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Review Article

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# A Detailed Overview of Medicinal Plants Having Hypoglycemic Activity

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## Abstract

Diabetes mellitus represents a spectrum of metabolic disorder, which has become one of the major public health concerns worldwide. Diabetes mellitus has emerged as a third leading killer after cancer and cardiovascular/cerebrovascular diseases and India has a distinction of having largest number of diabetics in world second to China. Herbal medicine for treating chronic diseases, especially diabetes has gained an exponential growth in the last few years and both developing and developed countries are adopting herbal drugs for treatment of diabetes mellitus. The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world. The WHO has defined herbal medicines as finished labelled medicinal products that contain aerial or underground parts of the plants or other plant material or combination thereof as active ingredients, whether in crude state or as plant preparations. This review attempts to present the profiles of plants with hypoglycemic properties, reported in the literature with proper categorization according to the botanical name, family, parts used, chemical constituents, and its other uses. Relevant medical databases and websites were searched. To qualify for inclusion, the herbs should have confirmed hypoglycemic potential. Other criteria for inclusion are: published in English and peer-reviewed journals. We also used related keywords like diabetes mellitus, plant, herb, glycemic control, natural or herbal medicine, Ayurvedic plants, and hypoglycemic plants, as keywords or combination of them. A total of 151 herbs belonging to 72 families were outlined in this review.

**Keywords:** diabetes mellitus, glycemic control, medicinal plants, antidiabetic, hypoglycemic.

## Introduction

Diabetes mellitus is one of the most common endocrine metabolic disorders, which has caused significant morbidity and mortality due to various microvascular and macrovascular complications [1]. Diabetes has become the third "killer" of the health of mankind along with cancer, cardiovascular, and cerebrovascular diseases[2]. Asia is one of the regions that have high prevalence of diabetes and is estimated that 20% of current global diabetic population resides in South East Asia region. India is a country with largest number of diabetic population, indeed the number of people with diabetes in India is likely to double in less than two decades from 39.9 million (in 2007) to 69.9 million by 2025[3,4]. Therapies currently available for diabetes include insulin and various oral antidiabetic agents such as sulfonylureas, biguanides and glinides [5]. Most of them exhibit serious adverse effects. Therefore, the search for more effective and safer alternate for treatment of diabetes is one of the most important areas of Investigation [6]. In diabetes, reactive oxygen species (ROS) were generated, which in turn cause lipid peroxidation and membrane damage and these free radicals play an critical role in the development of secondary complications of diabetes mellitus (kidney, eye, blood vessel, and nerve damage) [7,8]. The destruction of beta cells is prevented by antioxidants by inhibiting the peroxidation chain reaction and thus, in turn, prevents the development of diabetes. Natural antioxidants are present in almost all plants (tannins, flavonoids, vitamins C and E, etc.) that can maintain beta cell function and prevent diabetes-induced ROS formation [9,10]. Moreover, easy availability, raw consumption, least side effects and low cost makes the herbal drugs and preparations the king of all available therapies. Therefore, the current review focuses on traditional medicinal plants spread around the globe having antidiabetic potential with special emphasis to phytochemical constituents present in each herb.

## Methodology

Ethnobotonical information was obtained from a literature search of electronic databases such as EMBASE and Scopus from Elsevier, Medline from PubMed, and Google Scholar up to year 2014 for publications on medicinal plants used in diabetes management using keywords diabetes mellitus, plant, herb, glycemic control, natural or herbal medicine, Ayurvedic plants, and hypoglycemic plants. In addition, experts in the field were contacted to select studies that meet the criteria, and we also looked up references of key articles. The authors read the articles in full and extracted the data in a standardized fashion. In order to highlight medicinal plants traditionally used in diabetes management with the potential for integration into the healthcare system, not all identified plants were included in this study. Only those with more than one reference to use in diabetes management and experimental evidence in one or more diabetes experimental models validating its activity were retained. This review is therefore not exhaustive of all the plants used traditionally for diabetes management throughout the globe. The detailed overview of medicinal plants having hypoglycemic activity is listed in Table 1 below.

**Table 1: List of Hypoglycemic plants**

| S.No | BOTANICAL/ COMMON NAME | FAMILY | CHEMICAL CONSTITUENTS | INDICATIONS | PART USED |
|---|---|---|---|---|---|
| 1 | *Blighia sapida* Common name – Akeeapple | Sapindaceae | Hypoglycin A (HGA), hypoglycin B (HGB). - amino β (2methylene cyclopropyl) propionic acid, cyclopropanoid [11]. | Hypoglycemic [12], dysentery, and ophthalmic conjunctivitis. | Root |
| 2 | *Coccinia indica* Common name- Kunduru | Cucurbitaceae | Saponins, flavonoids, sterols ,alkaloids, amino acids [13]. | Hypoglycemic [14], antioxidant [15], antibacterial. [16] | Leaves |
| 3 | *Abutilon indicum* Common name- Indian mallow | Malvaceae | Mucilaginous substances,asparagines saponins, flavonoids, alkaloids, hexoses, nalkane mixtures (C), alkanol , β-sitosterol, vanillic acid, p-coumaric acid,caffeic acid, fumaric acid, Abutilon A, (R)-N (1'methoxycarbonyl-2'phenylethyl)-4-hydroxybenzamide, phydroxybenzoic, galacturonic, p- β-D-glycosyloxybenzoic and amino acids, essential oil (a-pinene, caryophyllene, caryophyllene oxide, endesmol, farnesol, borenol, geraniol, geranyl acetate, elemene and a-cineole) [17]. | Wound healing [18], Hypoglycemic [19], Hepatoprotective [20], Anti-inflammatory, Anthelmintic, Hyperlipidemic activity [21]. Analgesic [22]. | Leaves |
| 4 | *Acacia arabica* Common name- India Gum | Fabaceae or Leguminosea | Tannins, gum, proanthocynidins , saponins, phenolic ,Pod phenolic ,∝- Spinasterol, Tryptopham contents (total proteins, albumins, globulins) [23]. | Antihypertensive and antispasmodic [24], antioxidant [25], antidiabetic, eye complaints, diahorea, dysentry, wounds, ulcers, asthma, urinary problems [26]. | Bark |
| 5 | *Acacia catechu* Common name- NA Kattha | Leguminose ae | Catechin, catechutannic acid, epicatechin, catechin tetramer, dicatechin, gallocatechin, kaempferol, taxifolin, isorhamnetin, (+) afzelechinn, L-arabinose, D-galactose, D-rhamnose and aldobiuronic acid [27]. | Antidiarhoeal, leprosy, dysentry, rheumatism, cancer, asthma [26], hypoglycaemic [28], hepatoprotective [30]. | Bark |
| 6 | *Actinodaphne hookeri* Common name- Pisa | Lauraceae | Triterpenoids, steroids, alkaloids, carbohydrates, glycosides, flavonoids, tannins [30]. | Hypoglycemic [31], antioxident, hepatoprotective [30]. | Leaves |
| 7 | *Adiantum caudalum* Common name- | Adiyantaceae | Isoadiantone, ferene, hentriacontane,16-hentriacontanone [32]. | Antitussive [33], antibacterial, antidiabetic, antipyretic, and | Leaves |

| | | | | | |
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| | Mayur | | | anticancer [34]. | |
| 8 | *Aegle marmelos*<br><br>Common name-Bael | Rutaceae | Skimmianine, Aegeline, Lupeol, Cineol, Citral, Citronella, Cuminaldehyde, Eugenol, Marmesinine, Skimmianine, Fagarine, Marmin, Marmelosin, Luvangetin, Aurapten, Psoralen, Marmelide, Tannin [35]. | Hepatoprotective [36], antidiabetic, dyspepsia, stomachalgia, gastric irritability, digestive, laxative, anti-ulcer, antistress and adaptogenic [37], radioprotective [38]. | Leaves |
| 9 | *Aloe vera*<br><br>Common name-Gwarpattha | Liliaceae or Asphodelaceae | Aloe-emodin, aloetic-acid, anthranol, barbaloin, isobarbaloin , emodin, ester of cinnamic acid, Pure mannan, acetylated mannan, acetylated glucomannan, glucogalactomannan, galactan, galactogalacturan, arabinogalactan, galactoglucoarabinomannan, pectic substance, xylan, cellulose, 8-C-glusoly-(2'-O-cinnamoly)-7-O-methlyaloediolA, 8-C-glucosyl-(S)-aloesol, 8-Cglucosyl-7-O-methylaloediolA, 8-C-glucosyl-7-0-methylaloediol, 8-C-glucosyl-noreugenin, isoaloeresin D, isorabaichromone, neoalosin A [39]. | Antidiabetic, immuno stimulant, anti-inflammatory, antiviral, antitumor, antidiabetic, anti-HIV, anticancerous [40]. | Aloe gel |
| 10 | *Asparagus racemosus*<br><br>Common name-Satavar | Liliaceae | Steroidal saponins, folic acid, essential oils, asparagine, arginine, tyrosine, flavonoids, resin, tannin, sarsasapogenin , shatavarin I-IV, asparagamine, racemosol, kaempferol, quercetin, rutin, hyperoside, diosgenin, quercetin-3 glucuronide, isoflavone, 8-methoxy-5,6,4'-trihydroxyisoflavone-7-O-β-D-glucopyranoside [41]. | Antioxidant, anti-inflammatory, antidiabetic, immunomodulatory, anticarcinogenic [42], antimicrobial, diuretic, antiulcerogenic, hypolipidemic, adaptogenic, antidepressant, antiamnesic, prokinetic, fertility, hepatoprotective activity [41]. | Whole plant |
| 11 | *Azadirachta indica*<br><br>Common name-Neem | Meliaceae | Isomeldenin, nimbin, nimbinene, 6-desacetyllnimbinene, nimbandiol, immobile, nimocinol, quercetin, and beta-sitosterol, zafaral [24,25,26,27-tetranorapotirucalla-(apoeupha)-6alpha-methoxy-7alpha-acetoxy-1,14-dien-3, 16-dione-21-al], meliacinanhydride [24,25,26,27-tetranorapotirucalla-(apoeupha)-6alpha-hydroxy, 11alpha-methoxy-7alpha, 12alpha-diacetoxy, 1,14,20(22)-trien-3-one], tetranortriterpenoids, azadirachtin H azadirachtin I, tannin and oil [43]. | Immunomodulatory, antifungal, antidiabetic, antibacterial, antiviral, anti-fertility [44]. | Leaves |
| 12 | *Berberis aristata*<br><br>Common name-Daruharidra | Berberidaceae | Barberine, oxyberberine, berbamine, aromo line, karachine, palmatine, oxyacanthine, taxilamine, 4 protoberberine, bisisoquinoline, epiberberine, dehydrocaroline, jatrorhizine, columbamine, karachine, dihyrokarachine, pakistanine, 1-O methylpakistanine, pseudopalmatine chloride, pseudoberberine | Antidiabetic, anti-inflammatory, antifungal, anticancerous, eye complaints [37]. | Stem, bark, root. |



