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Anti-Obesity Therapeutics Potential of Plant Genetic Resources of Bangladesh and Their Conservation at Bangladesh Agricultural University Botanical Garden

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Abstract Obesity, a global health issue affecting 650 million people, leads to chronic diseases and health impairments. Anti-obesity drugs are expensive and may cause side effects, raising significant concerns. One hundred eighty-eight medicinal plant species from 157 genera and 62 families in Bangladesh exhibit anti-obesity activities. Fabaceae (syn. Leguminosae) is the largest family, consisting of 25 species, while Citrus is the largest genus with seven species. The leaf is the most commonly used plant part, followed by the fruit. Plant secondary metabolites, including acids, alkaloids, terpenoids, saponins, glycosides, tannins, carboxylic acids, (poly)phenols, and flavonoids, serve as effective interventions in a complex system approach to obesity. Among these medicinal plants, 110 species are conserved at the Bangladesh Agricultural University (BAU) Botanical Garden, and more than 50 species are cultivated on BAU farms and in homestead gardens. Twenty species are conserved both in the Botanical Garden and cultivated as field/horticultural crops and ornamentals. According to the IUCN Red List of Threatened Taxa, the current (global) status of these species is data deficient for 11, least concern for 73, near threatened for 1, vulnerable for 3, endangered for 2, and no assessment has yet been performed for 98 species. Future studies should focus on enhancing efficacy and reducing the side effects of conventional anti-obesity medications.

Index Terms Thermodynamic imbalance, secondary metabolites, anti-obesity, IUCN Red List, Bangladesh

I. Introduction

Obesity is characterised by abnormal or excessive fat accumulation that poses a health concern and is defined as a body mass index of 30 or higher. Globally, the proportion of children and adolescents aged 5 to 19 quadrupled from 2% to 8% between 1990 and 2022, while the proportion of adults aged 18 and over more than doubled from 7% to 16% (https://www.who.int/health-topics/obesity#tab=tab_1). In 2016, the World Health Organisation (WHO) developed a global action plan to halt the rise in obesity prevalence by 2025 [1]. Although these conditions were previously considered exclusive to high-income nations, they are now found in every region, with the highest prevalence in some middle-income nations (https://www.who.int/health-topics/obesity#tab=tab_1). The prevalence of obesity in Bangladesh increased from 1.7% to 25.6% among adolescents and from 1% to 23% among children since 1998 [2]. Genetic factors account for just around 33% of the variation in body weight [3], while environmental factors, including lifestyle and socioeconomic influences, play a significant role. Obesity is becoming increasingly common in cities of Bangladesh due to a lack of playgrounds, a decline in physical exercise, a sedentary lifestyle, and changes in dietary habits, particularly an increase in energy-rich fast-food consumption [4]. It is a significant public health concern, contributing to the development of numerous non-communicable diseases such as hypertension, diabetes, asthma, arthritis, and degenerative diseases, which affect various health impairments, including cardiovascular disease, Type 2 diabetes, musculoskeletal conditions, and an increased risk of dying from cancers of the colon, rectum, oesophagus, liver, gallbladder, pancreas, and kidney [5]. Obesity and overweight significantly impact healthcare systems, and obese individuals incur 30% more medical expenses than those of normal weight [6].

Bariatric surgery, medication, behavioural modifications, and dietary changes are some ways to address obesity issues. Glucagon-like peptide-1 (GLP-1) receptor agonists, selective serotonin reuptake inhibitors (SSRIs), serotonin receptor agonists, and cannabinoid receptor type 1 (CB1) antagonists are just a few of the medications identified to facilitate weight loss [7]. However, these drugs may cause negative side effects such as headache, nausea, drowsiness, asthenia, diarrhoea, insomnia, anxiety, depression, sweating, tremors, and sexual dysfunction, including erectile dysfunction, anorgasmia, and decreased libido, along with an increased risk of cardiovascular diseases [7], [8]. Furthermore, anti-obesity drugs often have limited accessibility and high costs [6]. Therefore, having alternative options or co-adjuvants is crucial, as the anti-obesogenic effects of natural compounds have not yet exhibited side effects. Plants are the most commonly utilised natural sources of local biodiversity, closely linked to people's daily needs. Dietary phytochemicals have recently drawn considerable attention as potential therapeutic agents for promoting health and mitigating obesity and related conditions. Obese patients frequently perceive herbal medicine as natural and safe, as these treatments are easily accessible and innocuous to use without a doctor's supervision [9]. Natural resources serve as viable bases for developing novel anti-obesity products, such as functional foods and dietary supplements, including fruit extracts, vegetables, and herbal substances, to prevent obesity and metabolic syndrome [5]. Plants are abundant in diverse compounds belonging to four biochemical classes: alkaloids, glycosides, polyphenols, and terpenes. The anti-obesity mechanisms of medicinal plants include decreased lipid absorption, reduced energy intake, increased energy expenditure, decreased pre-adipocyte differentiation and proliferation, enhanced lipolysis, and reduced lipogenesis [10].

Numerous reviews on the use of medicinal plants in anti-obesity medications have been published to date for example, [5], [7], [11]–[15]. Bangladesh is rich in (medicinal) plant genetic resources and possesses a long history of using plants for different disease therapies as a part of the Indian subcontinent’s traditional medicine [16]. However, little is known about the anti-obesogenic effects of Bangladeshi medicinal plants [17]–[20]. Hitherto, the solitary review paper by Rahman and Rahman [18] identified only twenty-three plant species of Bangladesh having anti-obesity properties. This study aims to provide a comprehensive review of the availability of natural medicinal agents, their potential for assisting weight loss in Bangladesh, and their conservation status at the Bangladesh Agricultural University Botanical Garden, hereafter “garden” only.

