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Review Article

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Herbal Medicine-A Natural Cure to Diabetes (An Overview)

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Abstract

Diabetes mellitus, a common and serious metabolic disorder, is a prevalent disease which is affecting the citizens of both developed and developing countries since last few decades. Medicinal plants constitute a group of industrially important crops which have been an exemplary source of medicine to cure specific ailments since ancient times. The existence of indigenous system of medicine *viz.* Ayurveda, Siddha and Unani, not only cater to the needs of nearly seventy percent of ethnic communities in India but also these systems of medicines are prevalent in China, Korea, Singapore, Malaysia, Burma and some West Asian countries. The demand for medicinal plants as raw materials has also been increased in the sector of modern pharmaceutical industries. Medicinal plants play an important role in the management of Diabetes mellitus with no side effect in comparison to that of synthetic drugs. Present review work is an attempt to document the antidiabetic plants along with their beneficiary effects on human beings.

Keywords: Diabetes mellitus, Medicinal plants, Beneficiary effects

Introduction

Diabetes mellitus, affecting body's ability to make or use insulin, is one of the common metabolic disorders throughout the world. Henceforth level of glucose is increased in blood stream which causes short- or long-term consequences ranging from renal failure, heart disease, blurred vision, brain damage etc. According to the factsheet of IDF 2014, global prevalence of Diabetes has been estimated to be 5.46% of world population which is projected to be 6.86% in 2035. In India, Diabetes is fast gaining the status of a potential epidemic with 4.95% of total population has been currently diagnosed with acute disease symptoms (Joshi and Parikh, 2007; Kumar et al., 2013) which is projected to be approx. 8.56% in 2035 (Kaveeshwar et al., 2014). Diabetes mellitus is a systemic metabolic disease characterized by hyperglycemia, hyperlipidaemia, hyperaminoacidemia and hypoinsulinaemia (Altan, 2003). It is caused by the abnormality of carbohydrate metabolism which is linked to the inherited or acquired deficiency of production of insulin by the pancreas or ineffectiveness of the target organs to produce insulin (Maiti et al., 2004). In medical sciences, four categories of Diabetes have been defined *viz.* Type I, Type II, Gestational and seconday diabetes.

The aetiology of Diabetes mellitus in India is multifactorial which includes Amalgamation of genetic factors with environmental influences such as obesity, changes in life style, rising of living standards, steady urban migration, increasing physical and mental stress etc (Kaveeshwar et al., 2014).

The disease, associated with reduced quality of life and increased risk factors for mortality and morbidity, requires proper diagnosis, treatment and changes in life style (Rawat and Parmar, 2013). Despite of considerable progress in the treatment of Diabetes by synthetic drugs, search for newer herbal drugs is still being continued due to several limitations of synthetic hypoglycemic agents.

In India, history of medicinal plants as natural cure for various diseases is as long as the days of Vedic glory. Historically, in *Atharva Veda* (*c.* 200 B.C.), medicinal plants were described in a separate chapters; Sushruta (*c.*400 B.C.) compiled 77 herbal drugs under 37 classes in 'Sushruta Samhita'; Charaka (*c.* 600 B.C.) made the scientific classification of 500 herbal crude drugs based on remedial properties in 'Charaka Samhita'(Mukherjee, 1981; Saxena et al., 2006). In recent years, herbal drugs, due to less side effects and low cost, have started to gain worldwide importance as a potential source of hypoglycemic agents which reported to possess pancreatic beta –cells regenerating insulin-resistance properties. The present review is an attempt to circumscribe the plants which have been tested by trial and error method for long time and reported to have antidiabetic potentialities.

Medicinal Plants with anti-diabetic potentialities:

India, according to the conventional systems of medicine as Ayurveda, Unani, Siddha etc., is enriched with a good number of native medicinal plants which possess confirmed blood sugar lowering properties. Although a large number of herbs are being used as a part of our daily diet as vegetables, fruits, spices etc, but recent pharmacological and clinical reviews on antidiabetic plants reveals more efficacy of decoction or other extract form in lowering blood glucose level than crude raw drugs (Mukherjee, 1981; Grover et al., 2005; Saxena & Vikram, 2004; Mukherjee et al., 2006). Details of Indian medicinal plants, their common/vernacular name, distribution, parts used, chemical constituents are provided along with their reported pharmacological and clinical efficacy (**Table 1)**.

Table 1: **List of Medicinal Plants with anti-diabetic potentialities**

Sr. No	Botanical Name	Family	Vern. Name/ Common name	Distribution	Parts Used	Chemical constituent	Antidiabetic potentialities and other beneficiary effects
1.	*Abelmoschus moschatus* medik.	Malvaceae	Okra/ Musk mallow	Native to India	Leaf	Myricetin	Improves insulin sensitivity through increased Post-receptor insulin signaling (Liu et al., 2007)
2.	*Abrus precatorius* L.	Fabaceae	Gunjaa/ Rati/ Indian liquorice	Native to Himalayas in India	Seed, roots, leaf	Quinines, Sotlavanoids, Abrin I, II, III (proteins)	Antidiabetic, purgative, aphrodisiac, emetic, hypolipidaemic (Marles et al., 1995)
3.	*Acacia nilotica* (L.) Willd. ex Delile	Fabaceae	Babul/ Kikar/ Gum Arabic tree	Wide spread in Africa, Asia, Australia	Pods, tender leaf	Tannin, Saponin, Flavonoids	Antidiabetic (Mukundi et al., 2015)
4.	*Acacia arabica* (Lam.)Willd.	Fabaceae	Babul	All over India	Seed, bark	Flavonoides, Gallotannins,Amino acids, Polyphenols, tannins	Hypoglycemic, anti-hyperlipidemic (Hegazy et al., 2015)
5.	*Achyranthes aspera L.*	Amaranthaceae	Apang/ Prickly chaff flower	Native to India	Root, seed, leaf, whole plant	Saponin A & B	Hypoglycemic/ Supply calcium,zinc, magnesium,manganese and copper to the beta cells (Geetha, 2016)

6.	*Achillea santolina* L.	Asteraceae	Zawal, Staunch weed	Northern hemisphere, mostly Europe, Asia	Dried aerial parts, flowers	1,8 Cineole, Fragranol, Fragranyl acetate, Terpine-4-ol, flavonoids, Sesquiterpine lactone	Hypoglycemic/ Antioxidant/anti-inflammatory/ reducing naval pain/analgesic (Al-Awaadi, 2013)
7.	*Achyrocline satureioides* (Lam.)DC.	Asteraceae	Macela	Native to America, found at higher elevation in India	Entire aerial parts, in-florescence	Achyrofuran	Antioxidant/ Lowering blood glucose level (Rahimi, 2015; Simoes et al, 1988)
8.	*Aegle marmelos* (L.) Correa	Rutaceae	Bel/Holy fruit tree	Native to India	Leaf	Coumarins, alkaloids, polysaccharides,Tannins, Carotenoids	Hypoglycemic (Kamalakkanan et al.,2003)
9.	*Agrimonia eupatoria* L.	Rosaceae	Agrimony, Church steeples	Europe, Asia	Leaf	Volatile oils, flavonoids, Apigenin, Luteonin, Quercetin, Kaempferol, Triterpene glycosides, Agrimony lactone,	Antidiabetic, hepato-protective, Antioxidant, analgesic, antibacterial, antiviral, immune-modulatory Ivanova et al., 2011)
10.	*Agrimonia pilosa* Ledeb.	Rosaceae	Hairy agrimony	Northern Asia, Eastern Europe	Leaf, seeds	Flavonoids, triterpenes, Iso-coumarin, Phenolic acid, ceramide, agrimols, fatty acids etc	Hyperglycemic, natural antioxidant (Soumyanath, 2006)
11.	*Allium cepa* L.	Liliaceae	Pyaj/Onion	Native to South-Western Asia	Bulb	Quercetin, Quercetin-3-glucoside, fructose, Isorhamnetin-4-glucoside, Xylose, Galactose, Glucose, Mannose, organosulfer compound, Allyl sulphides, Flavenols, Sulfoxides, Cycloalliin,	Hypoglycaemic, Hypo-cholesterlemic, Antiseptic, Lowering blood pressure, antioxidant (Augusti, 1973; Mathew et al., 1975)

						Thiosulfinates	
12.	*Allium sativum* L.	Liliaceae	Lahsun/ Garlic	Native to Central Asia	Leaves, bud	Allicin, Diallyl disulphide, S-allylcysteine, Di-allyl trisulphide, Allicin, Ajoene	Decrease serum glucose, total cholesterol, triglycerides, uric acid, creatinine (Mathew et al., 1973; Jain et al., 1975)
13.	*Aloe vera* (L.) Burm.f.	Liliaceae	Gheekumari/ Burn plant	Widely distributed in Africa, Asia(India)and other arid regions	Succulent leaf, dry pulp of leaf	Vitamines, enzymes, minerals, sugars, anthraquinones fatty acids, hormones	Hypoglycemic/ Cardioprotective activity(Ghannam et al., 1986; Vogler et al., 1999)
14.	*Artemisia herba-alba Asso*	Asteraceae	White Worm-wood	Native to Mediterranean basin of Northern Africa, Western Asia, South western Europe	Aerial parts	Herbalbin, cis-chryanthenyl acetate, flavonoids, monoterpene, sesquiterpene	Anti-diabetic, anti-spasmodic, antioxidant, antimalarial (Awad et al., 2012)
15.	*Artemisia pallens Wall. ex Besser*	Asteraceae	Davana/Machipatram	Native to sourthern parts of India, especially Karnataka, TamilNadu, AndhraPradesh, Maharashtra	Aerial parts	Davanone, Davan ether, Davana furan, Linalool	Lowering blood glucose level, antibacterial, anthelmintic (Kumar et al., 2012)
16.	*Anacardium occidentale L.*	Anacardiaceae	Kajubadam/Cashew nuts	Tropical America, Jamaica, South Africa, Malagassy, West Indies, India, Sri Lanka, Philippines	Roots, Bark	Anacardic acid, cardol, Magnesium, Iron, Niacin	Hypoglycemic, anti-hypertensive, anti-inflammatory (Godstimeet al., 2014)
17.	*Annona squamosa L.*	Annonaceae	Sharifa/ Custard apple	Native totropical America and West Indies	Roots, leaves, fruits, seeds, barks	Steroid, terpenoid, glycoside, alkaloid, flavonoid, saponin, phenolic compounds	Hypoglycemic/ Antioxidant (Shirwaikar et al., 2004)
18.	*Andrographis paniculata (Burm.f.) Wall. ex Nees*	Acanthaceae	Kalmegh/ Kiriyata/ King of bitter	Native to India and Sri Lanka	Leaves	Kalmeghin, andrographolide	Hypo-triglyceridemic, anti-hyperglycemic (Borhanuddin et al., 1994)

