

## Fig trees (*Ficus* spp.) : Species diversity, medicinal usage and conservation at the Bangladesh Agricultural University Campus

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Receipt : 15.11.2023 ; Revised : 22.02.2024 ; Acceptance : 26.02.2024

DOI : 10.53552/ijmfmap.10.1.2024.41-50

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### ABSTRACT

*Ficus* L. (Moraceae), commonly known as fig, is distributed in diverse ecosystems, especially in tropical and temperate regions. This study was carried out on twenty-four species of *Ficus* L. based on the morphological observations of taxonomically significant characteristics. Among 24-species, it was found that eighteen species were trees, four were shrubs and two were climbers. *F. auriculata* had the largest leaves, measuring (24-41×22-35.5cm), followed by *F. lyrata* (18-45×15-30cm) and *F. bengalensis* (18-20×8-15cm). In contrast, *Ficus retusa* had the smallest leaves, with dimensions ranging from 3-7×1-2 cm. The majority of species exhibit both medicinal and commercial applications. Additionally, certain plants are cultivated for ornamental purposes. A total of thirteen species have been classified as “least concerned” while eleven species have not yet been evaluated for their conservation status according to the criteria of IUCN. The present study, which investigates the species diversity within the genus *Ficus*, offers a valuable foundation for forthcoming endeavors in conservation and management, while also establishing a fundamental reference for subsequent research endeavors.

**Keywords:** *Ficus* spp. diversity, medicinal uses, conservation status, BAUBG

### INTRODUCTION

*Ficus* L., considered a keystone species in tropical rain forests, plays a very fundamental role in different ecosystems, due to its fruits which are consumed by insects, birds and animals throughout the year (Chaudhary *et al.*, 2012). *Ficus* is one of the largest genera in the angiosperms with 884 species, distributed throughout the world primarily in subtropical and tropical regions (<https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:327905-2>). *Ficus* is also considered one of the most diversified genera concerning its habits (deciduous and evergreen trees, shrubs, herbs, climbers and creepers) and life forms (free-standing trees, epiphytes, semi-epiphytes in the crevices, rheophytes and lithophytes) (Chaudhary *et al.*, 2012); it grows everywhere in Bangladesh and some of them produce edible fruits (Khatun *et al.*, 2016). *Ficus* species are used for medicinal properties in Ayurvedic, modern medicine and pharmaceutical applications (Adebayo *et al.*, 2009;

Abdulla *et al.*, 2010, Sharma *et al.*, 2016). For example, *F. racemosa* has been found to possess potential benefits in the treatment of skin cancer and wound healing (Lalla, 2005, Singh *et al.*, 2019). The fruit extracts of *F. religiosa*, *F. benjamina* and *F. benghalensis* have been found to have noteworthy antimicrobial and antibacterial properties as reported by Mousa *et al.* (1994), Sharma *et al.* (2016) and Singh *et al.* (2020a, b). Several species of *Ficus* are also employed in the treatment of cholera, diarrhoea, dysentery, mumps, vomiting and other related ailments.

*Ficus* is the most conspicuous and problematic genus because its microscopic flowers are located inside the closed fleshy receptacle (*i.e.*, Syconium) (Sharma *et al.*, 2016). Therefore, vegetative morphology plays an important role in the identification of different species (Corner, 1965). Leaf and fruit (Syconium) morphology vary significantly among the *Ficus* species and act as important characteristics for identification (Nair *et al.*, 2021). Leaf size can also provide clues about

the species' habitat, growth conditions and evolutionary adaptations. Some species may have large, broad leaves adapted for capturing more sunlight in dense forests, while others may have smaller leaves suitable for arid or open environments. The fig, a unique fruit type of the genus *Ficus*, morphology varies in different aspects like shapes, sizes, colors and textures; its' structure, including the presence or absence of specific features like ostioles (tiny openings through which wasps enter to pollinate the fig) can also aid in species differentiation (Nair *et al.*, 2021). Hence, the present study was conducted to assess the species diversity of the genus *Ficus* based on observations of taxonomically significant morphological traits including leaf size, shape and fig size in the Bangladesh Agricultural University Campus and their uses have been reviewed.