II. Methodology

The prospect of treating obesity in Bangladesh with medicinal plants was examined through an exhaustive literature review published during 2010-2025. Various electronic databases, including PubMed, Springer, MDPI, ResearchGate, Google and Google Scholar, ScienceDirect, and others, were searched for this publication. Bangladeshi publications were found in the BanglaJol database, a database exclusively for Bangladeshi journals, using a combination of keywords, for example, “obesity”, “medicinal plants”, “traditional medicine”, “plant extracts”, “Bangladesh”, etc. Editorials and comments without peer review and articles published in languages other than English were excluded. Information regarding the anti-obesity activity, plant parts used, and active constituents was taken from the selected publications. Nomenclature is updated by consulting with Plants of the World Online (https://powo.science.kew.org/), the International Plant Names Index (https://www.ipni.org/), and World Flora Online (https://www.worldfloraonline.org/), and the present global status with IUCN Red List (https://www.iucnredlist.org/search) and national status with “Encyclopedia of Flora and Fauna of Bangladesh” [21], [22].

III. Results and Discussion

Anti-obesity activities are observed in 188 medicinal plant species from 157 genera and 62 families (Table 1). Among these, only 18 species, representing 10% of the total, are monocotyledons, while the remainder are dicotyledons (Figure 1). A significant increase in the number of Bangladeshi medicinal plant species used to treat obesity is reported here compared to the previous figure, which is only 23 [18]. Some of these species have extensive global use for anti-obesity management; for example, Carica papaya, Zingiber officinale, Hibiscus sabdariffa, Foeniculum vulgare, Zea mays, Bauhinia variegata, Citrus medica, etc. [14]. Fabaceae (syn. Leguminosae) is the largest family with 25 species, followed by Cucurbitaceae (11 species) and Lamiaceae and Rutaceae (10 species each) (Figure 2). Citrus is the largest genus with seven species, followed by Piper and Solanum, each with three. The numerous reports from the Fabaceae family may be attributed to its vast number of species (https://powo.science.kew.org/), making it more likely to be used in Bangladesh and globally than other families with fewer species. Aumeeruddy and Mahomoodally [14] recorded 451 plant species from 110 families and 329 genera traditionally utilised to treat obesity.

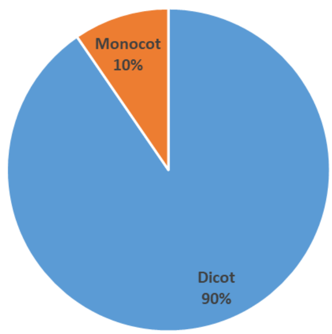

Figure 1: Taxonomic Classification of Anti-Obesity Plant Species as Monocots and Dicots

Among the plant parts used, leaves are the most common (n = 43; 23.0% of the total), followed by fruits (n = 40; 21.0%) and multiple parts (n = 35; 19.0%) (Figure 3). The biological potency and bioactive substances of various plant sections vary, which must be emphasised. For example, different parts of one of the most common medicinal plants, Boerhavia diffusa, are used for managing different diseases—roots serve as a laxative and for the management of inflammation and urinary illnesses; seeds and petals function as contraceptives; leaves lower blood glucose levels by increasing insulin release from pancreatic cells, etc. [23]. The abundance of active ingredients in leaves may explain their widespread use. Leaf harvesting is a sustainable practice due to its rich and easily collected active constituents. Underground harvesting, such as that of roots, can lead to plant death and threaten the survival of rare and slow-replicating plants, making leaves a more sustainable alternative to traditional harvesting methods [24].

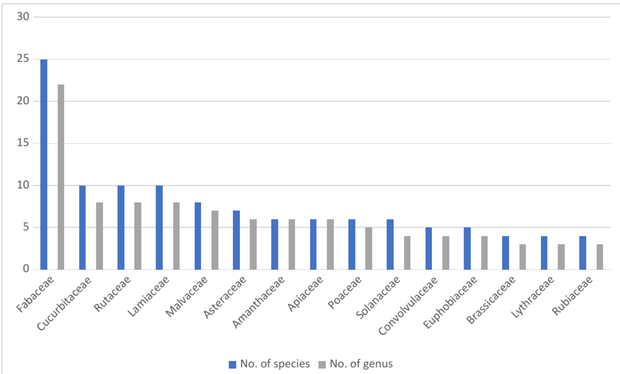

Figure 2: Top Fifteen Plant Families With the Highest Number of Genera and Species Reported for Anti-Obesity Properties

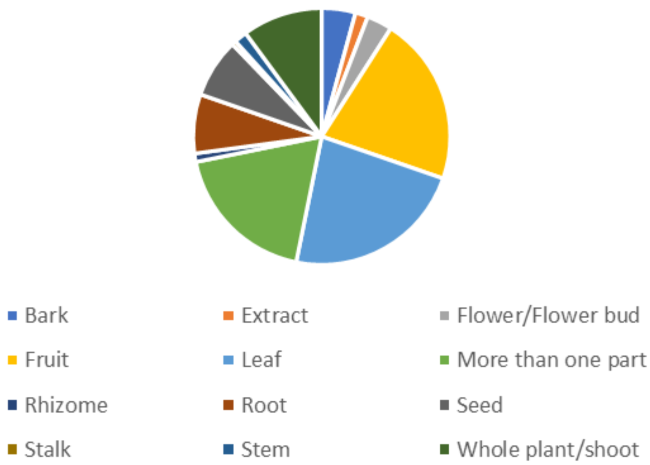

Figure 3: Pie Graph of Different Plant Parts Used in Anti-Obesity Treatments.

Plant secondary metabolites, including acids, alkaloids, terpenoids, saponins, glycosides, tannins, carboxylic acids, (poly)phenols, and flavonoids, can serve as effective interventions in a complex systems approach to obesity [25]. Phytochemicals found in plants are known to exhibit anti-obesity effects, including phenolic acids, curcuminoids, flavonols, flavones, flavan-3-ol, isoflavonoids, lignans, phytosterols, anthocyanins, and alkaloids [5]. Natural remedies derived from medicinal plants function as anti-obesogenic agents through various mechanisms, including metabolic and thermogenic stimulants, appetite regulators, pancreatic lipase, and amylase inhibitors—improving insulin sensitivity, inducing hypoglycaemia, inhibiting adipogenesis, and promoting adipocyte apoptosis [7], along with weight loss effects. Hasani-Ranjbar et al. [10] reported that the anti-obesity mechanisms of herbal plants can be broadly categorised into four types: decreased lipid absorption, reduced energy intake, increased energy expenditure, and decreased pre-adipocyte differentiation and proliferation. For instance, Camellia sinensis, Morinda citrifolia, Momordica charantia, Centella asiatica, and other species exhibit anti-obesity potential through inhibitory effects on pancreatic lipase (PL) and/or lipoprotein lipase (LPL) activities [3]. Moreover, in obese rat models, the combination of these plants effectively reduced body weight and food intake compared to individual species, enhancing thermogenesis, antioxidative effects and inhibiting adipocyte proliferation [3]. The anti-obesity effects were attributed to the inhibition of carbohydrate and lipid absorption from the small intestine by certain medicinal plants such as Hibiscus sabdariffa, Perilla frutescens, Momordica charantia, Centella asiatica, and others.

