shape, but other plants showed serrulate and light serrate.

The shape of leaf, leaf apex, leaf base and leaf margin were observed and found different shapes e.g. cordate, lanceolate, obtuse, linear, subulate etc. It might also be happened for their growing nature.

Table 6. Shape of leaf, leaf apex, leaf base and leaf margin of medicinal plants

Medicinal plants	Leaf shape	Shape of leaf apex	Shape of leaf base	Shape of leaf margin
China rose	Cordate	Acute	Cordate	Serrate
Periwinkle	Oval-oblong	Acute	Rounded	Entire
Country-mallow	Lanceolate	Pointed	Rounded	Serrate
Pithraj tree	Linear	Pointed	Acute	Entire
Rosy-flowered leadwort	Obtuse	Pointed	Cuneate	Entire
Life plant	Obtuse	Pointed	Oblique	Serrate
Rose flower fragrant	Lanceolate	Acute	Acute	Serrulate
Cattle bush	Cuneate	Obtuse	Cuneate	Serrulate
Asparagus	Subulate	Aristate	Cuneate	Entire
Rugged oil fruit	Elliptic	Obtuse	Acute	Light serrate
Snake plant	-	-	-	-
Nutmeg plant	Aristate	Aristate	Rounded	Serrulate

Color, Length, Width of Fully Grown Leaf and Length of Petiole

Different leaf characters like color, length, width of fully grown leaf and length of petiole of medicinal plants are shown in Table 7. Most of the medicinal plants had dark green colored leaf. The number shown dark green color was 4, 2 plants had greenish gold colored leaf, 2 was of light green leaf and others were green, golden green and yellowish green colored leaf. The highest length of leaf was recorded 15.6 cm in cattle bush followed by nutmeg plant. But the lowest was 3.9 cm in country mallow. The leaf width was found highest (8 cm) in nutmeg plant followed by china rose, but the lowest was 0.3 cm in asparagus. The highest length of petiole was filed 7.6 cm in nutmeg plant, but the lowest 0.1 cm in rosy-flowered leadwort. Cattle bush had no petiole in leaf.

Medicinal plants showed different leaf colors for their developing nature. The length of leaf was found 4 times more in cattle bush followed by nutmeg plant than country mallow. Nutmeg plant and china rose showed 26.67 times more leaf width than that of asparagus. The length of petiole was found 76 times more in nutmeg plant than that of rosy-flowered lead wort. These types of characters might be differed due to their producing habit which supported the findings of Haider and Alam (2014).

Table 7. Colour, length, width of fully grown leaf and length of petiole in different medicinal plants

Medicinal plants	Leaf colour	Length of leaf (cm)	Width of leaf (cm)	Length of petiole (cm)
China rose	Dark green	7.6	7.5	1.0
Periwinkle	Dark green	6.5	2.5	1.1
Country-mallow	Greenish gold	3.9	1.3	0.7
Pithraj tree	Light green	13.0	5.6	0.3
Rosy-flowered leadwort	Green	10.5	5.5	0.1
Life plant	Light green	7.0	4.3	1.0
Rose flower fragrant	Dark green	9.1	4.4	1.2
Cattle bush	Golden green	15.6	6.5	Nil
Asparagus	Greenish gold	7.2	0.3	0.8
Rugged oil fruit	Yellowish green	12.0	5.4	2.6
Snake plant	-	-	-	-
Nutmeg plant	Dark green	13.5	8.0	7.6

Salient Features of Medicinal Plants

The different characteristics of medicinal plants including their medicinal values and uses of plant parts are described in Table 8. The plants bear so many peculiar characteristics like perennial herb or shrub, evergreen shrub or small tree, deciduous large tree etc. These medicinal plants act to control different diseases e.g. dysentery, diarrhoea, piles, diabetes, leukemia, blood pressure, liver tumors, abdominal chest pains, rheumatism, headache, earache, eyeache, noseache, peptic ulcer, kidney stones, leucorrhoea, cough, cold, women's fertility etc. The leaves, roots, stems, barks, flowers, fruits and seeds of the mentioned medicinal plants are used as medicine. Plant parts based of medicinal values vary from plant to plant.

A lot of medicinal plants are in surrounding us which are wild in nature and not known to us. These different medicinal plants are used for the treatment of different diseases. We suffer from many kinds of diseases. It was found that same diseases are controlled by different plants. e.g., periwinkle, life plant, asparagus, are used to control diabetes. Here three different plants are used for same purpose. But this difference and diversity is very important for the people. Because all the plants are not found easily surrounding to the people when needed. It is seen that one plant is available, but the others not. It was also found that dysentery is controlled by using the plant parts of china rose and rugged oil fruit which are different in nature. China rose is medium bushy shrub and evergreen, rugged oil fruit is large tree and evergreen. These kinds of differences in nature between the plants might be helpful for the users or growers based on the plants habitat. The option would be the best if one

plant is used to control all the diseases. But it is impossible and impractical, because one plant is not possible to grow due to environmental variation in a country or in the world. So it might be absurd to collect this plant. On the other hand, if the plant is destroyed due to pest attack (insects, mites, pathogens etc.), many patients would die for the lack of medicinal plants. So we should conserve the medicinal plants according to their habitat and our needs.