19.	*Areca catechu L.*	Arecaceae	Supari/ Betel nut palm	Indian subcontinent	Leaves	Arecoline	Hypoglycemic (Mondal et al., 2012)
20.	*Anisodus tanguticus (Maxim.) Pascher*	Solanaceae	Tangut anisodus	Native to Indian Subcontinent, Nepal, China	Tubers	Anisodine	Lowers blood glucose/Anti-cholinergic (Pal et al., 2016)
21.	*Astragalus membranaceus Moench*	Fabaceae	Katira/ Milkvetch	Native to India	Root	Polysaccharides	Hypoglycemic Agyemang et al., 2013; Subramoniam, 2016)
22.	*Azadirachta indica A.Juss.*	Meliaceae	Neem/ Indian lilac tree	Native to India and Indian-subcontinent	Leaf, Seed	Azadirachtin-A, Beta-sitosterol	Hypoglycemic and anti-hyperglycemic (Satyanarayan et al., 1978, Chattopadhyay et al., 1987, 1999; Mukherjee et al., 2006; Waheed et al., 2006)
23.	*Balanites roxburghii Planch.*	Zygo-phyllaceae	Hingot/ Desert date	Indian Peninsula, Western Rajasthan, West Bengal, Maharashtra	Fruit	Diosgenin, Saponins, Flavonoids, Alkaloids	Antidiabetic, anti-inflammatory, analgesic, anti-oxidant, anti-tumour, larvicidal, anthelmintic (Gajalakshmi et al., 2013)
24.	*Barleria lupulina Lindl.*	Acanthaceae	Vajradanti/ Porcupine flower	Native to India, Sri Lanka, E, S and C Africa	Aerial parts	Barlelinoside, Barlelin, Lupulinoside, 6-O-trans-p-coumaroyl-8-O acetylbarlerin, 7-methoxy-diderroside	Antidiabetic, Kidney disorder, CNS activity (Sharma et al., 2014)
25.	*Bauhinia candicans Benth.*	Fabaceae	Brasilian Orchid tree	Native to South China, Myanmar, North Thailand; common in Southern India, Assam, Bihar	Leaf	Trigonelline, Kaempferol, dirhamnoside	Hypoglycemic (Fuentes et al., 2004)
26.	*Berberis aristata DC.*	Berberidaceae	Daruharidra/ Chitra/ Indian barberry/ Tree turmeric	Native to Northern Himalaya, SriLanka, India, Nepal	Root bark, fruit, stem	Berberine, Oxy berberin, Berbamine, Aromoline, Karachine, Palmatine, Oxycanthine, Taxilamine, Tannin, Sugar, starch	Antidiabetic, anti-inflammatory, anti-tumour, antioxidant, antiviral (Ahmed et al., 2012)

27.	*Beta vulgaris L.*	Chenopodiaceae	Palak/ Garden beet	Atlantic coast of South, Western Europeto India, China	Roots, leaves	Betanin, Isobetanins, Ferulic acid ester	Increases glucose tolerance in OGTT (Mishra et al., 2010; Prakash et al., 2015)
28.	*Biophytum sensitivum (L.) DC.*	Oxalidaceae	Lajalu/Little tree plant	Nepal,India, South east Asian countries	Whole plants	Cupressuflavone, Amentoflavone, Flavonoids, Luteolin-7-methyl ether, Isoorientin, 3'methoxyluteolin 7-O glucoside, 4-5 caffeoylquinic acid,	Hypoglycemic, anti-inflammatory, effective in arthritis, asthma, stomachachic (Sakthivel and Guru vayoorappan, 2012)
29.	*Bixa Orellana L.*	Bixaceae	Latkan/ Lipstick tree	Native of North, Central and South America, widely distributed in India	Leaves, seeds	Bixin, norbixin, isobixin, beta-carotin, cryptoxanthin, lutein, zeaxanthin, orellin, bixol, crocetin, ellagic acid, threonine, salicylic acid, tomentosic acid	Hypoglycemic, analgesic, anti-convulsant, antifertility, anticancer, hepato-protective, cardioprotective (Katiyar et al., 2017)
30.	*Boerhavia diffusa L.*	Nyctaginaceae	Punarnava/ spreading hogweed	Native to India	Root, leaves, whole plant, seeds	Sitosterol, esters of sitosterols, punarnavins, boerhavic acid, boerhavinone, palmitic acid	Decreases blood glucose level and increases plasma insulin level/ Antioxidant (Murti et al; Mishra et al., 2014)
31.	*Bombax ceiba L.*	Malvaceae	Semal/ Silk-cotton tree	Native to India, South China, Taiwan, Myanmarto Vietnam, phillippines to Papua New Gunea, Australia	Root, bark, leaf, gum	Naphthol, Naphtho-quinones, polysaccharides, anthocyanins, lupeol, shamimin	Hypoglycemic, antioxidant, astringent, diuretic, cooling, aphrodisiac, demulcent, anti-inflammatory, anti-cancer, anti-HIV activity (Bhavsar & Talele, 2013; Rameshwar et al, 2014)

32.	*Bougainvillea spectabilis Willd.*	Nyctaginaceae	Booganbel/ Baganbilas	Native to Brazil, Peru, Bolivia, Argentina; cultivated in India	Stem bark, leaf, root	Pinitol, Quercetin, Quercetin-3-0-α-L-rhamno-pyranoside	Hypoglycemic (Narayanan et al., 1984; Soumyanath A., 2006)
33.	*Brassica juncea (L.)Czern.*	Brassicaceae	Sarson/ Rai/Mastard	Native to central Asia(Northwest India), also found to grow in Eastern India, Central and Western China, Burma, Iran; cultivated throughout the Bangladesh, India, Central Africa, Japan, Nepal	Seed/ leaf	Iso-thiocyanate, Glycoside, Singrin, protein, fatty acids	Hypoglycemic (Thirumalai et al., 2011)
34.	*Butea monosperma (Lam.) Taub.*	Fabaceae	Palash/ Flame of the forest	Native to Indian Subcontinent, South-east Asia, Nepal, Sri Lanka, Myanmar, Thailand, Maos, Malaysia, Western Indonesia	Seeds, gums, resin, flowers, bark, leaf, root	Gum: Tannin, mucilaginous material, pyrocatechin; Seed: Oil, proteolytic & lysolytic enzymes, Plant proteinase, polypeptidase, palasonin, Monospermoside; Resin: Jalaric ester I, II, Laccijalaric ester III, IV, allophanic acid,Z-amyrin, e-sitosterone; Bark:Kino-tannic acid, Gallic acid, Pyrocatechin, Butrin,alanind, allophanic acid, butolic acid,cyanidine, histidine, lupenone, lupeol, miroestrol; Leaf: Glucoside,	Antidiabetic, antioxidant, antipyretic, antibacterial, antimicrobial, astringent, hepato-protective, radical scavenging, anti-tumour, wound healing (Firdaus and Majumder, 2012)

						Kino-oil containing oleic and linoleic acid, palmitic and ligoceric acid	
35.	*Bryonia alba L.*	Cucurbitaceae	Wildhop/ White bryony	Native to Italy, Central Europe, Iran, Central Asia	Root	Trihydroxy-octa-deca-dienoic acid	Hypoglycemic, Hypolipidemic (Subramaniam A., 2016)
36.	*Caesalpinia bonducella (L.)Fleming*	Fabaceae	Katkaranja/ Bonduc nut	Hotter parts of India, SriLanka, Burma	Seed kernels, leaf,root	Alkaloids, glycosides, terpenoids, saponin, tannin, triterpinoid	Antidiabetic, anti-febrifuge, tonic, anthelmintic, anti-asthmatic, anti-inflammatory, antioxidant, antibacterial, anti-tumour (Moon et al., 2010; Manikandaselvi et al., 2015)
37.	*Cajanus cajan (L.)Huth*	Fabaceae	Arhar/ Pigeon pea	Cultivated in India	Leaf, seed, fruit	Arginine, ascorbic acid	Hypoglycemic, antioxidant (Rahimi, 2015)
38.	*Cannabis indica Lam.*	Cannabaceae	Bhang/ Marijuana	Originated in China; indigenous to Central Asia and Indian Subcontinent	Seeds, roots, resin, leaf	Canabinoids, phytocanabinoidsEndocanabinoids, Exogenous canabinoids	Hypoglycemic, antispasmodic, vasorelactant, anti-epileptic, anxiolytic, bone-stimulant, anti-microbial, analgesic, anti-inflammatory (Kalita et al., 2014)
39.	*Cassia fistula L.*	Fabaceae	Amaltas/ Golden shower tree	Native to India and SriLanka	Leaf, bud, flower, pods	Anthraquinone, flavonoids, flavan-3-ol derivatives, terpenoids, reducing sugar, saponins, tannin, phlobatannin	Hypoglycemic, anti-tumour, antioxidant, hepato-protective, antipyretic, analgesic (Malpani and Manjunath, 2015)
40.	*Cassia auriculata L.*	Fabaceae	Tarwar/ Tanner's Cassia	Native to India, Myanmar, Sri Lanka; successfully introduced in different African countries	Leaves, seeds	Glycerine, thymine, 1-butanol, 3-methyl formate, 4-methyl benzaldehyde, n-hexadecanoic acid, phytol, 1-tridecyne	Anti-hyperglycemic, hyperlipidemic, antimicrobial, hepatoprotective,antipyretic, anthelmintic, antiulcer (Joy et al., 2012)