Bangladeshi medicinal plants are natural sources of anti-obesogenic substances, including alkaloids, polyphenols, terpenes, and saponins (Table 1). Hossain et al. [26] discussed the advancements in our knowledge of the anti-obesity potential of natural flavonoids and their molecular mechanisms for preventing and/or treating obesity. Some effects have been assessed at a molecular level, particularly those related to adipogenesis and the functions and homeostasis of adipose tissue cells. Anti-obesity compounds target lipase inhibition, regulation of adipogenesis, thermogenesis, and appetite suppression, with molecular effects focusing on adipogenesis and adipose tissue cell functions and homeostasis [6]. Polyphenols exhibited increased levels of adipohormones regulating hunger and satiety, anorexigenic hormones, and decreased levels of ghrelin, suggesting that AMP-activated protein kinase may regulate energy homeostasis, daily energy expenditure, and lipid metabolism. Alkaloids, like polyphenols, have been found to possess anti-obesogenic properties due to their structure, which facilitates interaction with molecules and receptors, particularly those of the nervous system [6]. Saponins, known for their anti-obesogenic effects, inhibit lipid digestion and absorption at the intestinal level. Two saponins, saikosaponin A and saikosaponin D, were isolated and evaluated on adipocytes. Results showed that these saponins suppress adipogenic genes, viz. CCAAT/enhancer-binding protein alpha (C/EBPα), peroxisome proliferator-activated receptor gamma (PPARγ), sterol regulatory element-binding protein-1c (SREBP- 1c), and adiponectin, and downregulate lipogenic genes, such as fatty acid-binding protein (FABP 4), fatty acid synthase (FAS), and lipoprotein lipase (LPL), preventing obesity development in key organs like adipose and hepatic tissues [6]. Terpenes from plants modulate lipid metabolism receptors such as PPARs and LXRs (liver X receptors), which are crucial in adipogenesis and cholesterol metabolism. PPARs express AP 2, adiponectin, FABP 4, glucose transporter type 4 (GLUT 4), LPL, and phosphoenolpyruvate carboxykinase (PEPCK), while LXRs regulate ATP-binding cassette transporters and cholesterol transport and elimination.

A. Anti-Obesity Therapeutic Plant Genetic Resources Conservation at Bangladesh Agricultural University Botanical Garden (24°43'27.9"N, 90°26'28.2"E)

The Bangladesh Agricultural University (BAU) campus has become a conservatory of agricultural and forest plant genetic resources, collected from home and abroad, along with the BAU Botanical Garden, hereafter referred to as the garden, and BAU Germplasm Centre [28]. The garden was established in 1963 to collect and conserve the country's and surrounding areas' plant genetic resources, as well as their multiplication and relocation in natural habitats. It has become a unique hub for plant conservation, education, scientific research, and knowledge about plant biodiversity on a national and regional scale [29]. Approximately 1800 plant species (including Pteridophytes, Gymnosperms, and Angiosperms), both native and foreign, can be found here [30], conserving more than 20% of the total flora (Spermatophyte) of Bangladesh [15], [31]. Plant collections in botanical gardens aid in ex-situ conservation of threatened species and habitat restoration and are the focus of research on population genetics, climate change responses, pest and disease susceptibility, and plant adaptive capacity [32]. Thus, the garden plays a vital role in preserving and investigating ex-situ preservation and investigation of the world's plant biodiversity. In terms of species collection, the garden is the country's second-largest and oldest botanical garden after the National Botanical Garden (Mirpur, Dhaka; established in 1961). Botanical gardens focus on plant study, conservation, and public awareness of plant species diversity while serving human needs and promoting well-being [33]. Among Bangladeshi plants with anti-obesity potentials, 110 species are conserved in the garden, and more than 50 species are cultivated in different farms and homestead gardens at the BAU campus. Twenty species, viz. Mangifera indica, Annona squamosa, Areca catechu, Aloe vera, Cosmos bipinnatus, Helianthus annuus, Stevia rebaudiana, Ananas comosus, Ipomoea batatas, Merremia hirta, Mentha arvensis, Punica granatum, Moringa oleifera, Psidium guajava, Cymbopogon citratus, Ziziphus jujuba, Aegle marmelos, Citrus limon, C. aurantiifolia and C. sinensis, were dual conservation, i.e., conserved in the garden and cultivated as field/horticultural crops and ornamentals (Table 1). We should take the initiative to collect other species with anti-obesity potentials for conservation purposes and ensure proper maintenance of plant species at the BAU campus. Replicating collections across institutions is crucial as a backup measure in case of loss due to attrition, closure, pests, disease outbreaks, natural disasters, or theft [32].

According to the IUCN Red List of Threatened Species, the current status of these species is globally categorised as data deficient (DD) for 11 species, least concern (LC) for 73 species, near threatened (NT) for 1 species, vulnerable (VU) for 3 species, endangered (EN) for 2 species, and for 98 species, an assessment has not yet been conducted, or information is unavailable (Table 1). Even rare plants often face exclusion from assessment or classification as "Data Deficient" due to insufficient information on species distributions, population decline rates, and threats. Moreover, the status of some species can differ from the global status when these species are assessed locally. For example, Acorus calamus and Terminalia chebula are assessed as globally LC but as VU at the national level in Bangladesh. In contrast, Cinnamomum verum was assessed as VU globally but as LC at the national level (Table 1; [21], [22]). A brief comparative assessment of anti-obesity plant species is presented in Figure 4, along with photographs of some threatened species preserved at the garden in Figure 5. Conservation dependent (CD), an additional status, was used in the national assessment. This category was part of the IUCN 1994 Categories & Criteria (version 2.3), which is no longer used in the evaluation of taxa.

