Medicinal plants having anti-obesity potentiality available in Bangladesh: A review.

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Abstract

Background: Obesity is a complex, severe and chronic disease that can have an unenthusiastic effect on many systems in human body. In traditional medication, many medicinal plants have been used to treat obesity. The aim of the present study is to present medicinal plants which are available in Bangladesh that proved their anti-obesity activities have been.

Method: Bibliographic study was carried out by analyzing conventional text books and peer reviewed papers, consulting wide-reaching accepted scientific databases. In this review, the investigation terms were "obesity" in addition to ("herbal medicine" or "plant", "medicinal plants" or "medicine traditional") with no limiting search objects. Later it was cross checked whether the plants were available in the country or not from the Bangladeshi online medicinal plants databases.

Findings: More than 100 plants have anti-obesity potentiality; however, only 23 species are available in Bangladesh. The plants are: *Achyranthes aspera Linn, Acorus calamus Linn, Aegle marmelos Linn, Allium cepa Linn, Allium sativum Linn, Bombax ceiba L., Coccinia grandis (L.) Voigt, Cucumis melo L., Hibiscus sabdariffa L., Ipomoea batatas (L.) Lam, Morus alba L., Murraya koenigii (L.) Spreng, Nelumbo nucifera Gaertn, Phaseolus vulgaris L., Punica granatum L., Senna siamea (Lam.) H.S.Irwin & Barneby, Shorea robusta Gaertn, Solanum lycopersicum L., Syzygium aromaticum (L.) Merr. & L.M.Perry, Tamarindus indica L., Zingiber officinale Roscoe, Moringa oleifera and Citrus limon (L.).*

Conclusion: There are a lot of plants in Bangladesh which seem to be a safe treatment source for obesity control. Further researches are recommended to evaluate this potentiality for presenting effective and safe drugs for obesity in the market.

Keywords: Anti-obesity, Bangladeshi plants, Herbal medication.

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Introduction

Obesity is fetching one of the most widespread health concerns amongst all populations and age groups all-inclusive, ensuing into a significant amplify in mortality as well as morbidity connected to coronary heart diseases, stroke, diabetes type 2, metabolic syndrome as well as cancers [1-4]. Choosing the best treatment for obesity depends on the accurate analysis. There are numerous complementary and integrative practices, including physical activity, dietary programs, surgical interventions, behavioral therapy, lifestyle modifications, medicinal therapies and the use of medicinal plants [5-10].

There are quite a few pharmacologic substances available as anti-obesity drugs, nevertheless they have risky side effects and therefore natural products have been used for treating obesity in many Asian countries and even in Bangladesh. Side effects with anti-obesity drug can differ depending upon the types of drugs we receive furthermore how the drug works. In the table, drug category and common side effects are mentioned. It is to be mentioned that weight loss medications are used beside a low calorie diet and a doctor-approved exercise plan intended for best results. In addition, it is to know that the majority people will get back some or all of the weight they lost when they discontinue using weight loss drugs if not efforts are made to keep their weight loss with diet and exercise. In the Table 1, generic name along with their category and common side effects are noted [11-15].

At the present time, while of high cost and potentially risky side effects, the need for natural products against obesity is under investigation which may be an alternative strategy for developing effective, safe antiobesity drugs and within economical risk [16-18]. It is also known that natural anti-obesity preparations can induce weight loss through several mechanisms with less risk of side effects [19-21].

To date, many reviews on anti-obesity agents have been consummate but focusing only Bangladeshi medical plants with anti-obesity activities still not found. Therefore, the aim of the present review was to collect or update data on potential anti-obesity herbal plants available in Bangladesh and assess the scientific data including active components and mechanisms of action against obesity in human.