41.	*Capparis sepiaria L.*	Capparaceae	Kanthari/ Wild Caper Bush	India, Sri Lanka, Central Burma, Indo-China, Malaysia, Australia	Leaf, dried fruit, root, flower	Alkaloids, flavonoids, steroids, glycosides, tannin, saponins	Antidiabetic, blood purifier, stomachic, tonic, appetizer (Rahnavard and Razavi, 2016)
42.	*Capparis decidua (Forssk.) Edgew.*	Capparaceae	Karir/Caper berry/ Kair	Northern and southern Africa;arid regions of India	Leaf, flowers, fruits	Spermidine alkaloids, glucosinolate, β-sitosterol, rutin, I-stachydrine, hydrocarbons and terpinolides	Antidiabetic, antioxidant, anti-inflammatory, antimalarial (Rathee et al., 2010)
43.	*Capparis spinosa L.*	Capparaceae	Kabra/ Caperbush	Western or Central Asia; drier parts of India	Roots, leaves, fruits, seeds	Alkaloids, glycosides, tannins, phenolics, flavonoids, triterpenoids, steroids, wide range of minerals and trace elements	Antidiabetic, antioxidant, cytotoxic, antimicrobial (Mishra et al, 2012)
44.	*Casearia esculenta Roxb.*	Salicaceae	Saptarangi/ Wild coryfruit	Native to India, Nepal, Pakistan, SriLanka	Leaves, aerial parts	3-hydroxymethyl Xylitol, esculentins A & B	Hypoglycemic, anti-peroxidative (Gupta et al., 1967)
45.	*Carum carvi L.*	Apiaceae	KalaJira/ Caraway	Native to Europe and West Africa; naturalized in India.	Roots, Flower, aerial parts	Essential and volatile oil, flavonoids, proteins, carbohydrate, vitamin, trace elements	Potent anti-hyperglycemic (Johri, 2011)
46.	*Cinnamomum tamala (Buch.-Ham.)T. Nees & Nees*	Lauraceae	Tejpat/ Bayberry	Native to Indian subcontinent	Leaf	Cinnamaldehyde, cinnamate, cinnamic acid, essential oil (trans-cinnamaldehyde, cinnamyl acetate, eugenol, L-borneol, caryophyllene oxide, b-caryophyllene, L-bornyl acetate, E-	Antidiabetic, antioxidant, anti-inflammatory, anticancer, antimicrobial (Tripathy et al., 1979; Udupa et al., 1980)

						nerolidol, terpinolene	
47.	*Commelina communis L.*	Commeli naceae	Asiatic dayflower/ Blue day flower	Native to east and south east Asia	Leaf	n-triacontanol, p-hydroxycinna mic acid, Daucosteril, D-mannitol	Antidiabetic, Depurative, diuretic, febrifuge (Kumar A.S. et al., 2011)
48.	*Croton cajucara Benth.*	Euphorbia ceae	Cajucara	Native to Brazil, Africa	Bark, leaf	Flavonoids, coumarins, alkaloids	Anti-hyperglycemic, antioxidant (Subramoniam, 2016)
49.	*Curcuma longa L.*	Zingibera ceae	Haldi/Halud/ Turmeric	Native to South and S.E. Asia, mostly Vietnam, China, India	Rhizome	Curcuminoids (Curcumin, Demethoxy-curcumin, bis-demethoxycur cumin)	Hypoglycemic/ Plays a role in PPAR-gamma activation (Akram et al., 2010)
50.	*Cynodon dactylon (L.)Pers.*	Poaceae	Doob/Durba/Ber muda grass	Native to North America; found wild in India	Whole plant, root	B-sitosterol, β-carotene, vitamin-C, palmitic acid, triterpenoids, arundoin, friedelin, selenium, ergonovine, ergonovinine, ferulic, syringic, p-coumaric, vanilic, p-hydroxy-benzoic, 0-hydroxy phenyl acetic acid, cyanogenic hyperoside	Anti-hyperglycemic (Ashokkumar et al., 2013)
51.	*Cassia auriculata L.*	Fabaceae	Tarwar/ Tanner's Cassia	Common in Asiatic countries	Bark, leaf, flower, fruit, seed	Thymine, glycerine, 1-butanol, 3-methyl formate, phytol, benzenamine, fatty acid ester, fatty acid amide, diterpene alcohol, tannin, flavonoids, saponin,	Anti-hyperglycemic, antioxidant, astringent, anti-conjunctivitis (Joy et al., 2012)

						stearic acid etc	
52.	*Catharanthus roseus L.*	Apocynaceae	Sadabahar/ Periwinkle	Native to Indian ocean islands of Madagascar; naturalized in India	Leaf, flower	Linolenic acid ethyl ester, stearic acid, phytol, hexadecanoic acid, limonene, linoleic acid ethyl ester, phytol	Hypoglycemic, anticancerous, antimicrobial, antioxidant (Sandeep et al., 2014)
53.	*Ceiba pentandra (L.) Gaertn.*	Bombaceae	Safed semal/ Kapok/ White silk-cotton tree	Originated in Central, Northern and Western-South America, Western tropical Africa; cultivated in India	Leaf, stem,bark, root, seed, whole plant	Tannin, flavonoids, glycosides	Antidiabetic, hypolipidaemic, hepato-protective, anti-bronchitis, anti-diarrhoea, anthelmintic, anti-inflammatory(Paramesha et al., 2014)
54.	*Centratherum anthelminticum (L.) Gamble*	Asteraceae	Shahi jeera/ Kaligiri/ Caraway	Widely distributed in India	Seed	δ-7-avenasterol, vernasterol, demanolide, centratherin, germacranolide, abscisic acid	Antidiabetic, antioxidant, antimicrobial, astringent, larvicidal, antipyretic (Paydar et al., 2013)
55.	*Citrullus Colocynthis (L.)Schrad.*	Cucurbitaceae	Indryan/ Indravena/ Bitter cucumber	Native to dryregions of North America; common throughout Africa, India	Dried roots, fruits	Alkaloids, ascorbic acid, flavonoids, leucine, lysine, phenolic acid, riboflavin, saponin, thiamine	Antidiabetic, anthelmintic, antipyretic, cathartic, purgative (Sci et al., 2014)
56.	*Cryptostegia grandiflora Roxb.*	Asclepiadaceae	Rubber ki bel/ Rubbervine	Native to India	Aerial parts, leaf	Oliandregenin, gitoxigenin, hyperoside, astragalin, quercetin, kaemferol, b-amyrin, lupeol, lanosterol, β-sitosterol, stigmasterol, campesterol, ursolic acid	Hypoglycemic, anti-inflammatory, antibacterial, coagulant (Aiman, 1970)
57.	*Coccinia grandis (L.)Voigt*	Cucurbitaceae	Telakucha/ Kunduru/ Bimba Ivy gouard	Native to Africa to Asia; India, China, Philippine	Root, stem, leaf, fruit	Triterpenoid, saponin, coccinioside, flavonoid, glycoside,	Antidiabetic, hypoglycemic, antimalarial, hepato-protective (Pekamwar et al.,2013; Ramachandran

						lupeol, β-amyrin, β-sitosterol, stigmast-7-en-3-one, taraxerone, taraxerol, β-carotene, lycopene, cryptoxanthin, hepatocosan, cephalandrol, tritriacontane, aspartic acid, glutamic acid, asparagine, tyrosine, histidine etc	et al., 2014)
58.	*Coccinia indica Wight & Arn.*	Cucurbitaceae	Kundru/ Bimbi/ Tundika	Native to Southern Asia, West Indies; wild in India	Aerial parts	Resin, alkaloids, starch, glucose, gum, fatty acid, carbonic acid, minerals	Hypoglycemic (Kishore et al., 2013)
59.	*Cocculus hirsutus (L.) W. Theob.*	Menispermaceae	Farid buti/ Jalajamani/Humera/Ink berry	Tropical Africa,, India, Nepal	Root, stem, leaf	D-trilobine, DL-coclaurine, triobin, isotrilobine, coclurine, mangnoflorine, hirsudol, cohirsine, cohirsinine, hirsutine, shaheenine, jamatinine, haiderine	Anti diabetic, anti-inflammatory, diuretic, laxative (Tharun Kumar et al., 2012)
60.	*Combretum micranthum G.Don*	Combretaceae	Kinkeliba/ Gugumi	Native to western Africa	Stem bark, Leaf, root	Alkaloids, saponins, glycosides, resins, flavonoids, tannins, steroids, triterpenes	Anti hyperglycemic, antibacterial (Chika and Bello, 2010)
61.	*Datura metel L.*	Solanaceae	Dhattura/ evil's trumpet	Native to America; naturalized throughout tropical countries	Leaf, flowers, seed	Tropane alkaloids (hyosciamine, hyoscine, littorine, acetoxytropine, valtropine, fastusine,	Hypoglycemic, antifungal, antibacterial, anti-spasmodic, lowering blood pressure (Murthy K.B. et al., 2004.)