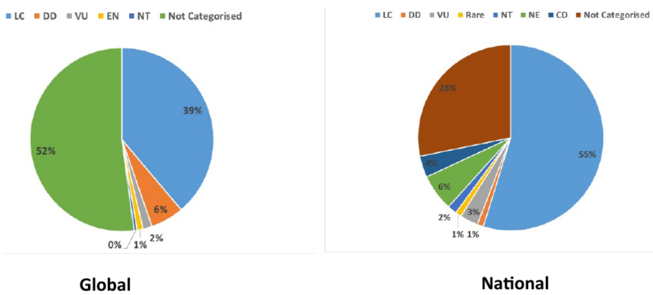

Figure 4: Conservation Status of the Studied Plant Species According to IUCN

Botanical gardens frequently engage in a wide range of scientific endeavours, including public education, restoration ecology, taxonomy, systematics, genetics, horticulture, seed science, propagation, conservation, and more [33]. Currently, the garden has conserved 527 medicinal and aromatic plant species from 101 families used in traditional medicine to treat various illnesses, and this number is constantly growing [16]. Other notable collections include minor fruits (108 species), hydrophytes (70 species), orchids (35 species), cacti and succulents (175 species), gymnosperms (13 species), palms (42 species), Ficus (24 species), pteridophytes (24 species), mangroves (18 species), bamboos (17 species), and others [28], [30], [34]–[36]. Approximately 100,000 visitors, including students, researchers, forest officials, international visitors, and others, visit the garden each year for recreation, plant identification/studies, expert consultation, and more. Gardens provide urban green spaces that may be the only access to plants and nature for many people [32]. Based on this garden collection, several academic research studies (leading to MS or PhD), such as [37]–[40] and others, have been conducted, and popular newspaper articles and YouTube videos have been published. Recently, a herbarium was established on the garden premises (Prof. Arshad Ali Herbarium, named after the first garden curator) to enhance taxonomic research activities; approximately 5,000 dried plant samples are housed here. The plants conserved in the garden provide food and shelter for birds, lizards, insects, herbivores, and others, playing an important role in achieving sustainable development goals (SDGs). Plant conservation actions by botanical gardens have close links to SDG 15, with clear connections to Life on Land and goals to end poverty, hunger, and ensure good health (SDGs 1, 2, and 3), as well as those focusing on clean water, renewable energy, sustainable cities, responsible consumption, and climate action (SDGs 6, 7, 11, 12, and 13) (https://www.bgci.org/).

Figure 5: Photographs of Some Threatened Species Conserved at the Garden. A. *Acorus calamus*, B. *Erythrina suberosa*, C. *Cichorium intybus*, D. *Coffea arabica*, E. *Ipomoea mauritiana*, F. *Morinda citrifolia*, G. *Mucuna pruriens*, H. *Passiflora quadrangularis*, I. *Piper longum*, J. *Plumbago zeylanica*, K. *Annona muricata*, L. *Dimocarpus longan*, M. *Salacia fruticosa*, N. *Senna alata*, O. *Vanilla planifolia*, P. *Withania somnifera*.

IV. Conclusion and Future Perspectives

Bangladeshi medicinal plants demonstrate great potential for treating obesity. The garden plays a vital role in conserving plant genetic resources, conducting research, and promoting citizen science education. The rising global prevalence of obesity, along with its financial burden and fatalities, highlights the urgent need for improved herbal treatments and preventive strategies. Future research should focus on understanding preparation methods, treatment dosages, frequency, duration, and side effects of traditional (herbal) anti-obesity medicines. The pharmaceutical industry needs anti-obesity drugs that are more effective and have fewer side effects. Additional clinical, in vivo, and in vitro studies should aim to identify safe and potent extracts and bioactive compounds from traditional medicinal plants.

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Ethics statement

This study did not involve human participants, animals, or the collection or processing of personal or sensitive data. The research was based exclusively on publicly available digital artifacts. Therefore, ethical approval and informed consent were not required.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Data Availability

No original datasets were generated or analyzed in this study. The research is based exclusively on a systematic review and qualitative analysis of publicly available scientific literature and published sources. The sources reviewed are accessible through their respective publishers and academic databases.

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Table 1: Medicinal Plant Genetic Resources of Bangladesh With Anti-Obesity Properties. LC Least Concern, DD Data Deficient, CR Critically Endangered, VU Vulnerable, EN Endangered, NT Near Threatened, NE Not Evaluated, CD Conservation Dependent. () National Status

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
1	Kalmegh	*Andrographis paniculata* (Burm.f.) Wall. *ex* Nees*	Acanthaceae	Leaf	(LC)	Diterpenoids	[41]
2	Calamas/Botch	*Acorus calamus* L.*	Acoraceae (M)	Rhizome, Leaf, root	LC (VU)	Asarone	[42]
3	Prickly chaff flower	*Achyranthes aspera* L.*	Amaranthaceae	Stem, Seed	(LC)	Triterpenoid saponin	[7]
4	Red Spinach**	*Amaranthus tricolor* L.	Amaranthaceae	Stem	(LC)	Flavonoid, Saponins, Tannins	[43]
5		*Dysphania ambrosioides* (L.) Mosyakin & Clemants	Amaranthaceae	Leaf		-	[14]
6	Botam phul	*Gomphrena globosa* L.*	Amaranthaceae	Flower	(LC)	-	[14]
7		*Ouret lanata* (L.) Kuntze	Amaranthaceae	Whole plant		-	[14]
8	Spinach**	*Spinacia oleracea* L.	Amaranthaceae	Whole plant		Cinnamic acid	[7]
9	Onion**	*Allium cepa* L.	Amaryllidaceae (M)	Bulb, Peel	(LC)	Allicin	[7]
10	Garlic**	*Allium sativum* L.	Amaryllidaceae (M)	Bulb, Root	(LC)	Allicin	[7]
11	Mango**	*Mangifera indica* L.*	Anacardiaceae	Fruit, Leaf	DD (LC)	Mangiferin	[7]
12	Soursop	*Annona muricata* L.*	Annonaceae	Fruit, Leaf	LC (NE)	Phenols, Flavonoids, Tannins	[44]
13	Custard apple**	*Annona squamosa* L.*	Annonaceae	Fruit, Leaf	LC (LC)	Phenols, Flavonoids, Tannins	[44]
14	Celery	*Apium graveolens* L.	Apiaceae	Whole shoot	LC	Cinnamic acid	[7]
15	Spade leaf	*Centella asiatica* (L.) Urb.*	Apiaceae	Leaf	LC (LC)	Asiatic acid, Madecassic acid	[15]
16	Coriander**	*Coriandrum sativum* L.	Apiaceae	Whole shoot	(LC)	-	[14]
17	Cumin**	*Cuminum cyminum* L.	Apiaceae	Whole shoot		-	[5]
18	Wild coriander	*Eryngium foetidum* L.*	Apiaceae	Root	(NE)	-	[14]
19	Fennel**	*Foeniculum vulgare* Mill.	Apiaceae	Whole shoot	LC (LC)	-	[13]
20	Anantamul/Karāla	*Hemidesmus indicus* (L.) R.Br.*	Apocynaceae	Extract		2-hydroxy 4-methoxy benzoic acid	[45]
21	Indrajau	*Wrightia tinctoria* (Roxb.) R.Br.*	Apocynaceae	Bark	LC	-	[14]
22	Supāri**	*Areca catechu* L.*	Arecaceae (M)	Fruit	LC (LC)	-	[42]