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| | | | chloride, secobisbenzlisoquinoline [45]. | | |
| 13 | *Boerhaavia diffusa*<br><br>Common name-<br>Punernava | Nyctaginaceae | Boeravinone, A,B,C,D,E,F phenolic glycoside, C-methylflavone, iriodendrinand syringaresinolmono-β-D- glycoside, hypoxanthine9-L-arabinose, dihydroisofuroxanthone-borhavine, phytosterols, punarnavine and punernavoside, potassiumnitrate, ursolic acid, fatty acids,boerhavin and boerhavicacid [46]. | Hepatoprotective [47], anti-inflammatory [48], antidiabetic [49]. | Leaf or root |
| 14 | *Caesalpinia bonducella (L) Roxb*<br><br>Common name-<br>Kakachika | Caesalpinaceae | Natin, Bonducin, protease, urease, amylase, peroxidase, catalaseand oxidase, Caesalpin, β-caesalpin, -caesalpin, –caesalpin, myristic acid, E,F,Ycaesalpin [50]. | Antidiabetic and antihyperlipidemic. | Seeds |
| 15 | *Casearia esculenta*<br><br>Common name-<br>Saptarangi | Samydaceae | Dulcitol, magniferan, flabetannin, glycosaides tannin, leucopelargonidin, tammisnad resins, calcium, magnesium, phosphorus, iron, iodine vitamin A, B1, riboflavin and niacin. | Antidiabetic [51], antioxidant and antilipidperoxidase. | Root |
| 16 | *Cassia auriculata*<br><br>Common name-<br>Amulthus | Caesalpiniaceae | Linoleic, oleic, stearic and palmitic acids,caprylic and myristic acids, lupeol, ß-sitosterol and hexacosanol, phenylalanine, methionine, glutamicacidandproline, carbohydrate, lipidandfreeaminoacid, 5-nonatetracontanone, 2-hentriacontanone, triacontane, 16-hentriacontanolandsitosterol, Fistucacidin, kaempferol, proanthocyanidin, epiafzelechin, epicatechin, catechin, procyanidinB-2 [52]. | Heaptoprotective, antiinflammatory, antitussive, antifungal, antibacterial [53], antihyperlipidaemic, antiulcer, antipyretic, hypoglycaemic. | Root |
| 17 | *Cinnamomum zeylanicum*<br><br>Common name-<br>Dalchini | Lauraceae | Essential oil containing cinnamaldehyde, eugenol, trans-cinnamic acid, polyphenols, including catechins and oligomericproanthocyanidins, tannins, limonene and alpha-terpineol, Sesquiterpenes including pinene, Calcium monoterpenoidoxalates, gum, mucilage, resin, starch, sugars, traces of coumarin [54]. | Antidiabetic, antioxidant, antimicrobial [37], Immune enhancing, and cancer support | Bark |
| 18 | *Tamarindus indica L.*<br><br>Common name-<br>Tamarind | Caesalpinaceae | Phenolic compounds, cardiac glycosides, tartaric acid, pectin, fatty acids, Limonene, benzyl benzoate predominant, *n*-hexacosane, eicosanoic acid, β-sitosterol, (+)-pinitol. octacosanyl ferulate, 21-oxobehenic acid, β-amyrin, compesterol, β-sitosterol polyphenolics, organic acids, Naringenin, Leupeol, Eriodectin, Catechin, Epicatechin, Procyanidin dimer, Procyanidin trimer [55]. | Antidiabetic, hypolipidemic , antioxidant, antimicrobial, anti-nematodal, hepatoprotective, analgesic, antipyretic, laxative, anticancer, antiemetic, and bioavailability enhancer [55]. | Fruit |



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| 19 | *Commiphora wightii*<br><br>Common name- Guggul | Burseraceae | Essential oils (myrecene, dimyrecene, polymyrecene), diterpene, hydrocarbon, diterpene alcohol, Z-guggulsterol-II, E-guggulsterone, guggulsterone, guggulsterol-I, guggulsterol-II, guggulsterol-III, cholesterol, sesamine, camphorene, carbohydrates [56]. | Hypolipidemic, antiarthritic, hypertension [43], antiinflammatory [56]. | Gum resin |
| 20 | *Agrimony eupatoria*<br><br>Common name- NA | Rosaceae | Volatile oils, flavonoids, apigenin, luteolin, quercetin, kaempferol, tiliroside, triterpene, glycosides including euscapic acid and tormentic acid, phenolic acids, tannins [57]. | Antidiarrheal, antirheumatic, haematological activity, Antituberculosis [58], antiinflammatory gene expression. | Seed |
| 21 | *Ephedra distachya*<br><br>Common name- Yellow astringent | Ephedereaceae | Ephedroxane, ephedradines, certain glycans (ephedran A, B, C, D and E), flavanols, Ephedra species contain alkaloids: ephedrine, pseudoephedrine, norephedrine, norpseudoephedrine (cathine), methylephedrine and methylpseudoephedrine [59] | Pain relieving, antiviral, antibacterial, expectorant, antitussive, and immune stimulant. | Aerial stem |
| 22 | *Barleria lupulina*<br><br>Common name- NA | Leguminosae | Iridoid glucosides, alkaloidsm, barlerin, acetylbarlerin, shanzhiside methyl ester, acetylshanzhiside methyl ester, ipolamiidoside, cardiac glycoside, flavonoids, phenols, steroids, tannins, and terpenoids [60]. | Antiinflammatory, anti-ulcer, antiarthritic, immunomodulatory [61], hypoglycemic agent, anti-amoebic, and diuretic [60]. | Aerial Part |
| 23 | *Bauhinia forficate*<br><br>Common name- Cow paw | Leguminosae | Pirogalic tannin, flobabenic tannins, anthocyanins, anthocyanidins, flavononols, leucoanthocyanidins, catechins, flavanones, alkaloids, steroids, triterpenoids and saponins. | Antiophidic, anticoagulant, antidiabetic, diuretic, antioxidant, antiproliferative, and antifungal [62]. | Leaves |
| 24 | *Biophytum sensitivum*<br><br>Common name - Life plant | Oxalidaceae | Phenolic and polyphenolic compounds, saponin, essential oil, polysaccharides and pectin, biflavones: bioflavonoid, amentoflavone, cupressoflavone; luteolin-7-methyl ether, isoorientin, 3- methoxyluteolin 7-O-glucoside, as well as two acids 4-caffeoylquinic acid and 5-caffeoylquinic acid, orientin, isovitexin, isoorientin 2”-O-rhamnoside, (–)-epicatechin and epicatechin-(4β-8)- epicatechin (proanthocynidin B2), 1,4- dimethoxy benzene, 1,2-dimethoxy benzene, 2-methoxy-4-methyl phenol, monoterpenes (Z)-linalool oxide, (E)-linalool oxide, linalyl acetate, 1-octen-3-ol, isophorone, BP100 III, galacturonic acid, and rhamnose [63]. | Radioprotective, immunostimulation, antitumor activity, antioxidant defense mechanism, antibacterial, cardioprotection, antimetastatic, targeting angiogenesis, chemoprotective ability, antidiabetic potential, and anti-inflammatory [63]. | Leaves |
| 25 | *Bougainvillea spectabilis*<br>Common name- NA | Rubiaceae | Alkaloid flavonoids, glycosides, phlobotannins, saponins, steroids, tannins terpenoids [64],<br>D-pinitol (3-o-methyl- chiroinositol) [65]. | Antidiabetic, antiviral, antibacterial, antiinflammatory, larvicidal, antifertility, and hypolipidemic [65]. | Seed, leaves |
| 26 | *Bryonia alba l.*<br><br>Common name- White bryony | Cucurbitaceae | Alkaloid bryonicine, flavonoids saponarin, vitexin, isovitexin, 5, 7, 4’-trihydroxy flavone 8-C-glucopyranoside, lutonarin, isoorientin; glycosides 22-deoxocucurbitosides A and B, | Hypoglycemic and antiatherosclerotic [66]. | Roots |

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| | | | 22- deoxocucurbitacin D, triterpenoids, cucurbitacin L, 23, 24-dihydrocucurbitacin B, 23, 24,-dihydrocucurbitacin D, arvenin IV, lipids, proteins [66], amylase, bryoamaride, bryonine, bryonol, bryopolyose, bryoresin, ceryl-alcohol, chrysophanic acid, dihydrocucurbitacin B, E, invertase, iso-23, 24- dihydrocucurbitacin D, linolenic acid, oleic acid, palmitic acid, peroxidase, phlobathene, rhamnose, spinasterol, stearic acid, and tannin [67]. | | |
| 27 | *Bumelia sartorum mart*<br><br>Common name- NA | Sapotaceae | Triterpenoids and steroids such as the (2β,3β,4 )-2,3,23-trihydroxyoleana-5,12-dien-28-oic acid, bassic acid [68]. | Anti-inflammatory, antidiabetic, antibacterial and antioxidant [68]. | Root bark |
| 28 | *Caesalpinia bonducella*<br><br>Common name- Fever nut | Fabaceae | Steroidal saponin, fatty acids, hydrocarbons, phytosterols, isoflavones, aminoacids, and phenolics [69]. | Antidiabetic, adaptogenic, anthelmintic, antifilarial, antiestrogenic, antiinflammatory, antimalarial, antimicrobial, antibacterial, antifungal, antispasmodic, antidiarrhoeal, antioxidant, antiproliferative, antipsoriatic activity, antitumor, anxiolytic, larvicidal, immunomodulatory, muscle contractile activity, hepatoprotective, anticonvulsant, and antiviral activity [69]. | Seed |
| 29 | *Cajanus cajan*<br><br>Common name- Pigeonpea | Fabaceae | Carbohydrate, protein, amino acid, fats and oils, steroid, glycosides [cardiac glycoside, anthraquinone glucoside, saponin glycoside, flavonoids], alkaloids, and phenolic compounds [71]. | Diuretic, laxative, expectorant, sedative [69], antidiabetic [70]. | Seed |
| 30 | *Tecoma stans*<br><br>Common name- Yellow trumpetbush | Bignonaceae | Triterpenes, hydrocarbons, resins and volatile oils. The leaf contains flavonoids, tannins, and traces of saponins, alkaloids, tecomine, tecostidine, beta carotene and zeaxantine [72]. | Antidiabetic, antibacterial, antihypertensive, treats GIT disorders and various cancers. The plant is an effective remedy for snake and rat bites. It is also used as vermifuge [72]. | Flower |
| 31 | *Capparis sepiaria*<br><br>Common name- NA | Capparaceae | Alkaloids, phenols, sterols. glycosides ß-sitosterol, Betulin, ß-amyrin, taraxasterol, erythrodiol, n-octacosanol [73]. | Antidiabetic [74]. | Leaves |
| 32 | *Ceiba pentandra*<br><br>Common name- NA | Malvaceae | Phenolics compound, alkanoid, flavonoid, tannin, sponnin, palmitic acid, fatty acid, phytate, oxalate, trypsin inhibitor, hemagglutinin [75], and linolenic acid. | Antifungal, antidiarrhoeal, antiulcer, hepatoprotective, anthelminthic, angiogenesis activity, antiinflammatory, hypoglycemic, hypolipidemic [76]. | Root, Bark |
| 33 | *Centratherum* | Asteraceae | Flavone glycoside, 8,5'-dimethoxy 3',4'- | Analgesic and antipyretic, | Seed |