Methods

Search strategy

Conventional text books and databases such as Web of Science, Scopus, and PubMed were searched for scientific

Table 1: *Common side effects of anti-obesity drugs.*

Drug Name	Drug Category	Common Side Effects
Phentermine	Appetite suppressant	Increased blood pressure along with heart rate, insomnia, restlessness, dependence, nervousness, abuse or withdrawal may occur with long-term use
Orlistat	Lipase inhibitor	Flatulence, fecal urgency, soft stools, fecal incontinence
Lorcaserin	Appetite suppressant	Headache, dizziness, nausea, fatigue, dry mouth, constipation and also euphoria may occur with higher doses
Phendimetrazine	Appetite suppressant	Increased blood pressure and heart rate, dependence, insomnia, nervousness, restlessness
Bupropion and naltrexone	Antidepressant and an opioid antagonist	Nausea, vomiting, headache, fatigue, constipation, diarrhea, increased blood pressure, anxiety, tremor, hot flush, unusual taste dizziness, insomnia, dry mouth
Methamphetamine	Appetite suppressant	Increased blood pressure and heart rate, insomnia, nervousness, restlessness, dependence
Benzphetamine	Appetite suppressant	Increased blood pressure and heart rate, restlessness, insomnia, nervousness, dependence
Amfepramone	Appetite suppressant	Constipation, restlessness, dry mouth, insomnia, nervousness, restlessness, increased blood pressure and heart rate, dependence
Liraglutide	Regulates appetite and food intake.	Nausea/vomiting, diarrhea, constipation, headache, heartburn, fatigue, dizziness, low blood sugar in type 2 diabetes, increased lipase stomach pain, gas, dry mouth

Table 2: *List of the medicinal plants with anti-obesity potentiality in Bangladesh with common names, local names and family. names.*

Serial no.	Scientific name	Common Name	Local name	Family
1	*Achyranthes aspera* Linn	Prickly Chaff-flower	Apang	Amaranthaceae
2	*Acorus calamus* Linn	Calamus	Bach	Acoraceae
3	*Aegle marmelos* Linn	Wood Apple	Bel	Rutaceae
4	*Allium cepa* Linn	Onion	Piyaj	Liliaceae
5	*Allium sativum Linn*	Garlic	Rasun	Liliaceae
6	*Bombax ceiba* L.	Silk Cotton Tree	Shimul-tula	Bombacaceae
7	*Coccinia grandis* (L.) Voigt	Ivy Gourd	Telakucha	Cucurbitaceae
8	*Cucumis melo* L.	Musk Melon	Bangi	Cucurbitaceae
9	*Hibiscus sabdariffa* L.	Indian Sorrel, Jamaica Sorrel	Lalmesta	Malvaceae
10	*Ipomoea batatas* (L.) Lam	Sweet Potato	Misti Alu	Convolvulaceae
11	*Morus alba* L.	Malberry, white mulberry	Tut	Moraceae
12	*Murraya koenigii* (L.) Spreng	Curry-leaf Tree	Chhotokamini	Rutaceae
13	*Nelumbo nucifera* Gaertn	Lotus	Poddo	Nelumbonaceae
14	*Phaseolus vulgaris* L.	Kidney bean	Bakola	Fabaceae
15	*Punica granatum* L	Pomegrante	Dalim	Punicaceae
16	*Senna siamea* (Lam.) H.S.Irwin & Barneby	Cassia tree	Minuri	Fabaceae
17	*Shorea robusta Gaertn*	Sal tree	Sal, Gajari	Dipterocarpaceae
18	*Solanum lycopersicum* L.	Tomato	Belati begun	Solanaceae
19	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Clove	Long	Myrtaceae
20	*Tamarindus indica* L.	Tamarind tree	Tetul	Fabaceae
21	*Zingiber officinale* Roscoe	Ginger	Ada	Zingiberaceae
22	*Moringa oleifera*	Drumstick Tree	Sajna	Moringaceae
23	*Citrus limon* (L.)	Lime	Lebu	Rutaceae

Table 3: *Anti-obesity potential Bangladeshi medicinal plants with their used part (s) and mechanism.*