Continued on the next page

Table 1 (continued)

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
23	Gurmar	*Gymnema sylvestre* (Retz.) R.Br. *ex* Sm.	Asclepiadaceae	Leaf		Gymnemic acid	[42]
24	Aloe vera**	*Aloe vera* (L.) Burm.f.*	Asphodelaceae (M)	Leaf	(LC)	Gallic acid, Quercetin	[15]
25	Safflower**	*Carthamus tinctorius* L.	Asteraceae	Flower, Seed	(LC)	Saffron, Crocin	[46]
26	Kasni/Chikory	*Cichorium intybus* L.	Asteraceae	Leaf	LC (NE)	Tanins	[47]
27	Cosmos**	*Cosmos bipinnatus* Cav.*	Asteraceae	Leaf	(LC)	-	[47]
28	Sunflower**	*Helianthus annuus* L.*	Asteraceae	Seed	LC (LC)	-	[13]
29	Lettuce**	*Lactuca sativa* L.	Asteraceae	Root, Leaf	(LC)	Esculin, Chlorogenic acid	
30	Mundorokha	*Pluchea indica* (L.) Less.	Asteraceae	Leaf	(DD)	-	[29]
31	Stevia**	*Stevia rebaudiana* (Bertoni) Bertoni*	Asteraceae	Shoot		Glucosides	[6]
32	Malabar spinach	*Basella alba* L.	Basellaceae	Flower	(LC)	-	[14]
33	Lipstick tree	*Bixa orellana* L.*	Bixaceae	Seed	LC (LC)	-	[14]
34	Wild cabbage	*Brassica oleracea* L.	Brassicaceae	Leaf	(LC)	Cinnamic acid	[7]
35	Mustard**	*Brassica rapa* L.	Brassicaceae	Root	(LC)	-	[13]
36	Shepperd's purse	*Capsella bursa-pastoris* (L.) Medik.	Brassicaceae	Leaf	LC (NE)	-	[14]
37	Radish**	*Raphanus sativus* L.	Brassicaceae	Whole plant	(LC)	-	[12]
38	Pineapple**	*Ananas comosus* (L.) Merr.*	Bromeliaceae (M)	Fruit	(LC)	Bromelain	[48]
39	Fonimanasa	*Opuntia ficus-indica* (L.) Mill.*	Cactaceae	Fruit	DD	-	[10]
40	Fonimanasa	*Opuntia monacantha* Haw.*	Cactaceae	Fruit	LC	-	[14]
41	Red pitaya	*Selenicereus monacanthus* (Lem.) D.R.Hunt	Cactaceae	Fruit		Betacyanin's	[15]
42	Asian lobelia	*Lobelia chinensis* Lour.	Campanulaceae	Whole plant	(NE)	Polysaccharides	[5]
43	Hemp	*Cannabis sativa* L.*	Cannabaceae	Leaf	(LC)	-	[14]
44	Papaya**	*Carica papaya* L.	Caricaceae	Leaf	DD (LC)	Flavonoids	[29]
45		*Salacia fruticosa* Wall. *ex* M.A.Lawson	Celastraceae	Whole plant		Mangiferin, Epicatechin	[49]
46	Brindleberry	*Garcinia cowa* var. *cowa**	Clusiaceae	Fruit	LC (LC)	Hydroxycitric acid	[15]
47	Arjun	*Terminalia arjuna* (Roxb. *ex* DC.) Wight & Arn.*	Combretaceae	Bark	(VU)	-	[14]
48	Bahera	*Terminalia bellirica* (Gaertn.) Roxb.*	Combretaceae	Fruit	LC (LC)	-	[47]
49	Horitoki	*Terminalia chebula* Retz.*	Combretaceae	Fruit	LC (VU)	-	[14]

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Table 1 (continued)