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| | *anthelminticum*<br><br>Common name- NA | | methylenedioxy 3, 7-dihydroxy flavone, vernolic acid, linoleic, oleic, palmitic and stearic acids, hexatetracontan-16-ol, 6,9-eicosadiene, butyl 11-hydroxy octadecanoate, hexyl 3-hydroxynonanoate, hexyl 9- hydroxyheptatriacontanoate, heptadecylnonadecanoate, stigmasterolsaponin 3-O-[β-D-glucopyranosyl-(1 3)- -L-rhamnopyranosyl-(1 2)- -L-arabinopyranosyl]-28-O-[β-D-glucuronopyranosyl- (1 4)- -L-rhamnopyranosyl-(1 3)-β-D-glucopyranosyl]-hederagenin [77]. | antifilarial, antihelmintic, antihyperglycemic, antimicrobial, antibacterial, antifungal, diuretic, larvicidal, and macrofilaricidal activity [77]. | |
| 34 | *Cichorium intybus*<br><br>Common name- NA | Asteraceae | Alkaloids, inulin, sesquiterpene, lactones, coumarins, vitamins, chlorophyll pigments, unsaturated sterols, flavonoids, saponins and tannins [78]. | Antihepatotoxic, antidiabetic, antiulcerogenic, and antioxidant [78]. | Stem |
| 35 | *Clerodendrum phlomidis*<br><br>Common name - NA | Verbenaceae | Alkaloids, saponin, tannins, β-sitosterol, γ-sitosterol, ceryl alcohol, clerodin, clerosterol and clerodendrin- A, -L-rhamnopyranosyl-(1 2)- -D-glucopyranosyl-7-O-naringin-4′-O- -D-glucopyranoside-5- methyl ether, D-mannitol, β-D-glucoside of β-sitosterol, β-sitosterol and ceryl alcohol, Lup-20(29)-en-3-triacontanoate, tetratriacontanol and 24β-ethylcholesta-5, 22E, 25-triene- 3β-ol, β-sitosterol, γ-sitosterol, palmitic acid, cerotic acid, Scutellarein, pectolinaringenin, Chalcone glycoside, pectolinarigenin, 7-hydroxy flavone and 7- hydroxy flavanone 7-O-glucoside, 6,4′-dimethyl-7-acetoxyscutellarein, pectolinarigenin, hispidulin, apigenin and luteolin [79]. | Antiinflammatory, analgesic, antiarthritic, antimicrobial, antiobesity, antihepatotoxic, antifertility, antiamnestic, antiasthmatic, antioxidant, antidiarrhoeal, hypoglycemic, and immunomodulatory [79]. | Leaves |
| 36 | *Cocculus hirsutus*<br><br>Common name- Jaljamini | Menispermaceae. | Essential oil, β- sitosterol, ginnol, glycosides,alkaloids, phenolic compounds, flavonoids, shaheenine, cohirsinine, hirsutine, jamtinine, jamitine- N–oxide, cohirsine, Cohirsitine haiderine, D- trilobine DL-coclaurine, isotrilobine, syringaresinol, protoquericitol, D-trilobine, coclaurine, sterols and resins [80]. | Antidiabetic, antiinflammatory, analgesic, antimicrobial, cardiotonic, diuretic, laxative, immunostimulant, and spermatogenic [77]. | Leaves |
| 37 | *Abelmoschus moschatus*<br><br>Common name- Muskdana | Malvaceae | Mucilage, β-sitosterol, glycosides, flavonoids, myricetin, phospholipid, essential oil, linoleic acid [80], farnesol, and lactone of ambrettolic acid. | Cooling, aphrodisiac, ophthalmic, cardio tonic, digestive, stomachic, constipating, carminative, pectoral, diuretic, stimulant, antispasmodic, deodorant [81]. | Aerial Part |
| 38 | *Aconitum carmichaeli*<br><br>Common name- Chinese aconite | Ranunculacea | Benzoic acid-5-hydroxy-2-benzoyl-amino methyl ester, honokiol,pinoresinol, salicylic acid, p-hydroxy-cinnamic acid, songorine, karakoline, mesaconitine,hypaconitine, 14-benzoylhypaconitine [82], Aconitine, | Analgesic, cardiotonic [83], diuretic, antiinflammatory, antirheumatic, and oriental medicine. | Root |

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| | | | Hypaconitine, and Mesaconitine. | | |
| 39 | *Adansonnia digitata*<br><br>Common name- Baobab | Bombacaceae | Terpenoids, flavonoids, steroids, vitamins, amino acids, carbohydrates, and lipids [84]. | Antibacterial, antifungal, antimalarial, antipyretic, immunostimulant, antioxidant, and analgesics [85]. | Bark, Fruit Pulp |
| 40 | *Agrimonia pilosa Ledeb*<br><br>Common name- NA | Rosaceae | Agrimonolide, coumarin, tannin, flavonoids, phenylpropanoids, triterpenes [87], agrimonin, catechin, quercetin, and rutin [86]. | Anticancer, antioxidant,acetylcholinesterase inhibitory, and anti-inflammatory [86]. | Aerial Part |
| 41 | *Allium cepa*<br><br>Common name- Onion | Alliaceae | Phenolics, polyphenol, shallots, anthocyaninpigments, flavonoid, quercetin, and organosulfur compounds. | Analgesic, anti-Crohn's, antiaggregant, antiaging, antiarthritic, antiasthmatic, antiatherosclerotic, antibacterial, anticataract, anticold, antidiabetic, antieczemic, antigingivitic, antihistaminic, antihypertensive, antimigraine, antiobesity, antiosteoarthritic, antiosteoporotic, antioxidant, antiperiodontic, antiseptic, antishingles, antitumor, antiviral, asthma-preventive, cancer-preventive, cold-preventive, diuretic, hypocholesterolemic, immunostimulant, vasodilator, vulnerary [88], anthelmintic, antiinflammatory, antiseptic, antispasmodic, carminative, expectorant, febrifuge, hypoglycaemic, lithontripic, stomachic, and tonic. | Bulb |
| 42 | *Amaranthus spinosus*<br><br>Common name- Calaloo | Amaranthaceae | 7-p-coumaroyl apigenin 4-O-beta-D-glucopyranoside, spinoside, xylofuranosyl uracil, beta-D-ribofuranosyl adenine, beta-sitosterol glucoside, hydroxycinnamates, quercetin, kaempferol glycosides, betalains; betaxanthin, betacyanin; amaranthine, isoamaranthine, gomphrenin, betanin, b-sitosterol, stigmasterol, linoleic acid, rutin, and beta-carotene [89]. | Astringent, diaphoretic, diuretic, emollient, antidote, emmenagogue, febrifuge<br>antidiabetic, antitumor, analgesic, antimicrobial, anti-inflammatory, spasmolytic, bronchodilator, hepato-protective, spermatogenic, antifertility, antimalarial and antioxidant properties [90]. | Leaves |
| 43 | *Anisodus tanguticus Pascher*<br><br>Common name- ZangQie | Solanaceae | Tropane Alkaloids called hyoscyamine and scopolamine [91]. | Spasmolytic and antiasthmatic agent. | Root |
| 44 | *Anacardium occidentale Linn*<br><br>Common name- Cashew | Anacardiacea e | Tannins, aldehydes, flavanoids, phenols [92], cardol ,anacardic acid, triglycerides, fatty acids, cholesterol, free fatty acids –palmitic oleic acids, phenolic resin, anacardic acid, urushiol, anacardicacids, lipopolysaccharide, | Antibacterial, antiinflammatory, hypoglycemic, antioxidant, antitumor, antiophidian, , anthelmintic, aphrodisiac , Gum as tablet binder, and larvicidal [93]. | Leaf |

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| | | | volatiles, carotenoids, and ascorbic acid. | | |
| 45 | *Areca catechu*<br><br>Common name-<br>areca palm | Arecaceae | Carbohydrate, fats, fiber, flavanoids, tannins, alkaloids, minerals, isorhamnetin, quercetin, liquiritigenin, 5,7,4'-trihydroxy-3',5'dimethoxyflavanone, catechin, resveratrol, ferulic acid, vanillic acid, 5,8-epidioxiergosta-6,22-dien-3beta-ol,stigmasta-4-en-3-one, beta-sitosterol, cycloartenol, de-o-methyllasiodiplodin. | Diuretic, digestive, anthelminthic, astringent,<br>Cardiotonic, antidepressant , and anti-rodents [94,95]. | Flower, Leaves |
| 46 | *Artemisia herba-alba-asso*<br><br>Common name-<br>Worm wood | Asteraceae | 1,8-cineole alpha and beta-thujone, oxygenated monoterpenes; terpinen-4-ol, camphor, borneol, Davanone, chrysanthenone,cis-chrysanthenol, monoterpene alcohols; *santolina* alcohol and *yomogi*alcohol, Eudesmanolide, germacranolide sesquiterpenes, flavonoids, hispidulin and cirsiliol. | Antihyperglycemic ,antimicrobial, antioxidant, antispasmodic, antivenom, nematicidal, anthelmintic, antileishmanial, neurological agent, pesticidal , antibiotic resistant inhibitor activities, analgesic, antipyretic , antiinflammatory, antimalarial, and potential relaxant [96]. | Aerial Parts |
| 47 | *Bauhinia rectusa*<br><br>Common name-<br>Semla | Acanthaceae | Steroids, triterpenoids, fatty alcohol, acid and ester, glycerols, flavonoids, phenols, chromone, sugar, 6′-(β-sitosteryl-3-*O*-β-glucopyranosidyl, and tetraeicosanoate. | Used to treat cholera, used in snakebite, and as diuretic [97]. | Bark, Leaf |
| 48 | *Bauhinia forficate*<br><br>Common name-<br>Brazilian orchid tree | Leguminosae | Astragalin, bauhinoside, beta-sitosterol, flavonols, flavonoids, glycosides, guanidine, heteroglycosides, kaempferitrin, organic acids, quercitrosides, rhamnose, and saponins. | Antidiabetic, antioxidant, hypocholesterolemic, diuretic, hypoglycemic, antiinflammatory, analgesic, antiulcer, anxiolytic, hepatoprotective, hypotensive, and antiproliferative against human tumoral cells [98, 99]. | Leaf |
| 49 | *Bidens pilosa L*<br><br>Common name-<br>Spanish needle | Asteraceae | Aliphatics, flavonoids, terpenoids, phenylpropanoids, aromatics, porphyrins [100]. | Antitumor, antiinflammatory, antidiabetic and antihyperglycemic, antioxidant, immunomodulatory, antimalarial,antibacterial, antifungal, antihypertensive, vasodilator, and antiulcerative activities [101]. | Whole plant |
| 50 | *Brassica nigra L*<br><br>Common name-<br>Black mustard | Brassicaceae | Glycerides of oleic, stearic and brassic acids, glucose, myrosin, allyl isothiocyanate, potassium hydrogen sulphate, sinigrinsinapine, sulphocyanate, and glucosinols [80]. | Antirheumatic, appetizer, digestive, diuretic, emetic, rubefacient, and stimulant. | Seed |
| 51 | *Cassia fistula*<br><br>Common name-<br>Tinnevelly senna | Leguminosea e | Anthraquinone glycosides, sennosides A & B, rhein and its glucoside, barbaloin, aloin, formic acid, butyric acid, ethyl esters, oxalic acid, pectin and tannin, galactomannan free sugars, free amino acids, ceryl alcohol, kaempferol, bianthraquinone glycoside, fistulin, rhein, its glycosides-sennosides A & B, albuminous starch, oxalate of calcium volatile oils, gum, astringent matter, gluten, phlobaphenes,oxyanthraquinone, and fistulic acid[102]. | Hepatoprotective, antiinflammatory, antitussive, antifungal, antibacterial [102], antioxident, hypoglycemic, antiviral, laxative, estrogenic, antitumor, analgesic, vermifuge, astringent, and purgative. | Bark |