## MATERIALS AND METHODS

Field surveys were conducted to identify and document different *Ficus* species within the Bangladesh Agricultural University Campus. The locations, habits and characteristics of each species were recorded. The collected specimens underwent a comprehensive morphological examination followed by taxonomic identifications through comparative analysis using available keys. Measurements were conducted using a measuring scale to determine the dimensions of leaf size (in cm), leaf shape and fig size (in cm).

## RESULTS AND DISCUSSIONS

A total of 24 *Ficus* species were identified from the Bangladesh Agricultural University (BAU) campus, mostly trees. Some are shrubs and a few climbers. Leaf area varied widely among different *Ficus* species (Figure 1). *Ficus auriculata* has the highest average leaf area whose value is 934.05 cm<sup>2</sup> followed by *F. lyrata* whose value is 708.75 cm<sup>2</sup>. On the other hand, *F. retusa* has the lowest average leaf area whose value is 7.5 cm<sup>2</sup> followed by *F. natalensis* (14.63 cm<sup>2</sup>). Fig size of different *Ficus* species has been shown in Figure 2. The fig size of *F. simplicissima*, *F. carica* and *F. lyrata* were the largest (4.0 cm) followed by *F. pumila* (3.67 cm). *F. microcarpa nitida* produced the lowest average fig size whose value is 0.75 cm. *Ficus elastica*, *F. heterophylla*, *F. maclelendii*, *F. religiosa*

and *F. semicordata* are the second last and their value is 1.0 cm.

A short description of each of *Ficus* species present at the BAU Campus with their uses has been presented below:

### 1. *Ficus altissima* Blume

**Common Name :** Kathal Bot (Bangla), Council Tree (English)

A big tree having a large crown; Leaf entire, oblong, variegated, quite thick, green-white, 10-15 cm × 6-9 cm. Figs are deep orange and 1.5 cm in size (Plate A-1).

**Use :** Leaves and bark are used in skin diseases. Methylated flavonoids were found only in *Ficus altissima*, indicating that flavonoids could play an important role in the systematics of the genus (Sharaf *et al.*, 2000). Stem and bark produce white latex which is used to make rubber. The foliage can be used in various flowering arrangements. Figs are used as food for animals, especially for birds and bats (tropical.theferns.info).

**Conservation Status :** Least concern (Lc)

### 2. *Ficus auriculata* Lour.

**Common Name :** Borodumur (Bangla), Australian Fig, Eve's Apron (English)

*Ficus auriculata* Lour is a perennial evergreen shrub or small tree, grown in tropical regions. Leaves are very large having rough surfaces on both sides and are green in color. The figs are also very big, about 3.5 cm in size having a light green color on the outside and pink color on the inside (Plate A-2).

**Use:** Used in the treatment of diarrhoea, dysentery, cuts, wounds, mumps, cholera, jaundice, etc. (Gairola and Biswas, 008). Young branches and leaves are used for food for elephants and camels. Figs are edible.

**Conservation Status:** Least Concern (Lc)

### 3. *Ficus benghalensis* L.

**Common Name :** Bot (Bangla), Banyan Tree (English)

*Ficus benghalensis* L. is a big tree having a large canopy. It also acts as a hemi-epiphyte. It is widely grown in tropical regions. Leaves are medium in size, thick and deep green. It produces small-sized fruits, about 1.65 cm in size which are very attractive to birds as they are deep orange (Plate A-3).

**Use :** Widely used in traditional medicine. The bark is useful for burning sensations, hemorrhages, diarrhea, dysentery, diabetes, ulcer and skin diseases. The leaves are good for ulcers, leprosy, skin allergies etc. The buds are used in diarrhea and dysentery. Latex is useful in rheumatism, hemorrhoids, inflammation and skin diseases (Rakesh *et al.*, 2022). Figs are eaten by birds and mainly spread by them.

**Conservation Status:** Not Evaluated (NE)

#### 4. *Ficus benjamina* L.,

**Common Name :** Pakur (Bangla), Yellow Fig, Java Fig (English)

This species is widely grown in tropical and subtropical regions. It is a big, evergreen tree having a large canopy with many branches. Leaves are medium in size and dark green in color. Figs are small, about 1.05 cm in size and orange in color (Plate A-4).