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
50	Sweet potato**	*Ipomoea batatas* (L.) Lam.*	Convolvulaceae	Leaf, Root	DD (LC)	-	[17]
51	Vuikumra kalmi	*Ipomoea mauritiana* Jacq.*	Convolvulaceae	Leaf	(VU)	-	[14]
52	Goat's foot creeper	*Ipomoea pes-caprae* (L.) R.Br.*	Convolvulaceae	Leaf	LC (LC)	-	[14]
53	Kalmi**	*Merremia hirta* (L.) Merr.*	Convolvulaceae	Leaf	(LC)	Total Phenolics, Flavonoids	[50]
54	Indian Jalap	*Operculina turpethum* (L.) Silva Manso*	Convolvulaceae	Root	(LC)	-	[42]
55	White gourd**	*Benincasa hispida* (Thunb.) Cogn.	Cucurbitaceae	Fruit	(LC)	-	[25]
56	Bitter Cucumber	*Citrullus colocynthis* (L.) Schrad.	Cucurbitaceae	Seed	(LC)	-	[13]
57	Watermelon**	*Citrullus lanatus* (Thunb.) Matsum. & Nakai	Cucurbitaceae	Fruit	(LC)	-	[14]
58	Ivy Gourd/Telakucha	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	Fruit	(LC)	β-sitosterol	[17]
59	Musk melon/Bangi**	*Cucumis melo* L.	Cucurbitaceae	Fruit peel	(LC)	-	[17]
60	Cucumber**	*Cucumis sativus* L.	Cucurbitaceae	Fruit	(LC)	Saponin	[51]
61	Crookneck squash	*Cucurbita moschata* Duchesne	Cucurbitaceae	Stalk	(LC)	Terpenes	[47]
62	Bottle gourd**	*Cucurbita pepo* L.	Cucurbitaceae	Fruit	LC (LC)	-	[14]
63	Sweet tea vine	*Gynostemma pentaphyllum* (Thunb.) Makino	Cucurbitaceae	extract		Actiponin, Saponins	[20]
64	Bottle gourd**	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae	Fruit	(LC)	-	[14]
65	Bitter melon**	*Momordica charantia* L.	Cucurbitaceae	Fruit	(LC)	-	[42]
66	Nut Grass	*Cyperus rotundus* L.*	Cyperaceae (M)	Whole plant	LC (LC)	Cyperine	[42]
67	Yam	*Dioscorea alata* L.*	Dioscoreaceae (M)	Root	(LC)	Dioscin, Diosgenin	[24]
68	Bitter yam	*Dioscorea bulbifera* L.*	Dioscoreaceae (M)	Root	(LC)	Dioscin, Diosgenin	[25]
69	Sal, Gajari	*Shorea robusta* Gaertn.*	Dipterocarpaceae	Leaf	LC (LC)	-	[17]
70	Snake weed	*Euphorbia hirta* L.*	Euphobiaceae	Whole plant	(LC)	-	[14]
71	Rangchita	*Euphorbia tithymaloides* L.	Euphobiaceae	Leaf	LC (LC)	-	[14]

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Table 1 (continued)

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
72	Verenda/Poison nut	*Jatropha curcas* L.*	Euphobiaceae	Leaf	LC (LC)	-	[17]
73	Dati Bura, Jhakura	*Macaranga denticulata* (Blume) Müll.Arg.*	Euphobiaceae	Bark	LC (LC)	-	[17]
74	Verenda	*Ricinus communis* L.*	Euphobiaceae	Leaf	(LC)	-	[14]
75	Shirish	*Albizia lebbeck* (L.) Benth.*	Fabaceae	Root	LC	-	[14]
76	Groundnut**	*Arachis hypogaea* L.	Fabaceae	Fruit	(LC)	Resveratrol	[7]
77	Raktokanchan	*Bauhinia variegata* L.*	Fabaceae	Bark, Flower	LC	-	[13]
78	Pigeon pea**	*Cajanus cajan* (L.) Millsp.	Fabaceae	Leaf, Seed	(LC)	-	[19]
79	Sonalu/ Bandar-lathi	*Cassia fistula* L.*	Fabaceae	Leaf	LC	-	[14]
80	Pig's senna	*Chamaecrista absus* (L.) H.S.Irwin & Barneby	Fabaceae	Seed	LC	-	[14]
81	Sensitive pea	*Chamaecrista nomame* (Makino) H.Ohashi	Fabaceae	Seed		-	[47]
82	Sun hemp**	*Crotalaria juncea* L.	Fabaceae	Leaf	(LC)	-	[13]
83	Cluster bean	*Cyamopsis tetragonoloba* (L.) Taub.	Fabaceae	Stem	(CD)	Guar gum	[11]
84	Sitshal	*Dalbergia latifolia* Roxb.	Fabaceae	Bark	VU (NE)	β-sitosterol	[52]
85	North Indian rosewood	*Dalbergia sissoo* Roxb. *ex* DC.*	Fabaceae	Leaf	LC (VU)	-	[53]
86	Mandar	*Erythrina suberosa* Roxb.*	Fabaceae	Bark	LC (NT)	-	[14]
87	Soybean**	*Glycine max* (L.) Merr.	Fabaceae	Fruit	(LC)	Daidzein	[8]
88	Licorice	*Glycyrrhiza glabra* L.*	Fabaceae	Root	LC	Flavonoid oil	[42]
89	Horse gram	*Macrotyloma uniflorum* (Lam.) Verdc.	Fabaceae	Leaf, Seed	LC (LC)	-	[5]
90	Alfalfa	*Medicago sativa* L.*	Fabaceae	Whole plant	LC (LC)	-	[14]
91		*Mimosa rubicaulis* Lam.	Fabaceae	Leaf, Flower, Bark		-	[14]
92	Alkushi	*Mucuna pruriens* (L.) DC.	Fabaceae	Seed	LC (LC)	-	[14]
93	Kidney bean**	*Phaseolus vulgaris* L.	Fabaceae	Fruit	LC (LC)	Phytohemagglutinin	[25]
94	Dad mordon	*Senna alata* (L.) Roxb.*	Fabaceae	Leaf	LC	-	[14]
95	Tanner's Cassia	*Senna auriculata* (L.) Roxb.*	Fabaceae	Leaf	LC	-	[14]
96	Cassia tree	*Senna siamea* (Lam.) H.S.Irwin & Barneby	Fabaceae	Root	LC	-	[17]
97	Sickle senna	*Senna tora* (L.) Roxb.*	Fabaceae	Leaf, Seed		-	[14]

Continued on the next page

Table 1 (continued)