						fastusinine), a no. of withanolides, tigloyl ester of tropine and pseudotropine, β-sitosterol, triterpene, daturanolone, daturadiol, fastusic acid, calystegines, 3-α, 6-β ditigloxytropane, tigloidine, apohyoscine, hyoscine, norhyoscine, meteloidine, hyosciamine, cuscohygrine, tropine	
62.	*Datura quercifolia Kunth*	Solanaceae	Oak-leaf Datura/Chinese thorn apple	Mexico, South-western United States, India	Leaf, seed, flower	Hyosciamine, atropine, hyoscine, meteloidine, scopolamine	Extract used to treat Diabetes, anti-asthmatic, anti-cholinergic, antimicrobial, anti-cancer, anti-inflammatory (Raman et al., 2012)
63.	*Dioscorea batatas Decne.*	Dioscoreaceae	Shora alu/ Chinese yam	Asia, South America, West Africa	Tuber	Mucin, Dioscin, Dioscorin, Allantoin, Choline, Polyphenols, Diosgenins, vitamins	Antioxidative, hypoglycemic, antimicrobial, hypo-cholesterolemic (Subramoniam, 2016)
64.	*Dioscorea dumetorum (Kunth) Pax*	Dioscoreaceae	Bitter yam	Wild throughout tropical Africa, cultivated in West Africa, especially in Nigeria.	Tuber	Dioscoretine	Hypoglycemic, hyper-rlipidaemic, hyper-cholesterolemic, hyper-ketonemic (Subramoniam, 2016)
65.	*Dioscorea japonica Thunb.*	Dioscoreaceae	Wild yam	Native to Japan, China, Korea, India (Assam)	Tuber, roots, aerial parts	Diosgenin, sesquiterpenoids, stilbenes, steroids, amenes, amylase, saponins	Antidiabetic, spermatorrhoea, contraceptive, diarrhea (Subramoniam, 2016)
66.	*Eleutherococcus*	Araliaceae	Siberian gingseng	Native toNorth-	Root	Ciwujianoside A-E,	Hypoglycemic, adaptogen, anti-stress,

	senticosus (Rupr. ex Maxim.) Maxim.			eastern Asia		eleutheroside-B, friedelin, isofraxidin	immunity boosting effect (Arouca and Grassi-Kassisse, 2013)
67.	*Enicostema littorale Blume*	Gentianaceae	Nagajibha/ Chota chirayata/ White head	South America, Africa, Asia	Root, leaf	Betulin, enicoflavin, gentiocrucine, apigenin, genkwanin, isovitexin, swertisin, saponarin, 5-o glucosylisoswertisin, catechin, saponin, steroids, sapogenin, triterpenoids, flavonoids, xanthones, verticilliside, phenolic acids, amino acids	Antidiabetic, antimicrobial, antioxidant, antiulcer, anti-inflammatory, hypolipidaemic, hepato-protective (Vijayvargia et al., 2000)
68.	*Ephedra sinica Stapf*	Ephedraceae	Mandara/ Indian Coral Tree/Crapa jasmine	Native to China and temperate Asia	Young stem, branches	Ephedrine, pseudo-ephedrine	Antiviral, anti-inflammatory, antidiabetic (Chauhan et al., 2010)
69.	*Ephedra distachya L.*	Ephedraceae	Seagrape	Southern and central Europe, parts of Central and western Asia from Portugal to Kazakhstan, India	Whole plant	Ephedran C	Anti-hyperglycemic (Patel et al.,2012)
70.	*Eragrostis bipinnata (L.) K. Schum.*	Poaceae	Kush/Daabh	Native to India, Nepal, Sri Lanka, Africa	Aerial parts	Camphene, Isobornyl acetate, Tricyclene, Caryophyllene diepoxide, β-eudesmol, Eseroline, Calarene, Xanthene, Flavonoids	Anti-diabetic, hepato-protective (Raman et al., 2012)
71.	*Eriobotrya japonica Lindl.*	Rosaceae	Lokat/ Loquat	Native to Japan and China; naturalized in India	Leaf	Polysaccharides, Triterpene, Tormentic acid, euscaphic acid, ursolic acid	Antidiabetic (Tanaka et al., 2008)

72.	*Eucalyptus globulus Labill.*	Myrtaceae	Sugandha patra/ Tailapatra/ Tasmanian Blue Gumtree	Native to Tasmania and South eastern Australia; in India, planted in Tamil Nadu, Andhra Pradesh, Goa, Daman, Diu, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh, Karnataka	Leaf	1,8-Cineole (Eucalyptol), α-Pinene, δ-Limonene, α-Terpenol, ρ-Cymene, Terpinene-4-ol, Cuminal aldehyde, Globulol	Anti-hyperglycemic, anti-inflammatory (Patil and Nitave, 2014)
73.	*Eupatorium odoratum L.*	Asteraceae	Banmara/Tivragandha/ Devil-weed	Native to Europe, Asia, Africa; chiefly found in Mexico, West Indies, tropical South America; naturalized in India	Aerial parts	A-pinene, β-pinene, geijerene, pregeijerine, germacrene	Antidiabetic, antibacterial, antioxidant, antipyretic, anti-spasmodic, anti-inflammatory (Chakraborty et al., 2011)
74.	*Euphorbia prostrata Aiton*	Euphorbiaceae	Prostrate spurge	Native of West Indies; grows wild in South India	Whole plant, leaves	Glucoside, galactoside, β-sitosterol, compesterol, stigmasterol, apigenin, luteolin, apigenin-7-glucoside, gallicacid, ellagic acid, tannin	Antidiabetic, analgesic, hypolipidaemic, anti-inflammatory, anti-asthmatic, anti-hemorrhoidal (Shamim et al., 2014)
75.	*Ferula assa-foetida L.*	Apiaceae	Heeng/ Hingu	Native to Mediterranean region to Central Asia; in India found to growin Kashmir, some parts of Punjab	Tap root or rhizome	Oleo-gum resin (ester of ferulic acid, complex carbohydrate, (R)-2-butyl-1-propenyl disulphide, 2-butyl-3-methylthioallyl, hendecyl sulpphonyl acetic acid etc	Anti-hyperglycemic, anti-hyperlipidaemic (Mahendra and Bisht, 2012)
76.	*Ficus*	Moraceae	Bargad/	Native to	Bark,	Leucopelargon	Antidiabetic (Kumar et

	benghalensis L.		Indian banyan tree	Indian subcontinent	aerial roots, fruits	in	al., 1989; Gupta et al., 2008)
77.	*Ficus hispida L.*	Moraceae	Gobla/ Kagsha/ Devil fig	Almost all parts of Asia, China, Australia; India	Leaves, bark, roots	Lupeol acetate, β-amyrine acetate, β-sitosterol, 10, ketotetracosyl arachidate, 6-O-methyltylophorinidine, 2-demethoxytylophorine, hispidine, oleanolic acid, Bergaptine, β-amyrine	Antidiabetic, anti-convulsant, anti-hepatitis, anticancer (Salvi et al., 2013)
78.	*Fumaria parviflora Lam.*	Fumeriaceae	Pitta papada/ Parpataka	Iran, Pakistan, Turkey; distributed throughout plains of India	Whole plant	Sanguinarine	Antidiabetic, hepato-protective, antifungal, anti-inflammatory, analgesic, muscle relactant (Gupta et al., 2012)
79.	*Galega officinalis L.*	Fabaceae	Goat's rue	Native to Middle East; naturalized in Europe, Western Asia and Western Pakistan.	Leaf, flowering twigs	Alkaloid-Galegine	Antidiabetic (Modak et al., 2007)
80.	*Garcinia kola Heckel*	Clusiaceae	Punarpuli/ Kotappul/ bitter kola	Native to Africa	Fruit	Biflavonoids xanthones, benzophenones, flavanones, dimethylamine, methylamine, ethylamine, iso-pentylamine, kola-flavanone	Antidiabetic, anti-hepatotoxic, antiparasitic, antimicrobial, anti-inflammatory (Smith et al., 2012)
81.	*Glycine max (L.) Merril*	Fabaceae	Bhat/ Bhatwar/ Soyabean	Native to China	Seed	Protein, soybean oil, carbohydrate, minerals, vitamins	Antidiabetic, anticancer, prevention of osteoporosis, cholesterol lowering effect (Thomas et al., 2012)
82.	*Gymnema sylvestre (Retz.) R.Br.*	Apocynaceae	Gudmar/ Periploca of the wood	Native to tropical forests of Southern and Central India; Sri Lanka	Leaf	Gymnemic acid, gymnemasaponingymnemasides	Antidiabetic,anti-hyperglycemic, anti-inflammatory (Kar et al., 2003; Gholap et al., 2003, 2004)
83.	*Hedyotis*	Rubiaceae	Khet papra/	Native to	Whole	6-α-hydroxy	Inhibit α-glucosidase

	biflora (L.) Lam.		Daman papra	tropical and south-tropical Asia, Sri Lanka;frequently found all over India	plant	geniposide, Oleanolic acid, ϒ-sitosterol, Biflorine, Asperuloside, Scandoside methyl ester, Rutin, Asperulosidic acid, Geniposide	activity, antibacterial, hepato-protectant, anticancer (Shivaprakasam et al., 2014; Raman et al., 2012)
84.	*Hoodia currorii Decne.*	Apocynaceae	Cactus art	Originated in South Africa(Namibia, Angola); cultivated in India	Whole plant	Aglycones, Hoodigogenin A, Calogenin, Hoodistanal, Dehydro-hoodistanal	Antidiabetic (Sounyanath, 2006)
85.	*Humulus lupulus L.*	Cannabaceae	Hops/ Common hops	Native to temperate regions to Northern Hemisphere; Western Himalaya	Flowers	Asparagin, polyphenolic tannins, Isohumulones	Antidiabetic, anti-inflammatory, antiviral, reduce cardiovascular problems, digestive (George et al., 2015)
86.	*Helicteres isora L.*	Sterculiaceae	Maror Phali/East-IndianScrew tree	Native to Tropical South-east Asia; grow throughout India	Root, bark	B-sitosterol, Cucurbitacin-b, Isocucurbitacin-b, Betulic acid, Oleanolic acid, Daucosterol, Isorin, Gallic acid, 10-methyl, 4-isopropynyl dodecahydro-ethano-phenanthrene	Antidiabetic, anticancer, antibacterial, antioxidant (Suthar et al., 2009; Kumar et al., 2009)
87.	*Hibiscus-rosa-sinensis L.*	Malvaceae	Gurhal/ China rose	Native to tropical Asia; in India as ornamental plant	Leaf, flower	B-sitosterol, Stigmasterol, Taraxeryl acetate, Cyanidin diglucoside , Thiamine, Riboflavine, Kaempferol-3-xylosylglucoside	Hypoglycemic, hypolipidaemic (Sachdewa et al., 2001)
88.	*Hypoxis hemerocallid*	Hypoxidaceae	African potato/ Miracle plant	Native to Southern	Tuberous part	Sterols, Sterolins,	Antidiabetic, anticancer, antiarthritis, antioxidant,