**Use:** *Ficus benjamina* possesses significant medicinal value, as it is employed in the treatment of several ailments such as malaria, influenza, dysentery, bronchitis, acute enteritis, pertussis and febrile seizures in pediatric patients (Hasti *et al.*, 2014). Plant extracts can enhance the antioxidant defense system in humans, making them a preferred choice due to their ability to reduce side effects and toxicity compared to synthetic alternatives.

**Conservation Status:** Least Concern (Lc)

#### 5. *Ficus benjamina* curly

**Common Name :** Weeping Fig (English)

**Description:** This species is also known as weeping fig, grown in sub-tropical regions. It is a small tree or large shrub. Leaves are small in size light green in color and curled at the apex.

**Use:** It contains various antioxidants. It is grown in households, parks and yards as ornament plants. Leaves can be used as cut flowers in different flowering arrangements. Figs are about 3 cm in size (Plate A-5).

**Conservation Status :** Not Evaluated (NE)

#### 6. *Ficus carica* L.,

**Common Name:** Angir-dumur (Bangla), Common Fig, European Fig (English)

The species is indigenous to an area extending from Asiatic Turkey to northern India. It is a big evergreen tree. Leaves are large and green in color.

Leaves have very rough surfaces. Figs are about 4 cm in size and reddish (Plate A-6).

**Use:** The species has some medicinal value. Figs can supply a lot of vitamins and minerals and can combat the hidden hunger caused by the micro-nutrient deficiency (Ashrafuzzaman *et al.*, 2021). Leaves, fruits and roots of the plant are used in native medicinal system for different disorders such as gastrointestinal (colic, indigestion, loss of appetite and diarrhea), respiratory (sore throats, cough and bronchial problems), inflammatory and cardiovascular disorders etc. (Penelope *et al.*, 1997). Additionally, fruits are edible and consumed as well as dried form by human.

**Conservation Status:** Least concern (Lc)

#### 7. *Ficus elastica* Roxb. ex Hornem

**Common Name:** Rubber Gachh, Attah Bar (Bangla), Indian Rubber Tree (English)

*Ficus elastica* Roxb. ex Hornem. is a large perennial tree grown in tropical regions. Leaves are thick and glossy and deep green. Figs are small in size, about 1 cm and yellowish-orange in color (Plate A-7).

**Use :** It produces latex which is used to make rubber. This rubber is very good in quality and used in day-to-day life activities. It is used in traditional medicine for various health problems, including pain, rheumatism, diarrhea, hypertension, infection, skin allergies, anemia, wounds, hernia and hemorrhoids (Arsyad *et al.*, 2023). Figs are eaten by birds, squirrels and other animals.

**Conservation Status:** Least Concern (Lc)

#### 8. *Ficus fistulosa* Reinw. Ex Blume

**Common Name:** Yellow Stem Fig (English)

*Ficus fistulosa* is an evergreen tree grown in tropical and sub-tropical regions. Leaves are large and thin and light green to green in color. Figs are about 2.5 cm in size and light green (Plate A-8).

**Use :** *Ficus fistulosa* is a traditional medicine used in the remedies of diarrhoea, diabetics and malaria (Sharma *et al.*, 2016). Sometimes they are also cultivated as ornamental plants.

**Conservation Status:** Least concern (Lc)

#### 9. *Ficus geniculata* Kurz.

**Common Name:** Dotted Fig (English)

It is a large tree. The plant of this species is widely available in subtropical regions. Leaves are

medium to large. Figs are green at an early stage and yellow when mature, size is 2 cm (Plate A-9).

**Uses:** It has both nutritional and ethano-medicinal values. Tribal people use young leaves and buds for cooking purposes. Besides, it contains phenols (Abdulla *et al.*,2010) and some anti-oxidants which are used for the treatment of leucorrhoea and degenerative diseases.