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
98	Tamarind	*Tamarindus indica* L.*	Fabaceae	Fruit, Bark, Root	LC	Tartaric acid	[17]
99	Fenugreek**	*Trigonella foenum-graecum* L.	Fabaceae	Stem, Leaf	(LC)	Steroidal sapogenins	[7]
100	Loha Kat/Burma Ironwood	*Xylia xylocarpa* (Roxb.) Taub.*	Fabaceae	Bark, Seed	LC	-	[14]
101	Glorybower	*Clerodendron glandulosum* L.	Lamiaceae	Leaf		-	[42]
102		*Clerodendrum phlomidis* L.f.*	Lamiaceae	Root	LC	-	[14]
103	Indian Coleus	*Coleus barbatus* (Andrews) Benth. *ex* G.Don var. *barbatus**	Lamiaceae	Root		Forskolin	[7]
104	Pudina**	*Mentha arvensis* L.*	Lamiaceae	Leaf	LC (LC)	-	[14]
105	Deshi pudina	*Mentha spicata* L.*	Lamiaceae	Leaf	LC (LC)	-	[14]
106	Sada tulsi	*Ocimum basilicum* L.*	Lamiaceae	Leaf	(NE)	Ursolic acid	[7]
107	Perilla**	*Perilla frutescens* (L.) Britton	Lamiaceae	Seed	LC (LC)	α-Linolenic acid	[3]
108	Ganiari	*Premna serratifolia* L.	Lamiaceae	Root	LC		[54]
109	Chia**	*Salvia hispanica* L.	Lamiaceae	Seed		-	[14]
110	Nishinda	*Vitex negundo* L.*	Lamiaceae	Leaf	LC	-	[17]
111	Cinnamomum	*Cinnamomum burmanni* (Nees & T.Nees) Blume*	Lauraceae	Bark, Leaf, Root	LC	Camphor, Eugenol, Cinnamaldehyde	[7]
112	Darchini/Cinnamon	*Cinnamomum verum* J.Presl*	Lauraceae	Bark, Leaf, Root	VU (LC)	Camphor, Eugenol, Cinnamaldehyde	[7]
113	Avacado	*Persea americana* Mill.*	Lauraceae	Fruit	LC (CD)	-	[14]
114	Tishi/Linseed**	*Linum usitatissimum* L.	Linaceae	Seed	(LC)	-	[14]
115		*Cuphea carthagenensis* (Jacq.) J.F.Macbr.	Lythraceae	Leaf		-	[47]
116	Queen's flower	*Lagerstroemia speciosa* (L.) Martyn	Lythraceae	Extract	LC (LC)	Corosolic acid	[9]
117	Mehedi	*Lawsonia inermis* L.*	Lythraceae	Leaf	LC (LC)	Polyphenols	[29]
118	Pomegranate/Dalim**	*Punica granatum* L.*	Lythraceae	Fruit, Leaf	LC	-	[14]
119	Baobab	*Adansonia digitata* L.*	Malvaceae	Root, Bark	(Rare)	Flavonoids, Phenolic acids, Tannins	[14]
120	Cotton tree	*Bombax ceiba* L.*	Malvaceae	Leaf, Bark	LC	Mangiferin	[7]
121	Silk Cotton Tree	*Ceiba pentandra* (L.) Gaertn.*	Malvaceae	Bark	LC	-	[14]
122	Tosha jute**	*Corchorus olitorius* L.	Malvaceae	Leaf		-	[5]
123	Tamthar	*Grewia villosa* Willd.*	Malvaceae	Fruit	LC	-	[14]
124	China rose	*Hibiscus rosa-sinesis* L.*	Malvaceae	Leaf	(LC)	-	[5]
125	Roselle/Lalmesta	*Hibiscus sabdariffa* L.*	Malvaceae	Flower, Leaf	(NE)	Hydroxycitric acid, Anthocyanins	[9]

Continued on the next page

Table 1 (continued)

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
126	Napa	*Malva parviflora* L.	Malvaceae	Aerial parts	(CD)	-	[14]
127	Neem	*Azadirachta indica* A.Juss.*	Meliaceae	Leaf	LC (LC)	Total Phenolics, Flavonoids	[14]
128	Spanish-cedar	*Cedrela odorata* L.	Meliaceae	Bark	VU (NE)	-	[14]
129	Gurjo or Guduchi	*Tinospora cordifolia* (Willd.) Hook.f. & Thomson*	Meliaceae	Stem	(NT)	-	[14]
130	Bread fruit	*Artocarpus altilis* (Parkinson) Fosberg*	Moraceae	Bark	(Rare)	-	[14]
131	Tut/Mulberry	*Morus alba* L.*	Moraceae	Fruit, Leaf	(LC)	Quercetin, Hesperetin	[12]
132	Tut/Black Mulberry	*Morus nigra* L.*	Moraceae	Fruit, Leaf	DD	Quercetin, Hesperetin	[13]
133	Drumstick tree**	*Moringa oleifera* Lam.*	Moringaceae	Fruit, Root	LC (LC)	Fitotesrol (β-sitosterol)	[47]
134	Nutmeg	*Myristica fragrans* Houtt.*	Myristicaceae	Whole plant	DD	-	[42]
135	Viḍaṅga	*Embelia ribes* Burm.f.	Myrsinaceae	Fruit	(CD)	Embelin	[42]
136	Guava**	*Psidium guajava* L.*	Myrtaceae	Leaf	LC (LC)	-	[14]
137	Clove	*Syzygium aromaticum* (L.) Merr. & L.M.Perry*	Myrtaceae	Flower bud		Eugenol	[17]
138	Jam/Java plum	*Syzygium cumini* (L.) Skeels*	Myrtaceae	Leaf, Seed, Root	LC (LC)	-	[14]
139	Indian lotus/Poddo	*Nelumbo nucifera* Gaertn.*	Nelumbonaceae	Whole shoot	DD (LC)	Phenolic compounds	[7]
140	Punarnava	*Boerhavia diffusa* L.*	Nyctaginaceae	Root	(LC)	Punarnavine, Boeravinone B	[23]
141	Beli	*Jasminum sambac* (L.) Aiton*	Oleaceae	Flower	(LC)	-	[13]
142	Kuding tea	*Ligustrum robustum* (Roxb.) Blume	Oleaceae	Leaf	LC (DD)	Ohenylpropanoid glycosides	[5]
143	Vanilla	*Vanilla planifolia* Andrews*	Orchidaceae (M)	Whole plant	EN	-	[14]
144	Opium poppy	*Papaver* L.*	Papaveraceae	Stem, Flower	LC (NE)	-	[14]
145	Passion fruit	*Passiflora edulis* Sims*	Passifloraceae	Fruit	(LC)	-	[5]
146	Giant Gandalia	*Passiflora quadrangularis* L.	Passifloraceae	Fruit	(NE)	-	[14]
147	Sweet leaf bush	*Breynia androgyna* (L.) Chakrab. & N.P.Balakr.	Phyllanthaceae	Fruit	LC	-	[42]
148	Indian gooseberry	*Phyllanthus emblica* L.*	Phyllanthaceae	Fruit	LC	Terpenoids	[15]
149	Pan/Betel vine	*Piper betle* L.*	Piperaceae	Leaf	(LC)	-	[29]
150	Long pepper	*Piper longum* L.*	Piperaceae	Fruit	(LC)	Piperlongumine	[9]