	ea Fisch., C.A. May & Ave-Lall.			Africa		Norlignan, Daucosterol, Rooperol	anti-inflammatory (Ojewole, 2006)
89.	*Ibervillea sonorae (S. Watson) Greene*	Cucurbitaceae	Big root/ Cowpie plant	Originated in North America; Cultivated in India	Root	Monoglycerides, 1-monopalmitin, 1-monomargarate, 1-monostearin, Glyceryl 1-mono-nonadecylate, Glyceryl 1-mono-pentacosanoate, Glyceryl 1-mono-hexacosanoate, (Lauric, Myristic, Pentadecanoic, Palmitic, Stearic)acid	Antidiabetic, anti-obesity (Zapata-Bustose et al., 2014)
90.	*Ichnocarpus frutescens (L.) W.T. Aiton*	Apocynaceae	Kalidudhi/ Black creeper	Native to China, India, Southeast Asia and northern Australia; grows throughout India	Root	β-sitosterols, 2-hydroxy,4-methoxy-benzaldehyde	Antidiabetic, antioxidant, antiobesity, atrophy, bleeding gums, antidysenteric, antitumour (Bari ketal., 2008)
91.	*Indigofera arrecta Benth. ex Harv.*	Fabaceae	Nil/Bengal Indigo	Native to East and Southern Africa and Asia (India, Indonesia, Vietnam, Laos, Philippines)	Root, leaf, fruit, seed	Protein, crude fibre, minerals, tannin, saponin, flavonoids, terpenoids, glycosides, alkaloids, steroids, phenols	Antidiabetic, antibacterial, emetic, purgative, heart burn, stomachache, amoebiosis, colic pain, jaundice, Abortifacients (Sittie and Nyarko, 1998)
92.	*Inula racemosa Hook.f.*	Asteraceae	Pohakarmul/Pushkar-moola/ Indian Elecampane	Endangered herb, found in temperate to alpine regions of Kashmir; Himachal Pradesh	Root	Alantolactones, Isoalantolactones	Antidiabetic, expectorant, antifungal (Sam et al., 2015)
93.	*Ipomoea aquatica*	Convolvulaceae	Swamp cabbage/	Originated in China; widely	Leaf	Carotenoids, chlorophylls,	Antidiabetic, antioxidant (Hamid et al., 2011)

	Forssk.		Kalambi/ Water morning glory	distributed all around the world, especially India, Malaysia, Indonesia, China, some parts of USA		Aspartic acid, Glycine, Alanine, Leucine	
94.	*Ipomoea batatas (L.) Lam.*	Convolvulaceae	Shakrkand/ Sweet potato	Originated in Central America; Widely cultivated in tropical, subtropical and temperate regions of world; widely cultivated in India	Tuber	Acylated anthocyanin, caffeic acid, chlorogenic, dicaffeoylquinic, tricaffeoylquinic, α-tocopherol,	Antidiabetic, anticancer, anti-inflammatory (Mohanraj and Sivasankar, 2014)
95.	*Juglans mandshurica Maxim.*	Juglandaceae	Blacknut/ Manchurian walnut	Native to East Asia; China, Bhutan; India:Sikkim	Leaf	Diarylheptanoids, tetralones, naphthoquinones, phenyl propanoids, phenol	Hypoglycaemic, anticancer (Dzhafarova et al., 2009)
96.	*Kalanchoe crenata (Andrews) Haw.*	Crassulaceae	Bakalpatta/ Patkavari	Native to East Africa, India, Thailand	Leaf	Alkaloids, Triterpenes, Glycosides, Flavonoids, Cardienolides, Steroids, Bufadienolides, Bryotoxin A,B,C, Digoxin, Digitoxin	Antidiabetic, antioxidant, anti-inflammatory, antimicrobial (Rajendra et al., 2014)
97.	*Kalopanax pictus (Thunb.) Nokai*	Araliaceae	Indian bean	Native to East Asia; India	Stem bark	Kalopanax-saponin A, B, C, D, E, F, G, H, I, J, Sapindoside, Septemloside III	Antidiabetic, anti-inflammatory, anti-rheumatoidal, hepato-protective, anticancer (Park et al., 1998; Huyn and Kim, 2009)
98.	*Lagerstroemia speciosa (L.) Pers.*	Lythraceae	Jarul/Pride of India	Native to tropical Asia, especially Indian subcontinent (India and Sri Lanka), Cambodia,	Leaf	Corosolic acid, ellagitannin	Hypoglycaemic, antioxidant, antitussive, anti-inflammatory, antimicrobial (Klein et al., 2007)

				Myanmar, Thailand, Vietnam, Indonesia, Malaysia, Philippines			
99.	*Lantana camara L.*	Verbenaceae	Chotra/ Lantana	Native to Central and South America; widely occurring invasive weed in India	Fruit	A-Copaene, Germacrene D, B, α-Cubebene, β-Elemene, α-Guaiene, α-Humuline, Aromadendrine, β-Selinene, α-Selinene, Caryophyllene oxide, Nerolidol, Spathulenol, δ-Cadinene	Hypoglycemic, hypolipidaemic, antioxidant (Kalita et al., 2012)
100.	*Laportia ovalifolia (Schum. & Thonn.) Chew*	Urticaceae	Koranko	Widespread in tropical Africa; Pakistan, India	Leaf	Protein, starch, calcium oxalate crystals, mucilage, tannins, saponin, flavonoids, phlobatannin, cardiac glycosides,	Antidiabetic, anti-androgenic, anticancer, anti-asthmatic (Subramoniam, 2016)
101.	*Larrea tridentata (DC.) Coville*	Zygophyllaceae	Chaparral/ Greasewood	Origin in Southern California, Mexico; Myanmar, India	Leaf	Lignans, apigenin, methyl ester, quercetin, dimethoxyl morin, amino acids, dextrin, glucose, sucrose, vitamin C, carotenoids	Antidiabetic, anticancer, antirheumatic, antiarthritis (Saravanamuttu and Sudarsanam, 2012)
102.	*Lepidium ruderale L.*	Brassicaceae	Narrow-leaved peppergrass/ Peppercress	Native to Europe to Mediterranean region, including South west Asia; in India grows in eastern Ghats and Western Ghats regions,	Leaf, stem, flower	Protein, carbohydrate, minerals, glucosinolate, benzyl glucosinolate, benzyl thiocyanate, benzyl isothiocyanate, phenyl	Antidiabetic, detoxifying, anti-rheumatic, used to treat Vit C deficiency, anti-asthmatic, antitussive, cardiotonic, diuretic (Chauhan et al., 2009)

				Kashmir Himalaya		acetonitrile, benzaldehyde, benzyl alcohol, benzyl mercaptan, 3'-phospho-adenosine 5-phosphosulfate, desulfo-glucosinolate sulfotransferase, imidazole transferase	
103.	*Lepidium sativum L.*	Brassicaceae	Halim/Asalu/ Garden Cress	Native to Egypt and Middle East	Seed	Iron, Calcium, folic acid, vitamin A, C, protein, glutamic acid, leucin, methionin, linolenic acid, glucosinolate, benzyl-isoticocyante, benzyl cyanide, glucotropoeoline, 4-methoxy-glucobrassicin, sinapine, sinapic acid, calmodulin, ester of caffeic, ferulic, quinic, p-coumaric acid	Antidiabetic, effective in respiratory disorder, anti-inflammatory, antimicrobial, laxative, chemoprotective (Mishra et al., 2017)
104.	*Leucaena leucocephala (Lam.) de Wit*	Fabaceae	Safed babool/Wild Tamarind	Native to southern Mexico and northern central America, escaped as weed in tropical and warm temperate countries of world; in India cultivated	Fruit, Seed	Lipids, crude proteins, carbohydrates, tannin, oxalic acid, mimosine	Antidiabetic, antioxidant, anticancer, stomachich, abortifacient (Choetivannakul et al., 2016)
105.	*Liriope spicata (Thunb.)*	Liliaceae	Creeping lilyturf	Native to China, Vietnam,	Tuberous root	Polysaccharides (LSP1, LSP2),	Hypoglycaemic, Hypolipidaemic, anti-inflammatory, anti-

	Lour.			Malesia, Pakistan; India		saponin, steroidal saponin, spicatoside A,	asthma, anti-osteoclastogenesis, anticancer (Arumugam et al., 2013)
106.	*Lithospermum erythrorhizon Siebold & Zucc.*	Boraginaceae	Red root gromwell	Native to northern tropical Africa; in India found to grow in cold desert area	Hairy roots	Shikonin	Stimulating release of insulin in β cells of pancreas, antimicrobial, anticancer, anti-inflammatory, febrifuge, contraceptive, antitumour (Soumyanath, 2006)
107.	*Lythrum salicaria L.*	Lythraceae	Purple loosestrife/ Purple lythrum	Native to Eurasia, extend from Great Britain to Central Russia to North Africa, Japan, Korea, Southeast Asia; northern India	Stem, flower	Ellagitannin, flavonoids, anthocyanin, phenolic acid, ellagic acid, coumarin, triterpene, steroids, phalate, alkaloids	Antidiabetic, antioxidant, eye inflammation, anti-hemorrhagic, anti-sinusitis, anti-rheumatic, antidiarrheal, antimicrobial (Singab et al., 2014)
108.	*Mallotus roxburghianus Mull. Arg.*	Euphorbiaceae	Nim-puteli/ Devil's wood tree	Native to India; widely distributed in Mizoram	Leaf	Bergenin, β-sitosterol-β-D-glucoside, 4-hydroxybenzoic acid, β-sitosterol, Stigmasterol, Betulinic acid, 3-(1-C-β-D-glucopyranosyl)2,6-dihydroxy 5-methoxy benzoic acid	Anti-diabetic, antioxidant (Lalhlenmawia et al., 2007)
109.	*Mangifera indica L.*	Anacardiaceae	Aam/ Mango	Native to tropical Asia; cultivated in Indian subcontinent over 4000 years	Fruit, seed, stem, bark, root, pulp, bark	Mangiferin, Mangin, Piuri-yellow dye, Benzoic acid, Citric acid, Tannin, Euxanthin acid, Oleostearin, Mangiferic acid, Mangiferol, Mangostine	Anti-diabetic, anti-oxidant, anti-viral, cardiotonic, anti-inflammatory, hypotensive, anti-allergic, anti-pyretic, anti-tumour, anti-spasmodic (Bhowmik et al., 2009)
110.	*Medicago sativa L.*	Fabaceae	Alfalfa/ Lucerne	Originated near east and Central Asia,	Aerial	(Lauric, Malic, Maleic, Malonyl,	Antidiabetic,antilipidaemic (Bora and Sharma, 2011)