Table 8. Salient features of medicinal plants grown at Bangladesh Open University Campus

Medicinal plants	Characteristics	Medicinal values	Uses of Plant parts
China rose	Evergreen shrub or small tree, ornamental plant.	Used to control dysentery, diarrhoea, piles etc.	Flower bud
Periwinkle	Perennial herb with oppositely arranged leaves, ornamental plant.	Act against diabetes, leukemia, blood pressure etc.	Whole plants, leaves
Country-mallow	Perennial sub-shrub, entire plant covered with soft white felt-like hair.	Worked against ophthalmic, stomachic, tonic, cooling etc.	Leaves, flower, seeds
Pithraj tree	A tree-like habit, occasionally a shrub, sometimes grown as an ornamental.	Effective against spleen and liver, tumors and abdominal, chest pains.	Bark, seeds
Rosy-flowered leadwort	Perennial herb or shrub, branched from the base, with the stems drooping and sometimes rooting.	Useful for the treatment of rheumatism, headache, peptic ulcer etc.	Leaves, root
Life plant	Perennial herb, often hairy in some species, sometimes grown as an ornamental.	Fruitful against diabetes, kidney stones, leucorrhoea etc.	Leaves
Rose flower fragrant	Large deciduous tree with greyish or dark brown bark.	Works efficiently against intestine, snake bite, vomiting etc.	Leaves, bark, stem
Cattle bush	Evergreen woody perennial, rapid upright.	Found successful results against cough, cold, cancer etc.	Leaves, fruits
Asparagus	Perennial herb, usually climbing.	Reactive against women's fertility, digestive, respiratory, diabetes etc.	Whole plant, root
Rugged oil fruit	Tree with a spreading crown, often planted for its fruit in home gardens.	Tonic for dysentery and diarrhea, mouth-wash for inflamed gums etc.	Leaves, bark, fruits
Snake plant	Leafless shrub of desert areas, arching stems with sharp spines.	Unknown	Fruit, stem
Nutmeg plant	A small evergreen tree, smooth dark green leaves.	Effective as anticancer, insomnia, appetiser etc.	Leaves, fruits

Tree Size, Type and Nature

The size, type and nature of the medicinal plants have been presented in Table 9. Five types of tree size were found in the research e.g. small, small to medium, medium, medium to large and large. The highest number was recorded 5 in small tree, but the lowest was found 1 in medium and medium to large tree. The type of medicinal plants was listed highest 4 in tree followed by shrub (3). But the lowest was 1 in bushy shrub/herb or shrub/shrub or small tree. Most of medicinal plants showed evergreen nature was 10, but the lowest was 1 in deciduous nature.

Table 9. Tree size, type and nature of different medicinal plants

Medicinal plants	Tree size	Tree type	Nature
China rose	Medium	Bushy shrub	Evergreen
Periwinkle	Small	Shrub	Evergreen
Country-mallow	Small	Shrub	Evergreen
Pithraj tree	Large	Tree	Evergreen
Rosy-flowered leadwort	Small	Herb or shrub	Evergreen
Life plant	Small	Herb	Evergreen
Rose flower fragrant	Large	Tree	Deciduous
Cattle bush	Small to medium	Shrub or small tree	Evergreen
Asparagus	Small to medium	Herb	Evergreen
Rugged oil fruit	Large	Tree	Evergreen
Snake plant	Small	Shrub	Leafless
Nutmeg plant	Medium to large	Tree	Evergreen

The size, type and nature of medicinal plants were found diverse. Small tree was found 5 times more than medium and medium to large tree. The type of tree plants was 4 times higher than bushy shrub followed by herb or shrub and shrub or small tree. The evergreen plants were found 40 times more than semi-deciduous plant. It might be happened due to the favor or disfavor of the environment and their growing nature which was similar to the findings of Yusuf *et al.* (1994).

CONCLUSION

Endeavors are invested to conserve twelve important medicinal plants in a piece of land at Bangladesh Open University (BOU) campus to study their morphological characters. The conservation of medicinal plants is a successive action. It's the responsibility for all the stakeholders in a country to preserve ecology simultaneously to conserve the biodiversity as medicinal plant is one of the parts. It will be possible to collect and conserve further medicinal plants in the plots of BOU as future genetic resources in the coming days. It is hoped that these medicinal plants will sustainably be used for our primary health care needs and future scientific study. BOU campus where those medicinal plants are conserved by which people can identify the plants authentically. Indisputably BOU and its surroundings people will be encouraged to cultivate these plants for their necessity and this will be popularized in the public.

Some of the ways might be taken for the future prospective which are stated below:

- Govt. should take initiation for the publicity of usefulness of medicinal plants through radio, television & other media.
- To save the forest for the conservation of medicinal plants.
- A specific division should be established in the ministry to know the medicinal plants easily.
- To establish gardens of medicinal plants in all the districts as gene bank.
- To organize seminars, symposiums, workshops, conferences for increasing awareness about medicinal plants.
- To motivate the mass people to grow medicinal plants in their homestead garden.

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