Continued on the next page

Table 1 (continued)

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
151	Black pepper	*Piper nigrum* L.*	Piperaceae	Fruit	(LC)	Piperine	[9]
152	Chitrak	*Plumbago zeylanica* L.*	Plumbaginaceae	Root	(NE)	-	[42]
153	Oat**	*Avena sativa* L.	Poaceae (M)	Seed	(CD)	β-glucan	[13]
154	Dedhaan	*Coix lacryma-jobi* L.*	Poaceae (M)	Seed	(LC)	-	[47]
155	Lemon grass**	*Cymbopogon citratus* (DC.) Stapf*	Poaceae (M)	Leaf	(CD)	-	[14]
156	Durba ghass	*Cynodon dactylon* (L.) Pers.*	Poaceae (M)	Whole plant	(LC)	-	[19]
157	Shama grass	*Echinochloa crus-galli* (L.) P.Beauv.*	Poaceae (M)	Seed	LC (LC)	-	[13]
158	Maize**	*Zea mays* L.	Poaceae (M)	Leaf, Style	LC (CD)	-	[14]
159	Water-pepper	*Persicaria hydropiper* (L.) Delarbre*	Polygonaceae	Leaf	LC (LC)	Flavonoids	[47]
160	Fennel**	*Nigella sativa* L.	Ranunculaceae	Fruit, Leaf	(LC)	Polyphenols	[11]
161	Jujube/Boroi**	*Ziziphus jujuba* Mill.*	Rhamnaceae	Leaf, Fruit, Root	LC (LC)	-	[14]
162	Mountain pomegranate	*Catunaregam spinosa* (Thunb.) Tirveng.	Rubiaceae	Whole plant	LC (LC)	Flavonoids, Alkaloids, Tannins	[14]
163	Coffea	*Coffea arabica* L.*	Rubiaceae	Seed extract	EN (NE)	Caffeine	[7]
164	Papra	*Gardenia latifolia* Aiton*	Rubiaceae	Leaf	LC (VU)	-	[14]
165	Noni	*Morinda citrifolia* L.*	Rubiaceae	Fruit, Leaf	LC (LC)	Catechin	[8]
166	Bel**	*Aegle marmelos* (L.) Corr^ea*	Rutaceae	Unripe fruit, Leaf	NT (LC)	Umbelliferone, Esculetin	[14]
167	Kagagilebu/Lime**	*Citrus aurantiifolia* (Christm.) Swingle*	Rutaceae	Fruit	(LC)	Essential oils	[13]
168	Pumelo	*Citrus aurantium* L.	Rutaceae	Fruit	(LC)	Sinefrin, Oktopamine	[11]
169	Lemon**	*Citrus limon* (L.) Osbeck*	Rutaceae	Fruit	(LC)	Polyphenols	[17]
170	Pomelo	*Citrus maxima* (Burm.) Merr.*	Rutaceae	Leaf, Fruit peel	LC (LC)	Hesperidin	[47]
171	Citron	*Citrus medica* L.	Rutaceae	Fruit	LC (LC)	-	[14]
172	Marsh/Grapefruit	*Citrus paradisi* Macfad.	Rutaceae	Fruit		-	[14]
173	Malta**	*Citrus sinensis* (L.) Osbeck*	Rutaceae	Fruit		-	[14]
174	Chhoto Kamini	*Murraya koenigii* (L.) Spreng.*	Rutaceae	Leaf	LC (LC)	-	[14]
175	Gaira/Tejovati	*Zanthoxylum armatum* DC.	Rutaceae	Seed	LC	-	[14]
176	Ashphal, Katlitchu	*Dimocarpus longan* Lour.*	Sapindaceae	Fruit	DD (NT)	Polysaccharides	[55]
177	Green peper**	*Capsicum* spp.	Solanaceae	Fruit	LC (LC)	Capsaicin, Capsaicinoids	[7]

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Table 1 (continued)

Sl. No.	Bangla/Common name	Scientific name	Family	Parts used	Conservation status	Active constituents	Reference
178	Tobacco**	*Nicotiana tabacum* L.	Solanaceae	Leaf	(LC)	-	[14]
179	Tomato**	*Solanum lycopersicum* L.	Solanaceae	Fruit	(LC)	Tomatine	[17]
180	Brinjal**	*Solanum melongena* L.	Solanaceae	Fruits	(LC)	Flavonoids	[45]
181	Kata Begun	*Solanum nigrum* L.*	Solanaceae	Whole plant	(NE)	-	[14]
182	Ashvagandhā	*Withania somnifera* (L.) Dunal*	Solanaceae	Leaf, Root	DD (CD)	Withaferin A	[42]
183	Tea	*Camellia sinensis* (L.) Kuntze*	Theaceae	Leaf	DD (LC)	Catechins, Cinnamic acid	[7]
184	Agnimanthā	*Clerodendrum multiflorum* (Burm. f.) Kuntze*	Verbenaceae	Stem, Leaf	(LC)	-	[42]
185	Harjora/Veld Grape	*Cissus quadrangularis* L.*	Vitaceae	Fruit	(LC)	CQR-300	[45]
186	Grapevine	*Vitis vinifera* L.*	Vitaceae	Fruit/Seed	LC	Total Phenolics, Flavonoids	[42]
187	Turmeric**	*Curcuma longa* L.	Zingiberaceae (M)	Root	DD (LC)	Curcumin	[7]
188	Ginger**	*Zingiber officinale* Roscoe	Zingiberaceae (M)	Rhizome	DD (LC)	Gingerols	[42]

* Conserved at BAU Botanical Garden; ** Cultivated on BAU campus; (M) Monocotyledons