Serial no.	Scientific name	Used part(s)	Mechanism	Reference
1	*Achyranthes aspera* Linn	Seed	The plant reduces total triglycerides, cholesterol, and LDL-cholesterol, and also increases HDL cholesterol level.	23
2	*Acorus calamus Linn*	Rhizome, roots and leaves	Ethyl acetate extarct derived from A. calamus suppresses α-glucosidase activity.	24
3	*Aegle marmelos* Linn	Leaves	The active chemical constituents of A. marmelos are responsible for the lowering of adipocyte accumulation.	25, 26
4	*Allium cepa Linn*	Peel	The mRNA levels of activating protein (AP2) is downregulated by A.cepa and Fatty acid binding protein 4(FABP4) and carnitine palmitoyl transferase-1 α (CPT-1α) are up-regulated by this.	27, 28
5	*Allium sativum* Linn	Stem, Bulb and Roots	It suppresses glutathione depletion and lipid peroxidation in hepatic tissue. It also increases antioxidant enzymes. Oil derived from A. sativum down regulates sterol regulatory element binding protein1c,fatty acid synthase, 3-hydroxy-3-methylglutaryl-coenzyme A reductase and acetylcoA carboxylase.	29, 30
6	*Bombax ceiba* L.	Stem bark	The extract and active constituent gemfibrozil alters the effects of HFD treatment on serum parameters. This occurs as they activate AMPK which causes thermogenesis and FAS inhibition.As a result, acetyl-coA carboxylase is inactivated.	31

7	*Coccinia grandis* (L.) Voigt	Fruit	C. grandis decreases body weight, organ and fat pads weight,food intake, and CHO ,serum GLU, TRG, LDL and VLDL cholesterol levels and increases the formation of HDL.	32
8	*Cucumis melo* L.	Fruit peel	C. melo decreases body weight, total cholesterol,LDL cholesterol level, triglyceride, atherogenic index and increases HDL cholesterol levels.	33
9	*Hibiscus sabdariffa* L.	Leaf	H. sabdariffa Promotes LXRα/ABCA1 pathway, helps to remove cholesterol from macrophages, and delays atherosclerosis. Also, the extract of H. sabdariffa reduces fat in the liver, downregulates SREBP-1c and PPAR-γ, inhibits the increase of IL-1, TNF-α mRNA and lipoperoxidation.	34, 35
10	*Ipomoea batatas* (L.) Lam	Fruit	I.batatas opposes the expression of SREBP-l, Acyltransferase, Glycerol-3-Phosphate, Acyl-CoA Synthase, HMG-CoA Reductase and Fatty Acid Synthase in liver tissue in mice.	36
11	*Morus alba* L.	Fruit, leaves	It reduces fatty acid synthase, hepatic lipids and 3-hydroxy-3 methylglutarylcoenzyme A (HMG-CoA) reductase and increases carnitine palmitoyltransferase-1 and hepatic peroxisome PPAR-α.	37
12	*Murraya koenigii* (L.) Spreng	Leaves	It decreases weight gain, triglyceride and cholesterol levels in mice.	38
13	*Nelumbo nucifera* Gaertn	Seed epicarp, leaves, seed, petals	The extracts of N. nucifera effectively inhibits preadipocyte differentiation. The flavonoids inhibits adipocyte differentiation and pancreatic lipase activity and decreases activity of PPARγ, GLUT4, and leptin. The methanol extract blocks lipase activity and decreases acetyl-CoA carboxylase, fatty acid synthase, and HMGCoA reductase and elevates the phosphorylation of AMP-activated protein kinase in the liver.	39, 40
14	*Phaseolus vulgaris* L.	Bean	It decreases food intake and weight gain in animal model and ultimately it controls glucose level in blood.	41
15	*Punica granatum* L	Leaves, seed	It contains punicic acid which attaches, activates and upregulates PPAR α and its responsive genes (Carnitine palmitoyltransferase1,Stearoyl-CoA desaturase-1, and acylcoenzyme A dehydrogenase) and PPAR γ and its responsive genes (Fatty Acid Binding Protein 4 and CD36) in intra-abdominal white adipose tissue. Punicic acid also inhibits expression of the inflammatory cytokine TNF-α and NF-κB activation.	42
16	*Senna siamea* (Lam.) H.S.Irwin & Barneby	Roots	Active constituents of S. siamea including physcion, chrysophanol, cassiamin A, emodin, friedelin and cycloart-25-en-3,24-diol shows pancreatic lipase inhibitory activity.	43
17	*Shorea robusta* Gaertn	Leaves	S. robusta reduces serum glucose, cholesterol, LDL cholesterol , VLDL cholesterol, atherogenic index, triglyceride, SGOT and SGPT.	44
18	*Solanum lycopersicum* L.	Fruit	S. lycopericum increases acetyl-CoA carboxylase phosphorylation and AMP-activated protein kinase in liver and decreases peroxisome PPAR- γ, HMG-CoA reductase, CCAAT/enhancer binding protein alpha and perilipin in the adipose tissue.	45
19	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	Flower buds	The extract of S. aromaticum inhibits the activity of lipid metabolism related proteins including CD36, FAS, PPARγ, and SREBP-1 in the liver.	46
20	*Tamarindus indica* L.	Fruit pulp, pulp, seed coat	It decreases total cholesterol, LDL-C, and triglyceride and elevates the level of HDL.	47
21	*Zingiber officinale* Roscoe	Rhizome	Z. officinale blocks the hydrolysis of dietary fat and ultimately suppresses the intestinal absorption.	48, 49
22	*Moringa oleifera*	Leaves	M. oleifera reduces total lipid content from body.Thus reduces body weight.	50
23	*Citrus limon* (L.)	peel	It upregulates the peroxisomal β-oxidation through increasing mRNA level of acyl-CoA oxidase in the liver and white adipose tissues, which is mediated via up-regulation of the mRNA levels of PPARα.	51