**Conservation Status:** Not evaluated (NE)

#### 10. *Ficus assamica* Miq

**Common Name:** Bhui-dumur, Bala-lata, Ballam Dumur (Bangla)

This species is widely found in the Indian subcontinent. It is a shrub. Leaves are small to medium in size. Figs are quite small, 1 cm in size and green in color in the early stage and yellowish-orange in color in the mature stage (Plate A-10).

**Use:** The plant has several uses in the medicine branch. Leaf pastes are used in skin diseases like rheumatism, ear infections etc. (Abdulla *et al.*, 2010). Figs are edible.

**Conservation Status:** Least Concern (Lc)

#### 11. *Ficus simplicissima* Lour.

**Common Name:** Dangra, Khandadumur, Khuskadumur (Bangla)

This species is grown in tropical regions. It is a small tree or shrub in nature. Leaves are large and membranous. Figs are 4 cm in size and red when ripe (Plate A-11).

**Use :** *F. simplicissima* is used to treat pneumonia, vitiligo, diarrhea, tonsillitis, cough, and rheumatic pain and promote lactation (Au *et al.*, 2009). Leaves are used as fodder. Figs are used as food for birds, squirrels, and other animals.

**Conservation Status:** Not evaluated (NE)

#### 12. *Ficus hispida* Blanco

**Common Name:** Kakdumur (Bangla), Opposite-leaved Fig, Rough-leaved Stem Fig (English)

*Ficus hispida* Blanco is grown in tropical and subtropical regions. It is a large shrub or small tree by nature. Leaves are quite medium to large in size and green in color. Leaves have very rough, surface hairy. Figs are 2.5 cm in size (Plate A-12).

**Use :** Figs are widely consumed as food in several West Asian countries. Traditionally, different parts of the plant have been used in the

treatment of ulcers, psoriasis, anemia, jaundice, vitiligo, hemorrhage, diabetes, convulsion, hepatitis, dysentery, piles, biliousness and purgative etc. (Abdulla *et al.*,2010).

**Conservation Status:** Not evaluated (NE)

#### 13. *Ficus krishnae* C.DC.

**Common Name:** Krishna Bot (Bangla), Krishna's Fig, Krishna's Butter Cup, Sacred Fig Tree (English)

This species is native to the Indian subcontinent. It is an evergreen tree having many branches. Leaves are medium in size dark green in color on the upper side and light green on the lower side. Leaves are pocket-shaped at the lower end. Figs are 2 cm in size and orange in color when they are ripe (Plate B-13).

**Use :** It has been used extensively by ayurvedic practitioner in India to treat various ailments such as ulcers, vomiting, fever, inflammations, leprosy, syphilis, biliousness, dysentery and inflammation of liver (Au *et al.*, 2009).

**Conservation Status:** Least Concern (Lc)

#### 14. *Ficus lyrata* Warb.

**Common Name:** Fiddle Fig Tree, Banjo Fig (English)

The species is grown in tropical rainforest. It is a large big, evergreen tree having a large canopy. Leaves are very big in size and lyre in shape. Leaf surface is smooth on the upper side and rough on the lower side and the veins are very clear to see. Figs are large, 4 cm in size and green in color and yellowish at a mature stage (Plate B-14).

**Use :** The plants may be used as indoor plants. The broad leaves of this *Ficus* houseplant remove chemicals like formaldehyde, ammonia and benzene from the air more efficiently than most medicinal air purifiers. Fiddle leaf fig is a rich source of antioxidants like flavonoids and phenols. These antioxidants treat liver fibrosis (accumulation of cells and collagen in the liver) and lower cholesterol levels. (Abdel-Hameed, 2009).