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| 52 | *Bridelia ndellensis beille*<br><br>Common name- NA | Phyllanthacea e | Gallocatechin-(4′-O-7)-epigallocatechin, quercetin, myricetin glycosides, bridelone, bridelonine, and isoflavone[103]. | Antiamoebic, antianemic, antibacterial, anticonvulsant, antidiabetic, antidiarrhoeal, antihelmintic, antiinflammatory, antimalarial, antinociceptive, and antiviral[103]. | Aerial Parts, Seed |
| 53 | *Capparis deciduas*<br><br>Common name- Caper berry | Capparaceae | n-pentacosane, n-triacontane, n-triacontanol, 2-carboxy-1, 1-dimethylpyrrolodine, 6-(1-hydroxy-non-3-enyl) tetrahydropyran-2-one, ß-sitosterol, ß-carotene, ascorbic acid, glucosinolates, indole bases capparin, capparilin, capparinin l-stachydrine, capparidisine, capparisin, pentacosane, n-triacontanol, β-sitosterol, isorhamnetin, arabinose, galactose, alanine, carotenes, polyphenols, capparisesterpenolide, decidua terpenolides A, B, C, D and E[104]. | Sedative ,depressant, antimicrobial, hepatoprotective, antiatherosclerotic, antidiabetic, antihypertensive, antihyperlipidemic,antioxidant, antidiabetic, and antihemolytic[105]. | Aerial parts |
| 54 | *Catharanthus roseus*<br><br>Common name- Madagascar periwinkle | Apocynaceae | Carbohydrate, flavinoid, saponin, and alkaloids (alkaloids like actineoplastidemeric, Vinblastin, Vincrestine, Vindesine, Vindeline, Tabersonin, ajmalicine, vinceine, vineamine, raubasin, reserpine, catharanthine)[106]. | Vomitive, anticancer, purgative, vermifuge, depurative, hemostatic, antibacterial, antifungal and antiviral, hypoglycemic, antidiabetic,cytochrome P450 inhibition, wound healing, antioxidant, hypolipidemic, anthelmintic, and antiulcer[106]. | Leaves |
| 55 | *Chamaemelumnobile (L) All*<br><br>Common name- Chamomile | Asteraceae | Aliphatic esters, Terpenic alcohol (Pinocarveol, farnesol), Terpeniccetones (Pinocarvone), and Chamazulene. | Pre-anesthetic,antiinflammatory,paraciticidal (lambias, ankylostomes), and hypoglycemic. | Flower |
| 56 | *Citrullus colocynthis*<br><br>Common name- Bitter apple | Cucurbitaceae | Colocynthin, colocynthein, colocynthetin, pectin gum, fixed oils, and albuminiods[107]. | Antiinflammatory, antidiabetic, anticandidal, antibacterial, antioxidant, antiinflammatory, analgesic, antiproliferative, hypolipidemic, anti-alopecia, antioxidant, larvicidal, growth inhibitory activity on breast cancer cells, and antifertility [107]. | Flower |
| 57 | *Clausena anisata (Willd) Benth*<br><br>Common name - Perdepis | Rutaceae | Aromatic essential oils, Carbazolealkaloids, coumarins, phenylpropanoids named clausamines,estragole, (*E*)-anethole, methyl chavicol, (*E*)-foeniculin, β-pinene, sabinene, (*Z*)-β-ocimene, germacrene B, (*E*)-β-ocimene, terpinen-4-ol, (*Z*)-tagetenone, (*E*)-tagetenone, (*E*)-nerolidol, germacrene D, methyl chavicol, myrcene, limonene, β-caryophyllene, 3-carene, β-humulene, coumarins of the furanocoumarin type - imperatorin, isoimperatorin, oxypeucedanine, bergaptene, xanthotoxin, xanthotoxol and chalepin, geranylcoumarin (anisocoumarin A–I), furanocoumarin-lactone type | Hypotension, anthelmintic, antiseptic, analgesic, and snake-bite antidote. | Root |

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| | | | (indicolactone, anisolactone), the tetranortriterpenoidslimonin, zapoterin, clausenolide, carbazole alkaloids furanoclausamine A and B, clausamine B, C, D and E, mukonal, glycosinine, mukonidine and clausine F, the pyranocarbazole alkaloid mupamine, β-pinene, sabinene, germacrene-D, estragole and linalool. | | |
| 58 | *Coriandrum sativum L*<br><br>Common name-Coriander | Apiaceae | Essential oil composed of coriandrol (linalool), cymene, pinene, limonene, phellandrene, geraniol and borneol, malic, oxalic and tannic acids, 1,8-cineole, ß-caryophyllene, citronellol, thymol, linalyl acetate, geranyl acetate, caryophyllene oxide, elemol, methylheptenone, flavonoids, coumarins, phthalides and phenolic acids, fixed oil, fatty matter, mucilage, tannin, malic acid, umbellifferone and scopoletin, quercetin-3-O-caffeyl, kaempferol-3-glucosides and ß-sitosterol, chlorogenic, caffeic acids, quercetin, rutin, triacontane, triacontanol, ß-sitosterol, tricosanol, psoralen, angelicincoriandrinol (ß-sitosterol glucoside). | Antidiarrhoeal, antihalitosis, appetizer, aromatic, carminative, expectorant, narcotic, stimulant, stomachic, depurative, diuretic, antipyretic,laxative, antihelmintic, refrigerant, antiinflammatory, antirheumatic, and antiscorbutic[108]. | Seed |
| 59 | *Cryptostegia grandiflora*<br><br>Common name-Rubber vine | Asclepiadaceae | Tanins, flavonoides, coumarins, steroids, and triterpens[109]. | Aperient, diuretic, emetic, emmenagogue, febrifuge, laxative, and tonic[110,111]. | Aerial Parts |
| 60 | *Cuminum nigrum*<br><br>Common name-Zeera | Umbelliferae | Essential Oil,aroma compounds are cuminaldehyde (a promising agent against alpha-synuclein aggregation),cuminic alcohol, substituted pyrazines, 2-ethoxy-3-isopropylpyrazine, 2-methoxy-3-*sec*-butylpyrazine, and 2-methoxy-3-methylpyrazine, γ terpinene, safranal, p-cymene, and β-pinene[112]. | Antidiabetic, immunologic, antiepileptic, antitumour, antimicrobial, antioxidant[113], and antifungal[114]. | Seed |
| 61 | *Cyamopsiste tragonoloba (L) Taubert*<br><br>Common name-Guar | Papilionaceae | Quinone, phenol, steroids, flavanoids, caradiac glycosides ,terpenoid, tannin, saponin, and steroids.[115] | Antidiabetic effect ,antiulcer, cytoprotective, anticholinergic, hypoglycemic, hypolipidemic, anticoagulant, hemolytic, antimicrobial, antiasthmatic, and anti-inflammatory[116]. | Pods |
| 62 | *Dioscorea japonica*<br><br>Common name-Glutinous Yam | Discoreaceae | Palmitic acid, beta-sitosterol, oleic acid, beta-sitosterol acetate, 5-(hydroxymethyl) furfural, nonanedioic acid, beta-daucosterol, cyclo-(Phe-Tyr), cyclo-(Tyr-Tyr), 6-methyl citrate, 1, 5-dimethyl citrate, and trimethyl citrate [117]. | Antioxidant and anti-inflammatory [118]. | Tubers |
| 63 | *Elephantopus scaber* | Asteraceae | Germancranolide, elephantopin and two Quinic acid esters (4,5-dicaffeoyl Quinic acid and 3,5- dicaffeoyl Quinic acid)[107], | Antimicrobial, hepatoprotective, antioxidant, antidiabetic, antiinflammatory, analgesic, | Root and Leaves |

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| | Common name- Elephant's Foot. | | Epifriedelinol, lupeol, stigmasterol, mixture of triacontan-1-o1, dotriacontan-1-o1, sesquiterpenedilactone-isodeoxyelephantopin, Sesquiterpene lactones, triterpenoids, steroids, flavonoids and essential oil [119]. | antiasthamatic, antiplatelet, and wound healing [119]. | |
| 64 | *Eucalyptus globules*<br>Common name- Tasmanian Blue Gum | Myrtaceae | Sterols, sterol esters, fatty acids, steroid ketones, hydrocarbons, triglycerides, fatty alcohol, mono&diglycerides, waxes, and tocopherols [120]. | Antidiabetic, antioxidants, insecticidal, anthelmintic, wound healing, antibacterial, antifungal, antiplaque, antitumor, antiviral, antihistaminic, antiinflammatory, antimalarial, nerve bloker, and larvicidal [120]. | Dried fruits and leaves |
| 65 | *Euphorbia prostrate*<br>Common name- Prostrate sandmat | Euphorbiaceae | Flavonoids, phenolic acid, tannins[121], sterols β-amyrine acetate, β-sitosterol, campesterol, stigmasterol and cholesterol, terpene alcohol β-terpineol, gallic acid, corilagin, 1,2,3-tri-O-galloyl-D-glucose, geraniin, various amino acids, myricylic alcohol, two triterpenes, taraxerol, and tirucallol. | Antiinflammatory, analgesic, antioxidant, haemostatic, antithrombotic,vasoprotective [121], wound healing, antihemorrhoidal, antiviral, anti-allergic, antiplatelet, and antitumour. | Aerial parts |
| 66 | *Ficus glomerata*<br>Common name- Indian Fig Tree (Gular) | Moraceae | Cycloar-tenol, euphorbol, hexacosanate, triacetate, taraxerone, tetratriterpene, glauanolacetate, racemosic acid, glau-anol, glucose, and hentriacontane [122]. | Antioxidant, hepatoprotective, hypoglycaemic, antiinflammatory, immunomodulatory, antimicrobial, analgesic, antiulcer, antidiarrheal, and anti-HIV [122]. | Leaf |
| 67 | *Ficus hispida Linn.*<br>Common name- Devil fig | Moraceae | Ficustriol, O-methyltylophorinidine, tannins, saponin, glycosides, bergapten, psoralen, β-amyrin, β-sitosterol, protein, ascorbic acid, carbohydrates, minerals, 10-keto-tetracosylarachidate, and hydrocarbons [80]. | Refrigerant, astringent, acrid, antidysenteric, antiinflammatory, depurative, vulnerary, haemostatic, galactagogue, hepatoprotective[123,124], antidiarrhoeal [125], anticancer [126], and anticoagulate [127]. | Bark |
| 68 | *Fraxinus excelsior L*<br>Common name- Ash | Oleaceae | Hydroxycoumarins, secoiridoid, glucosides, phenylethanoids, and flavonoids [128]. | Analgesic properties [129], antimicrobial, antioxidative, photodynamic damage prevention, wound healing, antiinflammatory, immunomodulatory, and antiviral [l30]. | Seed |
| 69 | *Morinda lucida*<br>Common name- Brimstone tree | Rubiaceae | Alkaloids, anthraquinones, anthraquinols, Oruwalol, Oruwal, tannins, flavonoids, saponosides, oruwacin, Ursolic, oleanolic acids, digitolutein, rubiadin 1-methyl ether, and damnacanthal [131]. | Antiinflammatory, antifever, pain-reducing, antimalarial, trypanocidal, antifungal, antidiabetic, hypoglycemic, and antibacterial [131]. | Stem bark |
| 70 | *Morus alba*<br>Common name- White Mulberry | Moraceae | Isobavachalcone, genistein, norartocarpetin, albanin A, guangsangon E, mulberrofuran F, chalcomoracin, and kuwanon J[131]. | Antibacterial, astringent, diaphoretic, hypoglycemic, odontalgic, and ophthalmic [132]. | Tender leaf |
| 71 | *Mucuna pruriens*<br>Common name- Cowitch | Leguminosae | Alkaloids, glycosides, reducing sugars, saponins, tannins, terpenoids, calcium, phosphorus, potassium, polyphenolic substances, protease inhibitor, phytic acid, and L-dopa [133]. | Antidiabetic, aphrodisiac, antineoplastic, antiepileptic, antimicrobial, learning and memory enhancement, antivenom, anthelmintic, antiinflammatory, antifungal, antioxidant, | Seed |