Table 4: *Anti-obesity potential of Bangladeshi medicinal plants with their short description and chemical compositions.*

Serial no.	Scientific name	Short Description	Chemical Composition
1	*Achyranthes aspera* Linn	It is an erect, diffuse herb, fine-pubescent. Leaves are simple and opposite. Flowers are greenish-white in terminal spikes. Seeds are shining. Fruits are deflexed.	Leaves, stems and roots of this plant contain alkaloids, saponins and sterol. Root contains ecdysone, ecdysterone. Seeds contain saponin A&B. Fruit contains two oleanolic acid based saponins. The plant also contains an alkaloid achyranthine, arginine, histidine, lysine, cystine, amino acids, threonine, lucine, isolucine, methionine, phenylalanine, tryptophan and carbohydrate, large amount of potash, valine, α-rhamnopyranosyl, β-D galactopyranosyl, galactose, xylose, β-D gluuronopyranosyl, rhamnose and glucose, hormones, ecdysterone and inokosterone
2	*Acorus calamus* Linn	Rhizome of the plant is pinkish and leaves are asymmetric. Flowers are in straight or slightly curved spadix and fruits are berries.	Rhizome contains an essential oil with β-asarone as major constituent and also ecgenol methyl ether, sesquiterpene alcohols, calamenenol, isocalamendiol, and palmitic acid. Aerial parts contain the choline , alkaloid and acorin glycosides and fresh leaves contain calcium andoxalic acid.