**Conservation Status :** Not evaluated (NE)

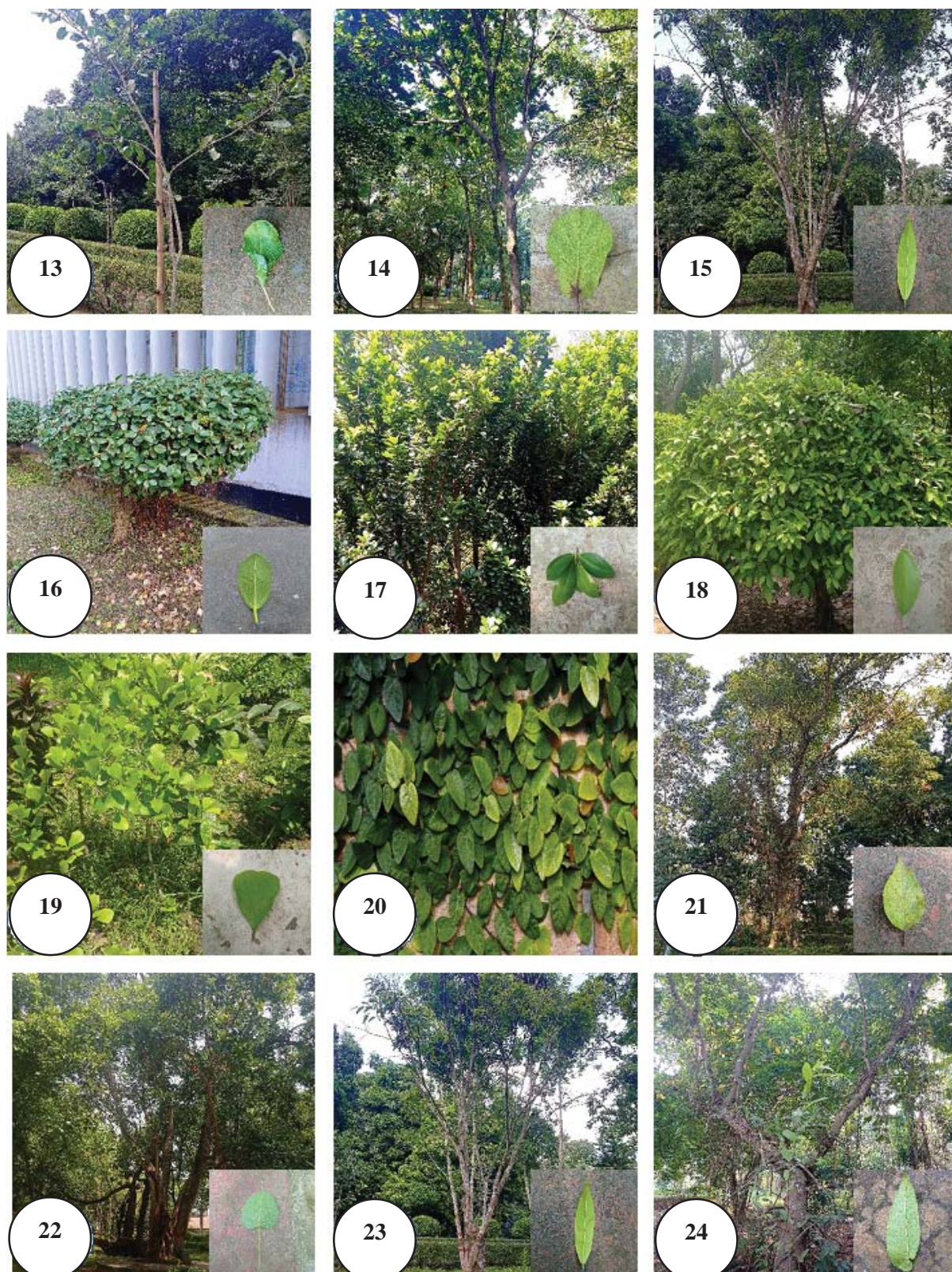
#### 15. *Ficus maclellandii* King

**Common Name :** Narrow Leaf Fig, Long Leaf Fig (English)

This plant is native to India, Southeast Asia, and China. It is an evergreen tree. It is also called banana leaf fig or alii fig commonly. Leaves are long and



**Plate A : Photographs of different Ficus species:(1) *Ficus altissima*, (2)*Ficus auriculata*, (3) *Ficus benghalensis*, (4) *Ficus benjamina*, (5) *Ficus benjamina curly*, (6)*Ficus carica*, (7)*Ficus elastica*, (8)*Ficus fistulosa*, (9) *Ficus geniculata*, (10) *Ficus assamica* (11) *Ficus simplicissima*, (12) *Ficus hispida***