				now naturalized almost all over the world; cultivated in India		Myristic, Oxalic, Palmitic, Quuinic)acids, Stachydrine, homostachydrine, amino acids	
111.	*Momordica charantia L.*	Cucurbitaceae	Karela/ Bitter gourd	Native to tropical and subtropical Africa & Asia; ubiquitous throughout India except North-east Region	Fruit	Momocharin (Charantin), Momordicin I & IV, Aglycone, Karavilagenin	Antidiabetic, hypoglycaemic (Lolitkar et al., 1966; Ng et al., 1986a &b)
112.	*Momordica cochinchinensis (Lour.) Spreng.*	Cucurbitaceae	Kakur/ Chinese cucumber	Native to India	Aerial parts	Cucurbitane triterpenoids, Saponin glycoside, MAP 30 protein, Phytosterol, Phenolic acid	Antidiabetic, antioxidant, anticancer, antimicrobial (Phani et al., 2013)
113.	*Morinda lucida Benth.*	Rubiaceae	Noni/ Brimstone tree	Native to Africa, Ethiopia; naturalized in India	Stem bark, root	Anthraquinones, anthraquinols, 1-methylether-alizarin, rubiadin, lucidin, soranjiol, dammacanthal, nor-dammacanthal, morindin, munjistin, purpuroxanthin, digitolutein, dammacanthal	Anti-diabetic, anti-oxidant, antimalarial, anticancer, hepato-protective, cytotoxic (Olajide et al., 1999)
114.	*Morus alba L.*	Moraceae	Shahatut/ White mulberry	Asia, Africa, Europe, South and North America; in India, widely grow in North-western zone covering sub-himalayan belt	Leaf, fruit, Root	Rutin, isoquercitrin, astragalin, quercetin-3-(-6-malonyl)	Anti-diabetic, anti-oxidant, anti-microbial, anthelmintic, anti-cancer (Wang et al., 2013)
115.	*Mucuna pruriens (L.) DC.*	Fabaceae	Konch beej/Velvet bean/	Native to Southern Asia and Malaysia;	Seed	L-Dopa (Dopamine)	Antidiabetic, pain healer, antibacterial, anti-infertility, scorpion-

			Cowhage	widely distributed in tropics			bite, snake bite, toothache, anti-inflammatory, increase libido, reduces high blood pressure (Yadav et al., 2017)
116.	*Murraya koenigii L.*	Rutaceae	Curry patta	Native to India, Sri Lanka	Leaf	Koenimbine, o-methyl murrayamine, o-methyl mahanine, isomahanine, bismahanine, bispyrayafoline, glycozoline, mukonosine, koenigine-quinone A & B, murrayanol, murrayanine, murrayazolidine, girinimbine, koenimbine etc	Hypoglycemic/ increases glycogenesis/decreased gluconeogenesis and glycogenolysis (Yadav et al., 2002)
117.	*Musa paradisiaca L.*	Musaceae	Kela/Banana	Origin in India and Malaysia; New Guinea, America, Australia, tropical Africa	Fruit	Carbohydrates, amino acid, sugar, starch, cellulose, hemicellulose, arginine, aspartic acid, glutamic acid, methionine, tryptophan	Anti-diabetic, anti-dysentery, anti-anxiety, anti-ulcer (Lakshmi et al., 2014)
118.	*Nelumbo nucifera Gaertn.*	Nelumbo naceae	Kamal/ Padma/ Lotus	Australia, China, Iran, Japan; national flower of India	Rhizome	Nuciferine, roemerine, anonaine, pronuceferine, N-nornuciferine, armepavine, N-methyl-coclaurine, dehydroemerine, dehy-dronuciferine, negferine, lirinidine etc	Hypoglycemic, anti-obesity, anti-inflammatory (Rakesh et al., 2011)
119.	*Nepeta ciliaris Benth.*	Lamiacea e	Billilotan/ North Indian catmint	Native to Indo-Pakistan subcontinent	Whole plant	Nepehinal, flavonoids, sterols, triterpenoids, alkaloids, phenolics	Antidiabetic, insect-repellant, carminative, stimulant, antispasmodic, aphrodisiac, antipyretic, hypotensive,

							antiplasmodial, hypotensive, hypocholesteromic (Raman et al., 2012)
120.	*Nigella sativa L.*	Ranunculaceae	Kalonji/ Black-cumin	Native to Southern Euroope, northern Africa, Southern Asia; cultivated all over India	Seeds, leaves	Nigellone, nigellicine, nigellimine, nigellimine-N-oxide, avenasterol-5-ene, avenasterol-7-ene, campesterol, cholesterol, citrostadienol, gramisterol, lophenol, obtusifoliol, sitosterol, cymene, melanthin etc	Decreases oxidative stress and preserves pancreatic beta cells integrity (Mathur etal., 2011)
121.	*Nymphaea stellata Willd.*	Nymphaeaceae	Neelkamal/ Star lotus/blue lotus	Native to Indian subcontinent	Whole plants	Sterols, alkaloids, saponins, tannins, flavonoids, Nymphayol	Antidiabetic, anti-inflammatory, aphrodisiac, urinary disorder, effective in menorrhagia, menstruation problem, blenorrhagia, liver disorder (Parimala and Shoba, 2014)
122.	*Ocimum gratissimum L.*	Lamiaceae	Tulsi/Holy basil	Native to Africa, Madagaskar, southern Asia; exotic in India, Thailand, Vietnam	Leaf	Eugenol, methyl eugenol, cis-ocimene, trans-ocimene, pinene, camphor, germacrene-D, farnesene, l-bisabolene, thymol, ρ-cymene, ϒ-terpene, 1,8 cineole, linalool, citral, cinnamate, limonene	Antidiabetic, antimicrobial, antifungal, anti-inflammatory, analgesic, anti-mutagenic, anti-hypertensive, cardiovascular, immune-stimulatory, antioxidant, hepato-protective, anticonvulsant (Raja et al., 2016)
123.	*Ocimum sanctum L.*	Lamiaceae	Tulasi/ Holy basil	Native to Indian subcontinent and widespread as a cultivated	Whole plant	Eugenol, euginal, urosolic acid, carvacrol, linalool, limatrol,	Anti-diabetic, anti-hypertensive, anti-inflammatory, chemo-preventive, anti-oxidant, anti-cataract, anti-microbial, anti-

				plant throughout the Southeast Asian tropics		caryophyllene, methyl carvicol, sitosterol, saponin, flavonoids, triterpenoids, tannins, apigenin, rosmarinic acid, cirsimaritin, isothymusin, isothymonin, vicenin	carcinogenic, antiulcer, anticancer, antifertility, larvicidal (Mukherjee et al., 2006; Chattopadhyay, 1993)
124.	*Olea europaea L.*	Oleaceae	Jalapai	Native to South Africa through Africa, Middle East, Pakistan, India to China	Leaf	Phenolic acid, phytosterol, tocopherol, carotenoids, chlorophyll, squaline	Antidiabetic, antioxidant, anti-inflammatory, anti-carcinogenic, anti-microbial, anti-hypertensive, laxative, antiplatelet (Eidi et al., 2009)
125.	*Oryza sativa L.*	Poaceae	Dhan/ Chaval/ Rice	Native to tropics and subtropics of South-east Asia	Roots, external seed coat, seed	Glycans-Oryzarans A,B,C, D	Anti-diabetic, lowering high blood pressure (Boue et al., 2016)
126.	*Panax ginseng C.A. Mey*	Araliaceae	Indian ginseng	Native to Asia	Root, leaf, berry	Ginsenoside, p-polysaccharides, triterpenoids, flavonoids, volatile oil, polyacetylenic alcohol	Anti-hyperglycemic, anti-fatigue, anti-aging, anti-obesity (Khayat et al., 2011; Radad et al., 2004)
127.	*Panax quinquefolius L.*	Araliaceae	American ginseng	Native to North America; cultivatedin India	Dried roots	Ginsenoside	Antidiabetic, analgesic, anticonvulsive, expectorant, digestive tonic, gynecological disorder (Sen et al., 2013)
128.	*Phyllanthus fraternus G.L. Webster*	Euphorbiaceae	Bhui-amla/Gulf-leaf flower	Origin in Pakistan and western India; grow throughout tropical and subtropical countries	Whole plant	Phyllanthine, hypophyllanthine, geraniin, quercetin, astralgin, quercetrin, isoquercitrin, rutin, phyllanthusin	Antidiabetic, effective in jaundice, gonorrhea, skin ulcers, sores, swellings and itchiness, dropsy, diarrhea, dysentery, urino-genital disorder etc (Romila et al., 2010)