3	*Aegle marmelos Linn*	It is basically a medium sized thorny tree. Leaves are sub-crenulate, acute and glabrous. Flowers are white in axillary panicles. Fruit is a large globose berry. Seeds are embedded in fleshy pilp.	Fruit pulp contains proteins, carbohydrates, minerals and vitamins, essential oil, marmesin, scopoletin, tannins, alcohols, ester, terpene. Fruit contains furanocoumarin, marmelide, psoralen, tamic acid, agelinol. Leaves also contain marmesin, rutin, polyphenolic compounds, sitosterols and essential oil containing of α & β-phellandrene alkaloids, marmelosins and agelenine. Root contains tembamide, umbelliferone, marmesin, marmin, skimmianine xanthotoxin, 6,7-di-Ome-coumarin and scopoletin. Bark contains aurapten, marmin, and umbelliferone, β-sitoterol, umbelliferone, lupeol, coumarin and alkaloids, skimmianine, marmesin.
4	*Allium cepa* Linn	It is an annual herb. Stem underground and modified in to small disc generally known as bulb. Leaves are radical long cylindrical and flowers are arranged in a terminal umbel. Fruit is a loculocidal capsule and membernous.	An essential oil as a principal constituent containing various sulphur compounds such as mono-, di-, tri-, and tetra-sulphides, thiophene and thiols derivatives. It also contains carbohydrates, proteins, kaempferol, vitamin B and C, a saponin, β-amyrin, amino acids, polyphenols, quercetin, sterols, phenolic acids and minerals. Diosgenin has been separated from flowers and bulb.
5	*Allium sativum* Linn	It is like bulbs ovoid, compressed of many bulblets. Leaves are flat, and keeled beneath. Stem is solid. Inflorescence is composed of not less than 3 bulbils.	An essential oil which is chief chemical constituent of Garlic contains diallyl disulphide, allyl propyl disulphide, dimethyl disulphide and polysulphides. Vitamins A, B, C and α-tocopherol (vitamin E) have also been isolated from garlic. Garlic also contains prostaglandins A2 and F1.
6	*Bombax ceiba* L.	It is a large sized tree. Leaves are digitately compound and elliptic.	Stem and root bark contains phenolic substances, a lactone, lupeol, β-sitosterol, naphthoquinone compound and 4 sesquiterpenes. Root yields β- sitosterol, triacontanol and new glycosides. Flower petals yield vital oil.
7	*Coccinia grandis* (L.) Voigt	It is a climbing herbaceous annual. Stems and coiled are tendrils. The leaves are alternate and stipules are absent. The flowers are actinomorphic and almost always unisexual. The fruit is a kind of berry called a pepo.	Aerial parts hold protein, fat, mineral, carbohydrates, vitamin C, sterols, β-sitosterol, phenolic compounds, triterpenoids, β-amyrin, β-amyrine acetate and lupeol, bitter glycoside constituents. Fruits contain β-amyrin, lupeol and a bitter glycoside having cucurbitacin B. β-Sitosterol, lycopene, cryptoxanthin, taraxerone, β-carotene, apo-6'-lycopenal taraxerol and ethylcholesterol gluciside. Roots contain lupeol acetate, β-amyrin acetate and β-sitosterol.
8	*Cucumis melo* L.	It is a robust, annual climbing herb. Stems are hirsute, prostrate, angular. Tendrils filiform, puberolous. Leaves are sub orbicular and lobe obtuse. Fruits are changeable in size and shape.	Fruit tail contains cucurbitin, cucurbitacin B and E and sterols and seeds contain an edible fixed oil.
9	*Hibiscus sabdariffa* L.	It is an erect shrubby annual with red stem and branches. Leaves are cuneate at the base and lobes lanceolate. Flowers are large.	The leaves, fruits and stems contain d-malic acid and leaves contain sitosterol- β-D-galactoside. Extract of flowers contain glycosides, reducing sugars, acids, an alkaloid and resins.
10	*Ipomoea batatas* (L.) Lam	It is a prostrate herb with trailing stem along with tuberous roots. Leaves are ovate-cordate and acute angular or more or less lobed.	Leaves are a superior source of vitamins B and C. Sweet potato in addition contains enzymes, scopoletin and some fungicidal and bactericidal substances.
11	*Morus alba* L.	It is a small tree or shrubs with milky juice. Leaves are simple and alternated. Flowers are dioecious or monoecious. The fruit is not a berry except a collective fruit.	Leaves have flavonoids, salts of citric and malic acids anthocyanins and artocapin. Fruits are rich in vitamins A, B1, B2 and C as well as minerals. Stems and bark contain pectin along with sugars.
12	*Murraya koenigii* (L.) Spreng	It is a strong smelling and shrub tree. Leaves are pinnately compound. Flowers are small and fruits are ovoid or subglobose.	Leaves have an essential oil, tannins, glucoside, koenigin, koenigicine, koenidine, koenimbine, resin, cyclomahanimbine, koemine, koenigine, mahanine, mahanimbidine and scopolin. Fruits and seeds have the carbazole alkaloids, koenimbine, koenigicine, mahanine, mahanimbine, murrayazolidine, girinimbine, iso-mahanine and murrayanol. Stem-bark has murrayanine, murrayacine, girinimbin, girinimbine, and a carbazole carboxylic acid - mukoeic acid, curryangine and curryanine. Flowers have a large number of mono- and sesquiterpenoids. Plant too contains mukonine in addition to mukonidine.
13	*Nelumbo nucifera* Gaertn	It is an aquatic plant. Leaves are peltate and broad. Fruits are torus and spongy. Seeds looked similar to capsules.	Leaves, pedicels and embryo have alkaloids, nornuciferine, pronuciferine, roemerine, anonaine, 5-methoxy-6-hydroxyaporphine and meratin hyperoside, quercetin, nelumbine and nupharine, nuciferine, isoquercetin, a quercetin glucoside, nelumboside, luteolin and glucoluteolin. Rhizomes and seeds have tannin, fat, resins, glucose and the alkaloid nelumbine.
14	*Phaseolus vulgaris L.*	It is highly polymorphic species and annual herb. Leaves are alternate and green or purple. Flowers are zygomorphic and variegated. Fruits are green and yellow.	The contents of analyzed compounds are protein, lipids, carbohydrates and starch.