**Plate B:** (13) *Ficus krishnae*, (14) *Ficus lyrata*, (15) *Ficus maclellandii* King, (16) *Ficus microcarpa*, (17) *Ficus retusa*, (18) *Ficus microcarpanitida* (king) F.C.Ho, (19) *Ficus natalensislepriurii*, (20) *Ficus pumila*, (21) *Ficus racemosa*, (22) *Ficus religiosa*, (23) *Ficus rumphii*, (24) *Ficus semicordata*

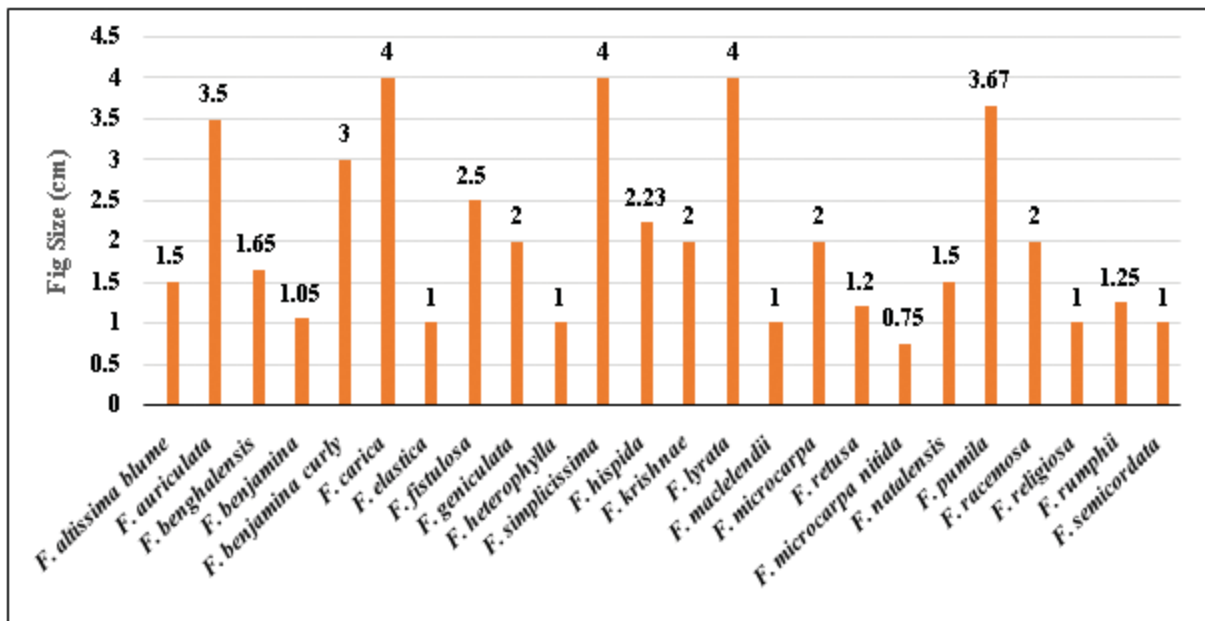


Fig. 1: Fig size (cm) of different *Ficus* species of the study area

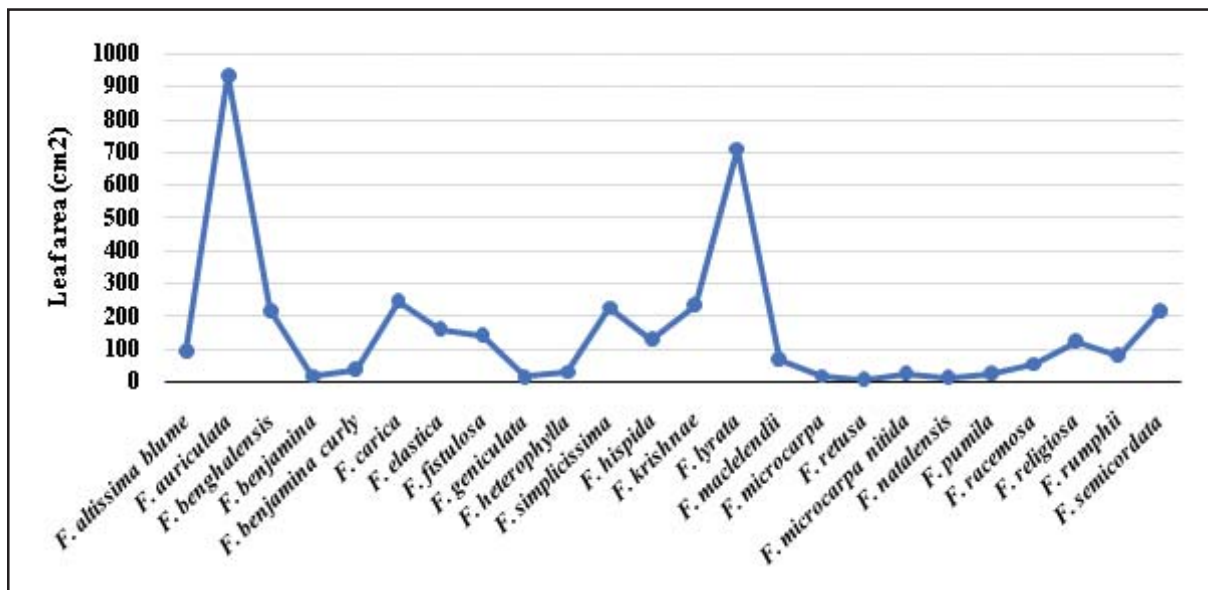


Fig. 2 : Leaf area (cm<sup>2</sup>) of different *Ficus* species of the study area

narrow in shape and light green to green in color. Figs are 1 cm in size and orange in color (Plate B-15).

**Use :** Figs are eaten by birds and other animals. Woods can be used as firewood. The bark *used for treating wounds, diabetes, hemorrhoids, and diarrhea.*

**Conservation Status :** Not evaluated (NE)

**16. *Ficus microcarpa* Blume L. f.,**

**Common Name :** Green Island Ficus (English)

This species is native to tropical and subtropical areas. It is an evergreen, perennial tree. Leaves are small in size dark green in color and rounded at the apex. Figs are 2 cm in size and green-yellowish in color (Plate B-16).

**Use :** *Ficus microcarpa* is cooling, astringent, and anti-bilious. It is found to have good healing

property, and is used in the preparation of oils, and ointments for external application in the treatment of ulcers. (Kumar *et al*, 2012). The plant is widely used as an indoor plant for beautification. Figs are eaten by birds.