						D, amariin, amarulone, amarinic acid, nyrphyllin, phyllnirurin	
129.	*Picrorhiza kurrooa Royle*	Scrophulariaceae	Kutki/ katuka	China, Pakistan, India, Bhutan, Nepal; north-western Himalayan region from Kashmir to Sikkim	Rhizome	Picroside I&II, iridoids, cucurbitacins, acetophenones, pikuroside, 6-feruloylcatalpol, veronicoside, kutkoside, picroside III, veronicoside, minecoside, picein, androsin, kutkin, apocyanin, drosin,	Antidiabetic, antioxidant, antimicrobial, antibacterial, antimutagenic, anticancer, cardio-protective, hepato-protective, anti-inflammatory, anti-ulcer (Chauhan et al., 2008)
130.	*Pongamia pinnata (L.) Pierre*	Fabaceae	Karanja/ Indian beech	Native to western Ghats of Indian subcontinent, Myanmar; frequently grow along river bank and coastal area	Flowers, leaf	Furanoflavones, furanoflavonols, chromeno-flavones, furanochalcones, pyranochalcones, pongapinol A-D, coumestan, pongacoumestan, pongamones A-E, karanjin,	Antidiabetic, antimicrobial, antilipidaemic, antiviral, ntifungal, antibacterial, anti-inflammatory (Sikarwar and Patil, 2010)
131.	*Prunella vulgaris L.*	Lamiaceae	Austa-khandus/ Common Self-heal	Native to North America; now naturalized throughout the world	Leaf (Dried)	Betulinic acid, camphor, delphinidin, hyperoside, manganese, oleanolic acid, rosmarinic acid, rutin, ursolic acid, tannin	Antidiabetic, alterative, antibacterial, antipyretic, antiseptic, antispasmodic, astringent, carminative, hypotensive, vermifuge (Patel et al., 2012)
132.	*Prunus persica (L.) Batsch*	Rosaceae	Aadoo/ Peach	Native to North-west China; cultivated in subtropical belt of Uttar Pradesh,	Aerial parts	Water, sacarose, glucose, fructose, protein, fat, cellulose, pectin,	Antidiabetic, antiobesity, digestive disorder, kidney disorder, heart disease (Chauhan et al., 2010)

				Kashmir, Himachal Pradesh and Punjab		hemicellulose, potassium, Vitamin B, C, β-carotene, α-carotene, β-cryptoxanthene, zeaxanthine, lycopene, xanthophyll	
133.	*Psacalium decompositum (A. Gray) H. Rob. & Brettell*	Asteraceae	Desert Indianbush/ Indian plantain	Native to Mexico;	Root, Rhizome	Cacalol, 3-hydroxy-cacalolide, epi-3-hydroxy-cacalolide, furano-eremoplilanes, cacalene, maturin, maturinone, maturone	Antidiabetic, pain healer, anti-rheumatic, anti-inflammatory (Campos et al., 2009)
134.	*Psacalium peltatum Cass.*	Asteraceae	-	Native to United States, China, Southeast Asia, Australia, India: Odisha	Root	Maturin acetate, cacalol, cacalol acetate, dehydrocacalol, maturinin, cacalohastin, maturinin, dehydro-cacalohastin, adenostin B, cacalone-epi-cacalone mixture, dimaturin, adenostylide, radulifolin-F, epi radulifolin-F, hyperin, sucrose, sitosterol, stigmasterol	Antidiabetic, antioxidant, anti-inflammatory, gastro-intestinal, renal disorder (Contreras et al., 2002)
135.	*Psidium guajava L.*	Myrtaceae	Amrood/ Guava	Native to Mexico, extends throughout south America, Europe, Africa and Asia; widely grown in India, Bangladesh, Florida, West Indies	Leaf	Essential oil (α-pinene, β-pinene, limonene, menthol, terpenyl acetate, isopropyl alcohol, longicyclene, caryophyllene, β-bisabolene,	Antidiabetic, antidiarrhoeal, antioxidant, anti-allergy, anti-microbial, anti-genotoxic, anti-plasmodial, antispasmodic, cardioactive, anti-inflammatory, febrifuge, anti-rheumatic(Kumari et al., 2013)

						cineol, caryophyllene oxide, β-copanine, farnesene, humulene, selinene, cardinene, curcumene, nerolidiol, ursolic, crategolic, guayavolic acid, avicularin, guavanoic acid, guavacoumaric acid, 2α-hydroxyursolic acid, jacoumaric acid, quercetin, luteolin, kaempferol, asiatic acid, guavenoic acid	
136.	*Pterocarpus marsupium Roxb.*	Fabaceae	Vijayasar/ Indian Malabar	Native to Central, western and southern region of India	Heart-wood	Pterostilbene, epicatechin, pterosupin, marsupsin	Anti-diabetic, astringest, antidysenteric (Pandey et al., 1975; Gover et al., 2005; Gupta et al.,2008)
137.	*Punica granatum L.*	Lythraceae	Anar/ Pome-granate	Native to Middle East; widely found in Northern India	Seed	Casuarinin, kaempferol, luteolin, Quercimeritrin, quercetin-3-0-rutinoside, betulinic acid, fatty acids, triglycerides, eicosenic acid, linoleic acid, daucosterol, coniferyl-9-o-[β-D-apiofuranosyl-(1,6)]o-β-D-glucopyranoside	Anti-diabetic, anti-hyperlipidaemic (Middha et al., 2013)
138.	*Quercus infectoria Olivier*	Fagaceae	Manjakani/ Majuphal	Native to Turkey, Syria, Persia, Cyprus,	Root, gall	Allagic acid, α-glucosidase, amentoflavone	Antidiabetic, antimicrobial, antiaging, astringent, antibacterial

				Greece; quite common in Asia Minor, Europe, Africa			(Bhusan and Mandeep, 2015)
139.	*Rauvolfia serpentina (L.)Benth. ex Kurz*	Apocynaceae	Sarpa-gandha/ Indian snakeroot	Moist tropical forest of the Pacific, South America, Asia, Africa; in India, throughout	Root	Reserpine	Anti-diabetic, anti-lipidaemic, antidote to snake venom etc (Kumari et al., 2013)
140.	*Saccharum officinarum L.*	Poaceae	Ganna/Ikshu/ Sugarcane	Indigenous to tropical Asia and Southeast Asia; domesticated in India; cultivated worldwide	Stem	Sugar, water, calcium, alkaloid, vitamin	Reduce diabetes, wound healing, anticancer, antioxidant (Singh et al., 2015)
141.	*Salacia macrosperma Wight*	Celastraceae	Saptrangi/ Salacia	Warmer parts of world; Southern India, Western Ghats	Root, stem	Salaspermic acid, Salacinol, mangiferin, kotanalol	Antioxidant, antidiabetic, antiobesity, anti-hypertensive, hypolipidemic (Roopa et al., 2015)
142.	*Swertia chirayita H. Karst.*	Gentianaceae	Kirayat Chirata/ Bitter stick	Native to temperate Himalayas, from Kashmir to Bhutan, and in the Khasi Hills	Wholeplant	Sawertiamarin, mangiferin, amarogenitine, balanophonin, oleanolic acid, maslinic acid, sumaresinolic acid etc	Lowering blood sugar level, hepato-protective, anti-leprosy, antibacterial, anti-malarial, anti-inflammatory, anthelmintic, antimicrobial (Sekar et al., 1987; Kar et al.,2003)
143.	*Syzygium cumini (L.)Skeels*	Myrtaceae	Jamun/ Blackberry	Native to Indian subcontinent and adjoining regions: Bangladesh, Burma, Nepal, Pakistan, Sri Lanka, Indonesia	Seed kernel	Jambosine, jambolin, antimellin, anthocyanin, glucosides, ellagic acid, isoquercetin, kaemferol, myrecetin	Antidiabetic, astringent, anthelmintic, diuretic, stomachic, anti-bronchitis (Nadkarni, 1976; Achrekar et al., 1991; Kohli et al., 1993; Sharma et al., 2006)
144.	*Sambucus nigra L.*	Caprifoliaceae	Elderberry	Native to Europe, Asia and North Africa, naturalized in United States	Leaf, fruit	Quercetin, rutin, cyaniding-3-glucoside, cyaniding-3-sabubioside, hemagglutinin, sambunigrin, viburnic acid	Antidiabetic, anti-oxidant, photo-protective, anti-allergy, antiviral, immune-modulating (Gray et al., 2000)

145.	*Sclerocarya birrea (A. Rich.)Hochst.*	Anacardiaceae	Marula	Native to South Africa; cultivated in India	Fruit	Ascorbic acid, sesquiterpene hydrocarbon, pleic, palmitic, myristic, stearic acidglutamic acid, arginine	Antidiabetic, anti-inflammatory, analgesic, anti-parasitic, antimicrobial, anti-hypertensive (Mousinho et al., 2013)
146.	*Scoparia dulcis L.*	Scrophulariaceae	Mithi patti/Bondhanya/ Swwet broom weed	Native to Neotropics, found to grow throughout India, Brazil, America, West Indies, Myanmar	Whole plant	Scoparinol, Scoparic acid, Scopadulcic acid, Scopadulciol, Scopadulin	Antidiabetic, antioxidant (Mishra et al., 2013)
147.	*Talinum cuneifolium Willd.*	Portulaccaceae	Ceylone bachali/ Pasali	Bangladesh, Pakistan, USA; eastern and western rocky parts of India, common weed in India	Leaf powder	Flavonoids, glycosides, saponins, steroids	Antidiabetic, antihepatitic, aphrodisiac
148.	*Tamarindus indica L.*	Fabaceae	Imli/ Tamarind	Indigenous to tropical Africa; widely cultivated in Indian subcontinent	Fruit pulp	Organic acid, amino acids, pectin, protein, pyrazine, thiazole, lupanone, lupeol	Antidiabetic, hepatoprotective, hypolipidaemic, antioxidant, antifungal, anti-inflammatory, antibacterial (Tariq et al., 2013)
149.	*Tecoma stans (L.) Juss. ex Kunth*	Bignoniaceae	Piliya/Yellow bells	Throughout India	Roots, leaves, flowers	Tecomine, 5-β-Hydroxy-skitanthine, phytosterols, alkaloids, quinones, saponin, flavonoids, phenols etc	Hypoglycemic (Verma, 2016)
150.	*Terminalia bellerica (Gaertn.) Roxb.*	Combretaceae	Baheda/ Bibhitaka	Native to India, common in plains and lower hills of South east Asia	Fruits, barks, leaves	B-sitosterol, gallic acid, ellagic acid, ethyl galate, galloyl glucose, chebulaginic acid	Stimulates insulin secreation/ enhances insulin action/ inhibits protein glycation and starch digestion, antioxidant (Sabu and Kuttan, 2009)
151.	*Terminalia chebula Retz.*	Combretaceae	Harra/ Harad/ Haritaki/ Myrobalan	Tropical and subtropical Asia, Cina, Tibet; in India, Karnataka,	Fruit	Chebulin, ellagic acid, 2,4,-chebulyl-β-D-glucopyranose,	Dose-dependent glucose lowering effect/antidiabetic and renoprotective/decreases hepaticand skeletal