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| | | | | hypotensive, hypocholesterolemic, hypothermic, and antiparkinsonian [133]. | |
| 72 | *Musa paradisiacal*<br><br>Common name- Plantain (banana) | Musaceae | Tannins, saponins, reducing and non reducing sugars, sterols, triterpenes, anthocyanin, carbohydrates, amino acids, sugar,starch, cellulose, hemicelluloses, arginine, aspartic acid, glutamic acid, methionine, tryptophan, bicyclic diaryl heptanoid rel (3S-4Ar,10Br)-8-hydroxy-3-(4-hydroxy phenyl)-9-methoxy-4a,5,6,10b-tetrahydro-3H naphtho (2,1-b) pyran, 1,2 dihydro 1,2,3 trihydroxy-9-(4-methoxy phenyl) phenalene, hydroxy anigorufone, 2-(4-hydroxy phenyl) naphthalic anhydride, 1,7 bis(4-hydroxy phenyl) hepta-4(E), 6 (E)-diene-3-one, acyl steryl glycosides, -glucan phosphorylase [134]. | Hepatoprotective, hair growth promoter, diuretic, analgesic, antiulcer, wound healing, antioxidant, hypoglycemic, antiurolithiatic, mutagenic, haemostatic, and antidiabetic activity [134]. | Flower, Fruit |
| 73 | *Nigella sativa L*<br><br>Common name- Black cumin | Ranunculaceae | Nigellicine, nigellidine, nigellimine, N-oxide, thymoquinone, di-thymoquinone, thymohydroquinone, nigellone, thymol, arvacrol, oxy-coumarin, 6-methoxy-coumarin,7-hydroxy-coumarin, alpha-hedrin, steryl-glucoside, flavinoids, tannins, essential fatty acids,essential amino acids, ascorbic acid,terpines, iron and calcium [135]. | Carminative, aromatic, stimulant, diuretic, anthelmitic, galactagogue, diaphoretic, antimicrobial, hepatoprotective, antidiabetic, antiinflammatory, antifertility, antioxytocic, cytotoxic, and analgesic [136]. | Seed |
| 74 | *Nymphaea stellata*<br><br>Common name- Water lilies | Nymphaeaceae | Phenols, flavones, tannins, protein, glycosides, saponins, alkaloids, and steroids [137]. | Aphrodisiac, antioxidant, antidiabetic, antiinflammatory, antihepatotoxic,antioxidant, anti microbial, cytotoxic, and scavenging activity [137]. | Flower, leaf |
| 75 | *Olea europaea*<br><br>Common name- Olive | Oleaceae | Flavonoids, flavone glycosides, flavanones, iridoids, iridane glycosides, secoiridoids, secoiridoid glycosides, triterpenes, biophenols , benzoic acid derivatives, xylitol, sterols, isochromans, sugars, phenolic compounds, flavonoids, secoiridoids, secoiridoid glycosides, Lignans, hydroxytyrosol derivatives , Oleuropein Galactolipids, triacylglycerols, and fatty acids [138]. | Antioxidant, antidiabetic, antimicrobial, antihypertensive, antiinflamatory, gastroprotective, enzyme inhibition, and neuroprotective [138]. | Leaves |
| 76 | *Origanum vulgare L.*<br><br>Common name- Wild marjoram. | Lamiaceae | Alkaloids, saponins, coumarins, sterols, terpenes, tannins, and flavonoids [139]. | Stimulant, expectorant, antibacterial, anticancer, antiinflammatory, antioxidant, laxative, antiurolithic, antispasmodic, diuretic, and pain relieving activity [139]. | Leaf |
| 77 | *Panax ginseng*<br><br>Common name- Ginseng | Araliaceae | Triterpene glycosides, or saponins, amino acids, alkaloids, phenols, proteins, polypeptides, vitamins B1 and B2 [140]. | Anticarcinogenic, immunomodulatory, antiinflammatory, antiallergic, antiatherosclerotic, | Berry, stem, leaf. |

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| | | | | antihypertensive, antidiabetic ,antistress , adaptogenic, pain-relieving effects, antitumor, enhanced liver function, anti fatigue, antioxidative, and anti-aging effects [140]. | |
| 78 | *Pongamia pinnata*<br><br>Common name- Karanj | Leguminosea e | Flavanoids, fatty acids, Karangin, sterols, sterol derivetives, disaccharides, olic acid, stearic acid, palmitic acid, Hiragonic,octadecatrienoic acid, pongamol, pongagalabrone pongapin, pinnatin, kanjone, metabolites: beta-sitosteryl acetate, galactoside, stigma sterol, galactoside, and sucrose [141]. | Antihyperglycemic, antilipidperoxidative, antioxidants, antihyperammonemic, antifungl, antibacterial, antiinflammatory, antiviral, antifilarial, antidiarrheal, antimotility, antisecretory, antimicrobial, nootropic, antinociceptive, protective effect against nephrotoxicity, antioxidant, and ulceroprotective activity [141]. | Pods, flower |
| 79 | *Prunus persica*<br><br>Common name- Peach | Rosaceae | Cyanogenic glycosides, amygdalin, prunasin glycerides, sterols, emulsion, Acetophenone 6-hydroxy 4-methoxy 2-O-β-D-glucopyranoside, Crysophenol 8-O-β-D-glactopyranoside, β-Sitosterol, and Querceitin [142]. | Antifungal, insectisidal, antibacterial [143], antiinflammatory, antitumor, antihyperglycemic, protecting against ultraviolet-induced DNA damage, anticancer, purgative, and diuretic [144]. | Flowers |
| 80 | *Radix astragali seu* hedysari<br><br>Common name- Astragalus. | Leguminosae | Flavonoids, saponins, polysaccharides, amino acids, various trace elements, benzofurans, organic acids, and lignans. | Immunostimulant, cardiotonic, hepatoprotective, antidiabetic, antiviral, hypotensive, antiageing, antioxidant, antiinflammatory, and analgesic [145]. | Root |
| 81 | *Radix clematidis*<br><br>Common name- Root of Chinese Clematis | Chinensis | Saponins, prosapogenins, protoanemonin [146]. | Antimicrobial, antidiabetic, induction of labor [146], antidiuretic, and analgesic [147]. | Root |
| 82 | *Radix Trichosanthis*<br><br>Common name- Trichosanthes root | Cucurbitaceae | Saponins, polysaccharide, amino acid, protein, flavonoids, steroid or triterpenoid aglycone (sapogenin) [148]. | Antitumor, antivirus, immunomodulatory, abortifacient, antiinflammatory, molluscicidal, antimicrobial, antispasmodic, antidiabetic, and antioxidant [148]. | Root |
| 83 | *Rhizoma Pinelliae*<br><br>Common name- Pinellia Tuber | Areaceae | Stigmast-4-en-3-one, cycloartenol, 5alpha, 8alpha-epidioxyergosta-6,22-dien-3-ol, beta-sitosterol-3-O-beta-D-glucoside-6'-eicosanate, alpha-monpalmitin, and beta-sitosterol [149]. | Cytotoxic, anti-tumor, antiemetic, insecticidal, antitussive, antimicrobial, and anticonvulsant [150]. | Rhizome |
| 84 | *Semen Cuscutae*<br><br>Common name- Cuscuta seed | Convolvulaceae | Alkaloids, anthraquinone, coumarin, flavones, glycoside sterols, terpene, tannic acid , sterols, and amino acid. | Antiaging, anticancer, antibacterial, and deficient kidneys effect. | Seed |
| 85 | *Semen litchi*<br><br>Common name -- litchi see | Sapindaceae | P-hydroxy- benzaldehyde, protocatechuic acid, daucosterol, kaempferol-3-O-β-D-glucopyranoside, enol compounds, flavonoids, and total saponins [151]. | Antidiabetic, blood lipid modulation, antioxidant, antivirus, antitumor, anti-liver injury, and enhancing insulin sensitivity activities [151]. | Seed |
| 86 | *Suaeda fruticosa* | Chenopodiace | Alkaloids, carbohydrates, and fatty acids | Antibacterial, antifungal, laxative, | Aerial |