**Conservation Status:** Not evaluated (NE)

#### 17. *Ficus retusa* L.

**Common Name :** Chinese Banyan, Pot Belly Fig, Indian Laurel, Curtain Fig (English)

The species is widely grown in tropical areas. It is an evergreen-perennial tree. Leaves are small in size and green to dark green. Figs are 1.2 cm in size (Plate B-17).

**Use :** The root, bark, and leaf latex are used to treat wounds, headaches, liver diseases, toothache and ulcers. Aerial roots are useful in treating skin diseases (Abdel-Hameed, 2009). This species is used for ornamental purposes indoors as bonsai.

**Conservation Status:** Not evaluated (NE)

#### 18. *Ficus microcarpanitida* (king) F.C.Ho

**Common Name:** Jir, Kamrup (Bangla), Chinese Banyan, Malyan Banyan (English)

This species is native to China through tropical Asia and the Caroline Islands to Australia. It is an evergreen perennial tree. It is a large tree having a large canopy but it is often kept small for beautification. Leaves are small to medium in size and dark green in color and pointed towards the end. Figs are 0.75 cm in size and green in color (Plate B-18).

**Use :** Figs are eaten by birds. The plants are sometimes used for medicinal purposes and are mostly used as indoor plants for beautification.

**Conservation Status :** Not evaluated (NE)

#### 19. *Ficus natalensislepriurii* (Miq.)

**Common Name:** Barkcloth Fig, Natal Fig, Mistletoe Fig, Triangle Fig, Sweetheart Tree (English)

This is a tropical and sub-tropical species. It is a shrub. Leaves are medium to large in size and dark green in color. Figs are 1.5 cm in size and green when unripe and pinkish when mature (Plate B-19).