15	*Punica granatum* L	It is a small multi-stemmed shrub or else small tree. Stems are woody and spiny. Leaves are simple and oppositely placed. Flowers are regular and solitary and fruits round berry globose with persistent callipe.	Bark, fruit rind and fruit juice contain alkaloids pelletierine isopelletierine, pseudopelletierine and methyl-isopellerierine, sucrose, isoquercetin, β-sitosterol, friedelin, estrone, pectin, sorbitol, mannitol, glucose, fructose, triterpenoids, ellagitannins (about 25%), citric acid (about 9%), phosphorus, iron, oxalic acid, calcium, sodium and potassium. Leaves have betulic in addition to ursolic acids and β-sitosterol. Flowers have sitosterol, acetic, ursolic, maslinic, asiatic, ellagic and gallic acids.
16	*Senna siamea* (Lam.) H.S.Irwin & Barneby	It is a medium to large tree. Leaflets are elliptic-oblong. Flowers are yellow.	Leaves contain protein, crude fibre, moisture content, ash content, carbohydrate, iron, magnesium, manganese, potassium, calcium, sodium, copper, phosphorus.
17	*Shorea robusta Gaertn*	It is a medium-sized to large deciduous tree. Barks are dark-grey or brown.Young leaves are reddish and mature leaves are yellowish or dark green. Fruits are samara and ovoid.	Barks have tannic principles, a gummy resin, polyphenol, hopeaphenol, lignin and starch. Seeds also have phenolic acid, ellagic, shorbic acid, corilagin, chebulinic and gallic acids.
18	*Solanum lycopersicum L.*	It is an undershrub. Leaves are imparipinnate. Flowers are yellow. Berries are fleshy and red when ripe.	Leaves contain glycol-alkaloides, tomatine, traces of solanine, amino acids and amides and tomatidine. Seeds have neotigogenin, quercetin, kaempferol, 24-methylenecycloartanol, lupeol, lanost-8-en-3β-ol, lanosterol, 24-methylenelanost-8-en-3β-ol, cycloartanol, β-amyrin, α- & β-globulins and daturadiol. Fruits have all the important amino acids except tryptophan and organic acids, mainly citric, oxalic and malic acids. Stem contains leucine, phenylalanine, glutamic acid, tyrosine, isoleucine, valine and γ-aminobutyric acid.
19	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	It is a small tree. Leaves are narrowly elliptic to obovate. Flowers are fragrant. Fruit are oblong and crowned.	Eugenol is the main essential oil extracted from cloves and other important essential oil constituents of clove oil comprise acetyl eugenol, tannins such as bicornin, gallotannic acid, beta-caryophyllene and vanillin, crategolic acid, methyl salicylate, the flavonoids eugenin, kaempferol, rhamnetin, and eugenitin, triterpenoids, stigmasterol, and campesterol and several sesquiterpenes.
20	*Tamarindus indica L.*	It is a tree and leaves pinnately compound. Flowers are racemes yellow. Fruits are pods and compressed. Seeds are orbicular and blackish brown.	Fruit pulp has large quantities (16-18%) of tartaric, potassium tartrate, citric, malic and acetic acids, invert sugar, gum and pectin. Leaves have glycosides and bark contains tannins as well as resin.
21	*Zingiber officinale Roscoe*	It is a rhizomatous herb. Leaves are oblong-lenceate and acuminate. Flowers are pale yellow within spikes.	Rhizome has essential oil, starch, protein, acrid oleoresin, lipids and sugars. Resin contains gingeodiols, gingerol, shogaols, and gingediacetates. Rhizome yields essential oil which contains 25 different monoterpene and sesquiterpene compounds.
22	*Moringa oleifera*	It is a large tree. Leaves are pinnate. Flowers are white. Fruits are elongated capsule.	Barks of the trunk yield a tragacanth-like gum which has bassorin galactose, dextrose, glucuronic acid, , β-sitosterol, enzyme and sugars, arabinose and rhamnose. Root bark contains alkaloids. Seeds have fixed oil along with fatty acids. Flowers and fruits also contain sucrose and glucose. Leaves also have glycine, threonine, alanine, aspartic acid, glutamic acid, valine, leucine, arginine, phenylalanine, tryptophan, isoleucine, histidine, lysine, cysteine and methionine. Each fraction of the plant contains substantial quantity of K, Mg, Zn and Ca.
23	*Citrus limon* (L.)	The lemon tree reaches 10 to 20 ft (3-6 m) in height in addition to usually has spiky thorns on the twigs. The fruits are oval with a nipple-like protuberance at the peak.	The fruit has protein, fat, ash, fiber, sodium, potassium, calcium, copper, iron, magnesium, zinc and phosphorus.