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| | *(SF) Euras*<br><br>Common name -- Shrubby Seablite | ae | [152]. | diuretic, antiemetic, hepatoprotective, and antimicrobial [152]. | parts |
| 87 | *Emblica officinalis*<br><br>Common name – Amla | Euphorbiaceae | Vitamin C, fixed oil, phosphatides, essential oil, free sugars: D-glucose, D-fructose, D-myo-inositol. pectin with D-galacturonic acid, D-arabinosyl, D- rhamnosyl, D-xylosyl, D-glucosyl, D-mannosyl and D- galactosyl residues, fatty acids: linolenic, linoleic, oleic, stearic, palmitic. myristic, quercetin, phyllaemblic compounds, gallic acid, tannins: Emblicanin A and Emblicanin B, flavonoids, polyphenolic compounds, terpenoids, alkaloids, and leucodelphinidin [153]. | Aperient, antibacterial, antifungal, antiviral, antioxidant, aphrodisiac, chelating agent, diuretic, and antidiabetic [153]. | Fruit, Leaves, Seed |
| 88 | *Eugenia uniflora*<br><br>Common name - Pitanga fruits, Brazilian cherry tree | Myrtaceae | Oxygenated sesquiterpenes, sesquiterpene hydrocarbons, Curzerene, $\gamma$-elemene, Myrcene, Limonene, Linalool, (*Z*)-3-Hexenyl butyrate, Cuminaldehyde, -Elemene, -Cubebene, Sativene, (*E*)-Caryophyllene, *trans*- -Bergamotene, Aromadendrene, -Humulene, Alloaromadendrene, $\beta$-Chamigrene, Germacrene D, $\beta$-Selinene, Curzerene, $\gamma$-Cadinene, -Cadinene, Selina-3,7-(11)-diene, Germacrene B, Spathulenol, Caryophyllene oxide, Globulol Viridiflorol, *trans*-$\beta$-Elemenone, Atractilona, Eudesm-7(11)-en-4-ol, and*trans*-$\beta$-elemenone[154]. | Antihypertensive [155], antidiabetic [156],<br>Antitumor [157], analgesic [158], antiviral, antifungal [159], antiinflammatory properties [160]. | Leaves |
| 89 | *Eugenia jambolana*<br><br>Common name – Black plum | Myrtaceae | Flavonoids, terpenes, and anthocyanins, carbohydrates, and minerals. | Antibacterial, antifungal, antiviral, anti-genotoxic, antiinflammatory, anti-ulcerogenic, cardioprotective, anti-allergic, anticancer, chemopreventive, radioprotective, free radical scavenging, antioxidant, hepatoprotective, antidiarrheal, hypoglycemic, and antidiabetic effects [161]. | Seed |
| 90 | *Euonymus alatus*<br><br>Common name - Winged Spindle Tree) | Celastraceae | 2,3-dihydroxypropanyl hentetracosanate and neozeaxanthin A [162]. | Antioxidants [163]. | Stem |
| 91 | *Fructus coini*<br><br>Common name - NA | Cornaceae | Ursolic acid and oleanolic acid [75]. | Antidiabetic activity [75]. | Fruit pulp |
| 92 | *Fumaria parviflora*<br><br>Common name - fumitory, earth smoke, beggary, fumus, vapor, fumittery or wax dolls | Fumariaceae | Isoquinoline alkaloids: protropine, cryptopine, sinactine, stylopine, bicu-culine, adlumine, parfumine, fumariline, fumaro-phycine, fumaritine, dihydro-fumariline, per-fumidine and dihydrosanguirine [164]. | Antiscabies, antiscorbite, antibronchite, diuretic, expectorant, antipyretic, diaphoretic, appetizer and antineoplastic, and hepatoprotective effects [164]. | Aerial parts |

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| 93 | *Galega officinalis*<br><br>Common name - Galega | Fabaceae | Saponin, tannins, glycoside, alkaloid, flavonoid, cardiac glycoside, phenol, resin, terpens and steroids [165]. | Diuretic, platelet aggregation, anti-bacterial, and anti-diabetic effect [166]. | Leaves and flowering top |
| 94 | *Garcinia kola*<br><br>Common name – Bitter kola | Clusiaceae | Biflavonoids, xanthones, kolanone, ameakoflavone, 24methylenecyclartenol, coumarine and prenylate benzophenones. Others include oleoresin , the chromanols, garcioic and garcinal [167]. | Purgative, antiparasitic, antimicrobial, antiviral, antiinflammatory, antidiabetic, antioxidant, hepatoprotective, antiulcer, antidiabetic, antihypertensive, and analgesic [168]. | Seed |
| 95 | *Glycine max*<br><br>Common name - Soyabean | Leguminosae | Proteins: globulins, 11S glycinin and 7S β -conglycinin, hemagglutinin, trypsin inhibitors, -amylase and lipoxygenases. Oil: triglycerides, polyunsaturated fatty acids like linoleic acid and -linolenic acid. Phospholipids, collectively called lecithin, as well as phytosterols, and tocopherols. Carbohydrates, Vitamins and minerals: - tocopherol, β -tocopherol, γ-tocopherol, and –tocopherol. Isoflavones, flavones, flavonols, aurones, red and blue anthocynin pigments, chalcones, Phytosterols: β -sitosterol, campesterol andstigmasterol. Phospholipids: phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl inositol, phosphatidic acid. soy saponins, ferritin [169]. | Estrogenic, hypocholesterolemic, anti-carcinogenic, immunostimulator, antiatherogenic, and antioxidant [169]. | Seed |
| 96 | *Gongronema latifolium*<br><br>Common name - utazi | Asclepidaceae | Polyphenols, alkaloids, glycosides and reducing sugars, pregnan ester glycosides, namely (17β)-marsdenin-12-O-acetate 3-O-[6-deoxy-3-O-methyl- β-D-allopyranosyl-(1 4)-β-D-canaropyranoside (7) and 3-O-[β-D-glucopyranosyl-(1 4)-6-deoxy-3-O-methyl-β-D-allopyranosyl-(1 4)-β-D-canaropyranosyl-11,12-di-O-tigloyl- 17β-marsdenin, saponins, flavonoids, and tannins [170]. | Hypoglycemic, hypolipidemic, antioxidative [171], antidiarrheal, and anti-tussive [172]. | Leaves |
| 97 | *Herbaepimedii*<br><br>Common name – Horny goat weed | Berberidaceae | Lignans, flavonoids-epimedin A, B, C and icariin, flavonol glycosides, terpene glycosides and phenolic carboxylic acids [173]. | Antioxidant, estrogen-like activity, osteoprotective, anticancer, immunological effects, antidepressant, cardiovascular effects, and neurological effects [173]. | Branches and leaves |
| 98 | *Hibiscus rosasinensis*<br><br>Common name – China rose | Malvaceae | β-sitosterol, stigmasterol, taraxeryl acetate, cyclopropane compounds and their derivatives, cyanidindiglucoside, flavonoids and vitamins, thiamine, riboflavin, niacin and ascorbic acid, Quercetin-3-diglucoside, 3,7-diglucoside, cyanidin- 3,5-diglucoside and cyanidin-3-sophoroside-5- glucoside, kaempferol-3- xylosylglucoside [174]. | Aphrodisiac, emollient, aperient, antifertility, anticomplementary, anti-diarrhetic, anti-phologistic, anti-spermatogenic, androgenic, anti- tumour, antioxidant, anticonvulsant, oral contraceptive, laxative, antimplantation, abortifacient, anti-tumour and | Leaves, flowers |

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| | | | | anticonvulsant [174]. | |
| 99 | *Humulus lupulus*<br><br>Common name – hop plant | Cannabinaceae | Volatile oils, resins, tannins, flavones (rutin, quercetin), chalcone (xantohumol), flavanones (izoxantohumol), choline, asparagine, trimethylamine, and p-aminobenzoic acid. | Antimicrobial, stimulative, sedative, general tonic, and cavity-preventive activity [175]. | Strobiles |
| 100 | *Hypoxis Radix*<br><br>Common name – African potato | Hypoxidaceae | Pentenyne glycoside hypoxoside[176], cytokininszeatin, zeatinriboside and zeatinglucoside [177]. | Antioxidant, anti-inflammatory, antimicrobial, antinociceptive, anticonvulsant, and and antidiabetic [178]. | Corm |
| 101 | *Inula racemosa*<br><br>Common name – Indian elecampane | Asteraceae | Sesquiterpene lactones, Alantolactone (ALT), isoalantolactone (IALT), Dihydroalantolactone, dihydroisoalantolactone, inunolide, B-setosterol, D-mannitol, dihydroxinunolide, neo-alantalactone, in-unolise, and alantodiene [179]. | Anti-hyperglycemic, cardiac activity, anti-dermatophytic, hepatoprotective, antiinflammatory, anti-fungal, and antibacterial [180]. | Root |
| 102 | *Ipomoea Batatas*<br><br>Common name – sweet potato | Convolvulaceae | Alkaloids, flavonoids, tannins, saponins, steroids, phenol, anthraquinone, Phlobatannin, Glycosides and terpenoids [181]. | Hypoglycemic effect [181]. | Leaves |
| 103 | *Lantana camara*<br><br>Common name - Lantana | Verbenaceae | Oleanonic acid, 22β-acetoxylantic acid and 22β- dimethylacryloyloxylantanolic acid, diterpenoids and rich in essential oils. Monoterpenes, triterpenes, flavones coumarin, steroids, and iridoid glycosides [182]. | Antimicrobial, fungicidal, insecticidal nematicidal, immunosuppressive, anti-tumor, anti-fertility, antifilarial, antiurolithiatic, antimotility, antiulcerogenic, anti-mutagenic, wound healing, antiinflammatory, hemolytic, antihyperglycemic, antioxidant, anticancer and antiproliferative activity [182]. | Fruits |
| 104 | *Lawsonia inermis*<br><br>Common name – Henna | Lythraceae | Lawsone, 2- hydroxy-1:4 napthaquinone, gallic acid, glucose, mannitol, fats, resin, mucilage and traces of an alkaloid, hennatannic acid and an olive oil green resin, essential oil, - and β- ionones, proteins, carbohydrates, fibers , fatty oils composed of behenic acid, arachidic acid, stearic acid, palmitic acid, oleic acid and linoleic acid [183]. | Analgesic, hypoglycemic, hepatoprotective, immunostimulant, anti-inflammatory, antibacterial, antimicrobial, antifungal, antiviral, antiparasitic, antitrypanosomal, antidermatophytic, antioxidant, antifertility, tuberculostatic, and anticancer [183]. | Leaves |
| 105 | *Lepidium sativum*<br><br>Common name – Garden cress | Brassicaceae | Alkaloids such as lepidine, glucotropaeolin, N,N'-dibenzyl urea, N,N'-dibenzylthiourea, sinapic acid and its choline ester (sinapin); carotene, cellulose, calcium, phosphorus, iron, thiamine, riboflavin, niacin, uric acid. Seed oil known to contain palmitic, stearic, oleic, linoleic, arachidic, behenic, lignoceric acids, benzyl isothiocyanate, benzyl cyanide, sterol and sitosterol, proteins, fat, carbohydrates, minerals – calcium and phosphorus, trace elements such as iron, nickel, cobalt and iodine, also contains various vitamins such as vitamin A, thiamine, | Chemoprotective effects, antidiabetic, antihypertensive, fracture healing property ,diuretic, hepatoprotective, antidiarrheal, antioxidant, hypercholesterolemic, laxative, nephroprotective, and pesticidal [184]. | Seed |