				Southern Maharashtra, TamilNadu, Uttar Pradesh, West Bengal		chebulinic acid, gallic acid,ethyl gallate, punicalagin, terflavin A, terchevin, luteolin, tannic acid	muscle glycogen content/increases insulin release from the pancreatic islets (Gupta, 2012)
152.	*Teucrium polium L.*	Lamiaceae	Cat thyme	Native to Western Mediterranean region	Dried aerial parts	Spathulenol, β-pinene, β-myrcene, germacrene B, D, bicycle-germacrene, linalool	Anti-diabetes, anti-hypertensive, antibacterial, anti-inflammatory, anti-convilsant (Gharaibeh et al., 1988)
153.	*Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson*	Menispermaceae	Nimgilo/ Guloncho/ Gulbel	Indigenous to tropical areas of India, Myanmar, Sri Lanka	Whole plants	Columbin, tinosporaside, jatrorhizine, palmatine, berberine, tembeterine, tinocordifolioside, phenylpropene disaccharide, choline, tinosporic acid, tinosporal, tinosporon	Antidiabetic, antispasmodic, antimalarial, anti-oxidant, anti-inflammatory anti-allergic (Joshi and Kaur, 2016)
154.	*Tinospora crispa (L.)Hook.f. & Thomson*	Menispermaceae	Guduchi/ Gulancha	Asia, Africa, Thailand, Malaysia, Indonesia	Root, leaf	Colombine, picroretine, berberine, tinosporine, N-cis-feruloyltyramine, N-trans-feruloyltyramine, seco-isolariciresinol, β-carotene, 2,2-diphenyl -1-picrylhydrazil, cycloeucalynol, cycloeucalynone	Anti-hyperglycemic/stimulates insulin release from islets (Sharma et al., 2015)
155.	*Tribulus terrestrisL.*	Zygophyllaceae	Gokshura/ Calthrops	Native to warm temperate and tropical regions of Old	Dried fruit	Flavonoids, flavonol glycosides, steroidal glycosides,	Antidiabetic, diuretic, aphrodisiac, anti-urolithic, hypolipidaemic, hepato-protective, anti-

				World in Southern Europe, Southern Asia, throughout Africa, Australia; grow in drier parts of India		furostanol saponins, furosteroidal saponins, furostanol glycosides, sapogenin	inflammatory (Mishra et al., 2010)
156.	*Trigonella foenum-graceum L.*	Fabaceae	Methi/ Fenugreek	Native to North Africa, Eastern Mediterranean; cultivated in India	Seed	Tryptophan, lycine, 4-hydroxyisoleucine, arginine, lysine, histidine, lecithin, choline, para-amino benzoic acid, saponin, coumarin, fenugreekine, nicotinic acid, phytic acid, scopoletin, trigonelline	Anti-diabetic, hypoglycemic, anti-cancer, antibacterial (Shani et al., 1974)
157.	*Urtica dioica L.*	Urticaceae	Bichu ghas/ Stinging nettle	Native to Europe, Asia, northern Africa, western north America	Leaf	Sterols, steryl glycosides, β-sitosterols, lignans, isolectins	Antidiabetic, ease allergy symptoms (Joshi et al., 2014)
158.	*Urtica pilulifera L.*	Urticaceae	Roman nettle	Europe, Egypt, Turkey, Russia, Afghanistan, Iran, Pakistan, N.W.India	Flower, young twig, seeds	Sterol, steryl glycosides, β-sitosterol, lignans, isolectins, quercetin, carotenoids, chlorophyll, acids, vitamins etc	Hypoglycemic, hypertension, antiasthmatic, diuretic (Joshi et al.,2014)
159.	*Vaccinium myrtillus L.*	Ericaceae	Kihar/ Bilberry	Widely found in North America, Asia	Berry	Phenolic compounds, flavonols, anthocyanins, vitamin-c, quercetin, catechin	Antidiabetic, antioxidant, antimicrobial (Helmstadter and Schuster, 2010)
160.	*Withania coagulans (Stocks) Dunal*	Solanaceae	Paneer doda/Indian rennets	Wide spreadin South Asia	Fruits	Proline, hydroxyproline, valine, tyrosine, asparticacid,	Anti-hyperlipidaemic /hypoglycemic/ antitumour/hepatoprotective (Gupta, 2012)

						glycine, asparagin, cysteine, glutamic acid, oleic, linoleic, palmitic, stearic, arachidonic acid, dihydro-stigmasterol, β-sitosterol, withanolides, withanones	
161.	*Withania somnifera (L.) Dunal*	Solanaceae	Ashwa-gandha/ Indian gingseng	Common in Bangla Desh, Pakistan, Sri Lanka, parts of northern Africa; abundantly grow in India	Berries, leaves, roots	Tropine, Cuscohygrine, Withanolides, Withanoferine A	Hypoglycemic/ Antioxidant/Di-uretic/ Hypo-cholesterolemic (John, 2015; Mishra et al., 2010; Shah et al., 2017)
162.	*Xanthium strumarium L.*	Asteraceae	Chota dhatura/ Common cocklebur	Common in temperate zone; serious weed in Australia, India, South Africa, America	Aerial parts	Feluric acid, chlorogenic acid, thiazolidinediones, caffeic acid, 1,3,5, -tri-o-caffeoyl quinic acid, β-sitosterol, strumasterol, monoterpene, sesquiterpene hydrocarbons, xanthanolide sesquiterpene lactone, triterpenoid saponin	Antidiabetic, antioxidant, antibacterial, anthelmintic, antifungal, anti-ulcerogenic, anti-inflammatory (Suresh et al., 2014)
163.	*Zingiber zerumbet (L.)Sm.*	Zingiberaceae	Kulanjan/ Banadrak/ Shampoo ginger	Throughout Asia	Rhizome	Terpenes, Polyphenols, Zerumbone, Sesquiterpene	Antidiabetic, antioxidant, anti-inflammatory, anticancer, antimicrobial, antiviral, analgesic (Koga et al., 2016)
164.	*Ziziphus mauritiana Lam.*	Rhamnaceae	Indian Plum/ Chinee apple/Ber	Indigenous over a wide area, from Southern Europe to South-east and east Asia. Cultivated in	Fruit, barks, leaves, seeds	Vitamin-C, Jujubosides A & B, Zizogenin, Zeatin, Frangufoline, Saponin, Leucocyanidin	Antidiabetic, astringent, pain relieving, cooling, stomachic (Niamat et al., 2012)

				China, India, Japan & Republic of Korea		e, Mauritines A, B, C,D,E, F, Rutin, Yuziphine, Yuzirin, Betulinic aldehyde, Betulinic acid, Ceanothic acid, Spinosin, Beta-sitosterol, Daucosterol, Docosanoic acid, Stearic acid, Palmitoleic acid	
165.	*Ziziphus sativa Gaertn.*	Rhamnaceae	Ber/Indian jujube	Native to China, Afghanisthan. Cultivated in India	Root, leaves, fruits	Butane 2,3-diol, glycerol, stepharine, 1,2-dimethoxy, 5, 6, 6a, 7 tetrahydro-4H-dibenzo-quinoline	Hypoglycemic, anticancer, antibacterial, antifungal, anti-inflammatory (Niamat et al., 2012)
166.	*Ziziphus spina-christi (L.) Willd.*	Rhamnaceae	Thorn jujube/ Christ thorn	Widespread in tropical and subtropical region. Cultivated and naturalized in NE India.	Fruits, barks, seeds, leaves	Steroids, β-sitosterol , β-D- glucoside , condensed tannins, and four saponin, glycosides, namely 3-0-α--L-fucopyranosyl (1→2) -P-D-glucopyranosyl (1→3) -[α-L-airabinopyranosyl] jujubogenin, 3-0-[α-D-fucopyranosyl (1→2)-β-Dglucopyranosyl -4-sulphate(1→3) -α- L-arabinopyranosyl] jujubogenin,	Insulinotropic/ Hypo-glycemic/Depressant effect on Central Nervous System (Glombitza et al., 1994)

						3-0[β-Dglucopyranosyl (1 →2) -α-L-rhamnopyranosyl (1→3)α-L-arabinopyranosyl] jujubogenin, and 3 -0[α-L-fucopyranosyl (1→2)- β-D-arabinopyranosyl (1→3)-P-Dglucopyranosyl (1→3)- α--L-arabinopyranasyl]. Jujubogenin have been isolated from the leaves.	

With increasing concern about side effects of synthetic antidiabetic drugs, different pharmaceutical companies have came into frontline and have marketed different herbal formulations that are used regularly by diabetic patients on the advice of Physicians *viz.* 'Diabecon', 'Glyoherb', 'Diabeta' plus, 'Epinsulin', 'Pancreatic tonic', 'Bitter guard powder', 'Dia-care', 'Diabetes-Daily Care', 'Gurmer powder', 'Diabeta', 'Syndrex' etc. In these drugs, different plants either have been used individually or with different other herbal ingredients in specific ratio.

Discussion and Conclusion

In recent years, Diabetes mellitus has turned into a horrifying issue around the world, affecting individuals of all age groups of all genders and all races. The most appalling part of Diabetes is its associated complications in human body leading slowly multiorgan failure and death. Although the synthetic drugs available in market are clinically and pharmacologically excellent, but due to significant adverse side effects, herbal formulations are much preferred over synthetic drugs to cure diabetes mellitus all over the world. In the last few years, there has been an exponential growth in the field of herbal medicine and are gaining popularity in both developing and developed countries due to their natural origin and less side effects.The World Health Organization (WHO) has listed c. 21,000 medicinal plants all over the world of which 2500 species are Indian and c. 150 species are used commercially in drug development on a fairly large scale. However one of thye major drawback of herbal formulation is that the active ingredients are not well defined. It is important to know the active component and their molecular interaction, which will help to analyse therapeutic efficacy of the product and also to standardize the product.

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