articles published till 2017, using the following descriptors: “herbal medicine” or “plant”, “medicinal plant” or “medicine traditional”, without restriction on the language of the articles and without limiting the search items.

Inclusion and exclusion criteria

Both original works and reviews on medicinal plants were considered, including those that cited the plant species referenced for obesity treatment, with botanical identification correctly described according to the Ethnobotanical Database of Bangladesh (EDB) (http://www.ethnobotanybd.com/) and Medicinal Plants of Bangladesh (http://www.mpbd.info/). Ethnopharmacological articles that presented possible methodological bias in terms of sample quality and authenticity of the species described in the study were not considered.

Data analysis

To analyze and manufacture the objects, an exploratory reading of the bibliographic materials were conducted, assessing the title and abstract of the work. After that, the articles that appeared in the results of all were checked. After completing the exploratory analysis, a selective reading of the articles that included plant species with botanical records were done and were checked in as information contained in the consulted periodicals were performed, thus enabling the collection of the data from the bibliographic review. Information on anti-obesity action was obtained directly from the selected articles [22-50].

Results and Discussion

There were more than 100 medicinal plants available worldwide introduced as anti-obesity plants but in Bangladesh, there were only 23 medicinal plants available for this purpose. For easy understanding, information about these Bangladeshi plants is provided in tables. In the Table 2, there is the list of these plants with local names, common names and their family names. In Table 3, the using parts and mechanism actions of the plants are included. Finally, in Table 4, their short description and chemical composition are provided [51-54].

Dosage of anti-obesity medicinal plants

There were various researches held on anti-obesity medicinal plants and still going on. It is to be mentioned that there is not any fixed dose were found for obesity control. In different experiments, the dose ranges is different.

Conclusion

It is very well known that natural alternatives may provide increased health expectancy in obesity control. In Bangladesh, several plants possess anti-obesity potential but have been poorly studied by the local researchers, while others are not even promoted. More anti-obesity data is needed about those plants, but in order to accomplish this, more researches in this area with well-designed clinical trials focused on both safety and efficacy with these plants materials is required.

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