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| | | | riboflavin, niacin and ascorbic acid, stigmast-5-en-3β, 27-diol- 27-benzoate, glucotropoeolin, 4-methoxy glucobrassicin, sinapine, sinapic acid, calmodulin, sinapoyglucose, esters of caffeic, p-coumaric, ferulic, quinic acids, protein, minerals, vitamins, 5-4'-dihydroxy- 7,8,3',5-tetramethoxyflavone, 5-3'-dihydroxy-7,8,4'-trimethoxyflavone, 5-3'- dihydroxy-6,7,4'-trimethoxyflavone [184]. | | |
| 106 | *Leucaena leucocephala*<br><br>Common name - kubabul | Leguminosae | Lipids, crude protein and carbohydrates, tannin and oxalic acid , oil, and mimosine [185]. | Abortifacient, cancer chemopreventive, anti-proliferative, anthelmintic, antidiabetic and antibacterial [185]. | Seed |
| 107 | *Lirio pespicata*<br><br>Common name - NA | Liliaceae | Steroidal glycorides, tentatively named glycoside I, II, III and IV or beta.-sitosterol (major) and stigmasterol (minor)-.beta.-D-glucopyranoside (glycoside I), 25(S)-ruscogenin 1-O-.beta.-D-fucopyranosido-3-O-.alpha.-L-rhamnopyrannoside (glycoside II), 25(S)-ruscogenin 1-O-.alpha.-L-rhamnopyranosyl (1 .fwdarw. 2)-.beta.-D-xylopyranoside (glycoside III) and 25(S)-ruscogenin 1-O-[.alpha.-L-rhamnopyranosyl(1.fwdarw.2)][.beta.-D-xylopyra-nosyl(1.fwdarw.3)]-.beta.-D-fucopyranoside (glycoside IV) [186]. | Antidiabetic [187]. | Root |
| 108 | *Lithospermum erythrorhizon*<br><br>Common name - NA | Boraginaceae | Lithospermumerythrorhizon, Lithosperman A,B & C [75]. | Antibacterial, wound healing, anti-inflammatory, antithrombotic, and antitumor effects [188]. | Seed |
| 109 | *lupinus albus*<br><br>Common name - lupin | leguminosae | Protein , lipids, fatty acids, ash, fibre, amino acids, carbohydrates, calcium, phosphorus, zinc, iron, copper and manganese, antioxidants including vitamin E, vitamin C, thiamin, riboflavin and niacin [189], | Hypoglycemic, antibacterial, and anti-parasitic [189]. | Seed |
| 110 | *Lythrum salicaria*<br><br>Common name – Loosestrife | Lythraceae | Flavon C-glycosides (vitexin, isovitexin, orientin and isoorientin), anthocyanins, vescalagin, pedunculagin, vanoleic acid dilactone, 1,6-di-O-galloylglucose, 1-O-galloylglucose and 6-O-galloylglucose and β-sitosterol, and tannin [190]. | Antioxidant, antimicrobial, and hypoglycaemic [190]. | Stems and flowers |
| 111 | *Mangifera indica*<br><br>Common name – mango tree | Anacardiaceae | Vitamins (A, B6, C, D, E and K), carotenoids, essential elements (potassium and copper), amino acids antioxidants, carotenoids, polyphenols, omega-3 and omega-6 polyunsaturated fatty acids, provitamin A, carotene (a and b), lutein (3), polyphenols (quercetin, kaempferol, gallic acid, caffeic acid, catechins, tannins and mangiferin [191]. | Analgesic, antiinflammatory, immunostimulant, antioxidant, spasmolytic, antidiarrheal, antilipidemic, antidiabetic, antiamebic, anthelminthic, antiallergic, and antibacterial [192]. | Leaves, Stem Barks, and Seed |
| 112 | *Momordica* | | Vit-E, fatty acids, carbohydrates, flavonoidal | Antioxidant, anti-microbial, and | Fruits, |

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| | *cochinchinensis*<br><br>Common name – Gac | | glycosides [193]. | antidiabetic [193]. | seeds, and leaves |
| 113 | *Murraya koenigii*<br><br>Common name – curry leaf or karipatta | Rutaceae | Carotenoids: lutein, -tocopherol, carotene, β-carotene, Carbazole alkaloids: 8, 10'-{3,3',11, 11'-tetrahydro-9,9' dihydroxy- 3,3',5, 8'-tetra methyl –3,3'-bis (4-methyl-3-pentenyl)}bispyrano (3,2 a) carbazole (a dimericcarbazole alkaloid), koenimbine, O-methyl murrayamine, O- methyl mahanine, isomahanine and bismahanine and bispyrayafoline, glycozoline, 1-formyl –3 methoxy- 6-methyl carbazole and 6, 7-dimethoxy- 1- hydroxy- 3-methyl carbazole, Koenigine, koenine, koenidine and (-) mahanine, mahanimbine, isomahanimbine, koenimbidine and murrayacine,Isomahanimbicine, Euchrestine B, mahanine, mahanimbicine, mahanimbine, bismurrayafoline E, mahanimbicine, bicyclomahanimbicine, cyclomahanimbine, bicyclomahanimbine, mahanimbidine, mukonicine, 8, 8"- biskoenigine, new binary carbazole alkaloid along with its monomer koenigine, koenigine- quinone A and koeniginequinone B, structures were established as 7- methoxy- 3 methyl carbazole- 1,4- quinone and 6, 7-dimethoxy-3-methyl carbazole-1, 4- quinone, 9-carbethoxy-3-methyl carbazole and 9- formyl –3- methyl carbazole, Me- 2-methoxycarbazole –3- carboxylate and 1-hydroxy –3- methyl carbazole, Murrayazolinol (a minor carbazole alkaloid), mahanimbinol, murrayazolidine, murrayacinine, mukonidine, murrayazolinine, murrayanine, girinimibine and mahanimbine, girinimbinol and mahanimbilol, Mahanimbine,koenimbine, sesquiterpenes, b-caryophyllene, bicyclogermacrene, a-cadinol, caryophyllene epoxide, b-selinene, humulene, apinene, sabinene, ß-pinene, ß-caryophyllene, limonene, bornyl acetate,terpinen-4-ol, g-terpinene and a-humulene,monoterpenoids, β-caryophyllene, β-phellendrene, - pinene, β-elemene and β thujen, - caryopyllene, cardinene, selinene, linalool, trans ocimen, gujunene, monoterpenoids, sesquiterpenoids, β-caryophyllene, (E)- β-Ocimene and linalool [194]. | Antioxidant and free radical-scavenging activity, activity, activity, antimicrobial and anti-fungal activity, pancreatic lipase inhibitory effect, effect on dental caries, anticancer activity, antiinflammatory, immunomodulatory, cardioprotective, antiosteoporotic, antiobesity and antihyperlipidemic activities, antiamnesic and wound-healing activity, kidney protective activity, antipyretic, antiulcer, antitrichomonal, antidiarrheal, anthelmintic, and cosmetic use [194]. | Leaves |
| 114 | Nelumbo nucifera | Nymphaeacea | Dauricine, L. iensinine, Isoliensinine , | Cardiovascular activity, | Rhizome |



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| | Common name – Indian lotus, Chinese water lily and sacred lotus | e | lotusine, Neferine, Nuciferine, N-Nornuciferine, O-Nornuciferine, Pronuciferine, Roemerine, Armepavine, Gallic acid, Procyanidin, Anonaine, D(–)-3'-bromo-O-methyl-armepavine, Coclaurine, Norcoclaurine, D-1,2,3,4-tetrahydro-6-methoxy-1-(p-methoxybenzly)-2-methyl-7-isoquinolinol, Liriodenine, Dehydroemerine, Dehydronuciferine, Dehydroanonaine, Nelumboside, Remerine, Quercetin-3-O-β-D-glucuronide, N-methyl-coclaurine, N-methylisococlaurine, Kaempferol 3-O-β-D-glucopyranoside, Kaempferol 7-O-β-D-glucopyranoside, Kaempferol 3-O-β-L-rhamnopyranosyl-(1,6)- β-D-glucopyranoside, Kaempferol 3-O-β-L-rhamnopyranosyl-(1 2)- β-D-glucopyranoside, Kaempferol 3-O-β-L-rhamnopyranosyl-(1 2)- β-D-glucuronopyranoside, Kaempferol 3-O- -D-glucuronopyranoside[195]. | hypocholesterolemic, analgesic, anthelmintic, antiobesity, hematopoietic, cosmetic agent, antioxidant, diuretic, psychopharmacological, antidiabetic, antipyretic, antimicrobial, aphrodisiac, anti-fibrosis , anti-proliferative, immunomodulatory, and hepatoprotective [196]. | |
| 115 | Nymphaea nouchali<br>Common name – Indian blue water lily | Nympheaceae | Protein, pentosan, mucilage, tannins, Astragalin, corilagin, gallic acid, gallic acid methyl ester, isokaempferide, kaempferol, quercetin-3-methyl ether, quercetin, 2,3,4,6-tetra-o-galloyl dextroglucose, and 3-o-methylquercetin-3'-o-beta dextroxylopyranoside , crude protein-16.8, ash-, crude fat, crude fiber, and nitrogen free extract, sodium, potassium, calcium, phosphorus, Apomorphine, nuciferine, and nornuciferine [197]. | Antidiabetic, antihepatotoxic, cholinergic, analgesic anti-inflammatory, antimicrobial, antibacterial, antifungal, antiprotozoal, antiviral, and diuretic [197]. | Leaves |
| 116 | *Opuntia sterptacanthas*<br>Common name – Prickly Pear | Cactacceae. | Isorhamnetin-glucoside, kaempferol, luteolin, penduletin, piscidic acids, quercetrin, rutin, and β-sitosterol, galactose, arabinose, xylose, and rhamnose, biothiols, taurine, flavonols, tocopherols, and carotenoids. | Antidiabetic, anti-inflammatory, hypocholesterolemic, anti-ulcer, antioxidant, diuretic, neuroprotective, antiviral, and wound healing. | Stems |
| 117 | *Combretum micranthum*<br>Common name – Combretumaltum Perr | Combretacea e | Flavonoids, saponins, cyano-genetic and cardiac glycosides [198]. | Antipyretic, tonic, diuretic, antidiarrheal and choleretic, anti-viral and anti-inflammatory [199]. | Leaves |
| 118 | *Dioscorea dumetorum Pax*<br>Common name – Bitter yam or cluster yam | Dioscoreacea e | Alkaloid, dihydrodioscorine, dioscorine and dumetorine, sapogenin, and diosgenin [200]. | Schistosomiasis, anaesthetic, and hypoglycaemic [200]. | Tuber |