**Use :** It is mostly grown as a bonsai plant for ornamental purposes. Besides, different plant parts are used in traditional medicine. The root has

analgesic properties and is used for the treatment of headaches, arthritis etc. (Kumar *et al.*, 2012).

**Conservation Status:** Least Concern (Lc)

#### 20. *Ficus pumila* L.

**Common Name :** Lata Dumur, Dewal Dumur (Bangla), Fig Ivy, Creeping Fig, Climbing Fig (English)

It is a climbing perennial. A native of China and Japan also found in South East Asia. Leaves are small in size greenish in color. Figs are 3.75 cm in size and purple-black in color (Plate B-20).

**Use :** They are widely used to soften the look of concrete garden walls. They can also used as a groundcover. Figs are edible. The plants are used for local medicinal use.

**Conservation Status :** Least Concern (Lc)

#### 21. *Ficus racemosa* Willd.

**Common Name :** Jogyadumur (Bangla), Cluster Fig, Indian Fig, Redwood Fig (English)

The species is widely grown in the Indian subcontinent. It is a big, evergreen tree. Leaves are medium in size and dark green in color. Figs are 2 cm in size and green in color at an immature stage and deep orange at a mature stage (Plate B-21).

**Use:** Different parts of the plant have been used for traditional medicines. They are used for the treatment of diabetes, diarrhea, liver disorders, respiratory and urinary diseases, etc. (Abdel-Hameed, 2009).

**Conservation Status:** Least Concern (Lc)

#### 22. *Ficus religiosa* Forssk.

**Common Name:** Ashwatha, Ashwath, Panbot (Bangla), The Pipal, Bo-tree (English)

This plant is native to tropical and subtropical regions. It is a big evergreen tree having a large canopy. Leaves are medium to large have a pointed tail towards the end and are green in color. Figs are 1 cm in size and green at the immature stage and orange to reddish at the mature stage (Plate B-22).

**Use:** This species has been widely used in traditional medicine for many years. Different plant parts are used for about fifty types of disorders such as diabetes, diarrhea, asthma inflammatory disorders and sexual disorders, gastric problems etc. (Kumar *et al*, 2012).

**Conservation Status :** Least Concern (Lc)



### 23. *Ficus rumphii* Blume

**Common Name:** GaiAswatha, Sunmjor (Santal) (Bangla), Golden Rumph's Fig, Golden Mock Bodhi Tree (English)

This species is widely grown in the Indian subcontinent. It is a big tree having a large canopy and vigorously grown branches. Leaves are very similar to *Ficus religiosa* but do not have a tail at the end of the leaves. Leaves are green. Figs are 1.25 cm in size and green in color (Plate B-23).

**Use:** The plant is widely used in traditional medicines. The bark is used for snake-bite and the juice extracted from the plant is also taken internally with turmeric, pepper etc. to treat asthma. (Kumar et al., 2012).

**Conservation Status:** Least Concern (Lc)

### 24. *Ficus semicordata* Miq.

**Common Name :** Sadimadi-dumur (Bangla)

The species is grown in tropical areas. It is a big tree. Leaves are medium in size and green to dark green but they are not equal on both sides. Leaves are cordate shaped that's why they are called semi-cordata. Figs are 1 cm in size and reddish when ripe (Plate B-24).

**Use :** The plant has medicinal value. They have some antioxidant activity, antidiabetic potential etc. (Sharma et al., 2016). Figs are eaten by birds for food.

**Conservation Status :** Not evaluated (NE)

## CONCLUSION

A total of 24 species (out of 884) are found in BAU campus. Most of them are trees, some are shrubs and climbers. It is also found that fruits are used as food for birds, insects, animals even humans. They are very healthy and nutritious and energetic. They contain different types of chemicals and minerals like protein, fat, starch, vit-C, beta-carotene etc. They can serve widely in the pharmaceutical industry and clinical uses. Many important drugs can be invented by using them. People can get benefitted from this. More further studies should be done to explore the potentiality of these plants.

## CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal

relationships that could have appeared to influence the work reported in this paper.

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