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| 119 | Oryza sativa<br><br>Common name – Rice | Poaceae | Anthocyanin - cyaniding-3-0-glucoside and peoxidin-3-0-glucoside, carbohydrates, protein, fat, flavonols, flavones, flavanones, isoflavones, catechins, anthocyanidins and chalcones [201]. | Antineurotic, antirheumatic, anti-allergic, antiplatelet, anti-inflammatory, antitumour and antioxidant activities [201]. | Root |
| 120 | *Panax quinquefolius*<br><br>Common name – American Ginseng | Araliaceae | Ginsenosides, polyacetylenes, alkaloids, polysaccharides, oligosaccharides, oligopeptides, phenolic compounds, lipids, vitamins, and minerals [202]. | Adaptogen, aphrodisiac, anti-depressant, immunopotentiating, antineoplastic, and antiapoptotic properties [202]. | Root |
| 121 | Paeonia lactiflora<br><br>Common name – common garden peony | Paeoniaceae | Paeoniflorin, albiflorin, oxypaeoniflorin, benzoylpaeoniflorin, oxybenzoyl-paeoniflorin, paeoniflorigenone, lactiflorin, galloylpaeoniflorin, paeonin, paeonolide, and paeonol [203]. | Immunomodulatory, analgesic, antioxidant and anti-inflammatory [203]. | Root |
| 122 | *Phyllanthu sfraternus*<br>Common name – Bhumiamalki, Bhoiamli | Euphorbiacea e | Alkaloids, flavonoids, tannins, glycosides, saponin, carbohydrates, resins and phenols [204]. | Analgesic and as an aperitif, carminative, digestive, laxative, stomachic, tonic, and vermifuge [204]. | Leaves |
| 123 | *Picrorhiza kurrooa*<br><br>Common name – Kutki | Scrophulariac eae | Vanillic acid, apocyanin (4'-hydroxy-3'-methoxy acetophenone), picroside-I:[(2R,3S,4S,5R,6S)-6-[[(1aS, 1bS,2S,5a R,6S, 6aS)-6- hydroxy-1a-(hydroxymethyl)-2,5a,6,6a-tetrahydro-1bH-oxireno[5,6]cyclopenta [1,3-c]pyran-2-yl]oxy]-3,4,5-trihydroxyoxan-2- yl] methyl (E)-3 phenylprop-2-enoat, picroside-II: [1a-(hydroxymethyl)-2-[3,4,5-trihydroxy-6-(hydroxymethyl)oxan-2-yl]oxy-2,5a,6,6a-tetrahy dro-1bH- oxireno[5,6]cyclopenta[1,3-c]pyran-6-yl]4-hydroxy-3-methoxy benzoate, kutkoside: [1a,1b,2,5a,6,6a-Hexahydro-6-hydroxy-1a-[[(4-hydroxy-3-methoxy benzoyl)oxy] methyl]oxireno[4,5]cyclopeanta[1,2-c]pyran]-2- yl β-D-glucopyranoside (10 vanilloylcatalpol), picroside-III: (1aS,1bS,2S,5aR,6S,6aS)-1a,1b,2,5a,6,6a-Hexahydro-6-hydroxy-1a-(hydroxymethyl)oxireno[4,5]cyclopenta[1,2-c]pyran-2-yl beta-D-glucopyranoside 6- [(2E)-3-(4-hydroxy-3-methoxyphenyl)-2-propenoate], (2β,3β,9β,10 ,16 , 20ϵ,24ϵ)-20,24-epoxy-2-(β-D-glucopyranosyloxy)-3,16, 25, 26-tetrahydroxy-9-methyl-19-norlanost-5-en-11-one, pikuroside: β-D-glucopyranoside, (3R,5S,5aS,6R,7S, 8R, 8aS)- hexahydro-8,8a-dihydroxy-7-[(4-hydroxy-3-methxy benzol) oxy]-3,6-methano-1H-cyclopenta[e] [1,3]dioxepin-5-yl, 1-O-galloyl-β-D-glucose (9) 1-O,3-O,6-O-trigalloyl β-D-glucose (10) 1-O,2-O,3-O,4- | Anti-inflammatory, hepatoprotective, immunomodulatory, free radical scavenging, gastric ulcer, anti-allergic and anti- anaphylactic, anti-hepatitis-B surface antigen activity, antispasmodic, antitumor, antiviral, purgative, antioxidant, anti-phosphodiesterase, neuritogenic, antidiabetic, antiasthmatic, cardioprotective, molluscicidal and leishmanicidal activities [205]. | Rhizome |



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| | | | O,6-O-pentagalloyl-β-D-glucose (11) (52) isochebulic acid [205]. | | |
| 124 | *Poria cocos*<br><br>Common name – Indian bread | Polyporaceae | Triterpene and polysaccharide [206]. | Anti-fungal, antibacterial, antioxidant, neuroprotective, anti-hypertonic, anti-inflammatory, anti-angiogenic, and anti-cancer [207]. | Sclerotium |
| 125 | *Psidium guajava*<br><br>Common name – Guava | Myrtaceae | Vitamin C, vitamin A, iron, calcium, manganese, phosphoric, oxalic and malic acids, saponin combined with oleanolic acid. Morin-3-O- -L-lyxopyranoside and morin-3-O- -L-arabopyranoside, flavonoids, guaijavarin, Quercetin. Essential oil contains hexanal, -2-hexenal , 2,4-hexadienal, 3-hexenal, 2-hexenal, 3- hexenyl acetate and phenol, while β-caryophyllene, nerolidol, 3-phenylpropyl acetate, caryophyllene oxide, pentane-2-thiol, 3-penten-2-ol and 2-butenyl acetate, 3-hydroxy-2-butano3-methyl-1-butanol, 2,3- butanediol, 3-methylbutanoic acid, (Z)-3-hexen-1-ol, 6- methyl-5-hepten-2-one, limonene, octanol, ethyl octanoate, -pinene, β-pinene, limonene, menthol, terpenyl acetate, isopropyl alcohol, longicyclene, caryophyllene, β-bisabolene, caryophyllene oxide, β-copanene, farnesene, humulene, selinene, cardinene and curcumene, mallic acids, nerolidiol, β-sitosterol, ursolic, crategolic, and guayavolic acids, cineol, quercetin, 3-L-4-4-arabinofuranoside (avicularin) and its 3-L-4-pyranoside (Essential oil), resin, tannin, eugenol, caryophyllene (1a -, 4a -, 7 -, 7a β-, 7b - )]-decahydro-1H-cycloprop[e] azulene, Guajavolide (2 -,3 β-,6 β-,23-tetrahydroxyurs-12-en-28,20 β-olide; 1) and guavenoic acid (2 -,3 β-,6 β-,23-tetrahydroxyurs-12,20(30)-dien-28-oic acid, triterpeneoleanolic acid, triterpenoids, flavinone-2 2'-ene, prenol, dihydrobenzophenanthridine and cryptonine,polyphenols, resin and crystals of calcium oxalate, Tannin, leukocyanidins, sterols, gallic acid, carbohydrates, salts, tannic acid, Proteins, starch, oils, phenolic, flavonoid compounds, flavonol glycoside, quercetin-3-O-β-D-(2"-O- galloyglucoside)-4'-O-vinylpropionate [208]. | Antioxidant, anti-diabetic, antimicrobial, hepatoprotective, antidiarrheal activity, spermatoprotective, antimutagenic, inotropic, spasmolytic, anti-cancer, analgesic, anti- inflammatory, immunomodulatory, antiproliferative, and antipyretic [208]. | Leaves |
| 126 | *Punica granatum*<br><br>Common name – pomegranate | Lythraceae | Ellagic acid ellagitannins (including punicalagins), punicic acid, flavonoids, anthocyanidins, anthocyanins, estrogenic flavonols, glucose, ascorbic acid, gallic acid, caffeic acid, catechin, EGCG, quercetin, rutin, and flavones [209]. | Antioxidant, anticarcinogenic, and anti-inflammatory [209]. | Fruit |

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| 127 | *Radix Angelica Sinensis*<br><br>Common name – Chinese Angelica | Umbelliferae | Simple alkyl phthalides (ligustilide, (Z)-ligustilide, (Z)-6,7-epoxyligustilide, angelicide, (Z)-butylidenephthalide, butylphthalide, 2,4-dihydrophthalic anhydride), terpenes (β-cadinene, carvacrol and cis-β-ocimene), phenylpropanoids ((E)-ferulic acid, coniferylferulate); benzenoids (valerophenone-o-carboxylic acid and vanillic acid); and coumarins (angelol G, angelicone and umbelliferone) [210]. | Antihepatotoxic, cardiovascular activity, and antithrombotic activity [210]. | Root |
| 128 | *Rauwolfia serpentina*<br><br>Common name – Indian snake root | Apocyanaceae | Reserpine, Ajmalicine, ajmaline, isoajmaline, ajmalinine, chandrine, rauwolfinine, renoxidine, rescin-namine, reserpiline, reserpin, reserpinine, sarpagine, serpentine, serpentinine, tetraphyllicine,yohimbine, 3-epi-a- yohimbine, ophioxylin, resin, starch, wax, Riboflavin, thiamine, and niacin [211]. | Analgesic, antispasmodic, bactericidal, cardiovascular effects, antipsychotic, anticancerous, antioxidants, anti-inflammatory, anticholinergic, hypotensive, anticontractile, sedative, relaxant, hyperthermic, antidiuretic, sympathomimetic, hypnotic, vasodialater, antiemetic, anti-fibrillar, tranquilizing agent, anti-arrhythmic, antifungal, antidiabetic and nematocidal [212]. | Root |
| 128 | *Retama raetam*<br><br>Common name – White broom | Fabaceae | Alkaloid, essential oils and flavonoids [213]. | Emetic, purgative, vermifuge, anthelmintic, antiseptic, antidiabetic, analgesic, antibacterial, antifungal, antiviral, cytotoxic, hypoglycemic, diuretic, anti-hypertensive, and antioxidant [213]. | Root |
| 129 | *Telfairia occidentalis*<br><br>Common name – Telfairia Nut | Cucurbitaceae | Tannins, reducing sugars, glycosides, and sterol and triterperoids, flavonoids, alkaloids, saponins, steroids, anthraquinones, and reducing sugars, pentadecanoic acid, hexadecanoic acid; 16- octadecenoic acid methyl ester; 9, 12- octadecadienoyl chloride (Z,Z); 9- Octadecadienoic acid (Z)-, 2, 3-dihydroxypropyl ester; Octadecanoic acid; hexadecanoic acid, 2,3-bis[(trimethylsilyl)oxy] propyl ester in the hexane fraction and 2,4-heptadien-6-ynal,(E,E); benzoic acid; dodecanoic acid; linoleic acid ethyl ester; hexadecanoic acid, methyl ester; -phellandrene; -campholenealdehyde; terpinen-4-ol; trans-β-ocimene; borneol; stigmastan-3- ol [214]. | Antioxidant, antidiabetic, hematological, anticancer, anti-inflammatory, analgesic activity, male fertility activity, hepatoprotective, antimicrobial activity, and antimalarial [214]. | Leaves |
| 130 | *Terminalia chebula*<br>Common name – Black Myroblans | Combretaceae | Tannins, flavonoids, sterols, amino acids, fructose, resin, fixed oils, chebulic acid, chebulinic acid, chebulagic acid, gallic acid, corilagin and ellagic acid [215]. | Antibacterial, antifungal, antiamebic immunomodulatory, antiplasmodial, anthelmintic, antiviral, antimutagenic, anticancerogenic, and antioxidant [215]. | Fruit And Seed |
| 131 | *Triticum repens* | Graminae | Triticin (carbohydrate), mannitol, mucilage (triticin), silicic acid, potassium, inositol, | Hypoglycaemic. | Rhizomes |

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|---|---|---|---|---|---|
| | Common name – Outara | | mannitol, glycosides (including glucovanilline), gum, vanillin, saponin, agropyrene, iron and other minerals. | | |
| 132 | *Rhizoma atractylodis*<br>Common name – NA | Compositae | Atractans A, B, C[75]. | Hypoglycaemic[75]. | Rhizome |
| 133 | *Myrcia uniflora*<br>Common name – Vegetable Insulin | Myrtaceae | Flavonoids, flavonols, flavanones, myrciacitrins I and II, and myrciaphenones A and B | Hypoglycemic, astringent, hypotensive, antihemorrhagic, antioxidant, cardiotonic, and gastrototonic. | Leaves |
| 134 | *Lagerstroemia speciosa*<br>Common name – Queen's Flower | Lythraceae | Ellagitannins (flosin A and B, and reginin A, B, C and D), lagerstannins A, B and C, ellagic acid, ellagic acid sulphate and four methyl ellagic acid cyanidin 3-O- glucoside, virgatic acid, corosolic acid, ursolic acid and β-sitosterolglucoside, triterpenes (oleanolic acid, arjunolic acid, asiatic acid, maslinic acid, corosolic acid and 2, 3-hydroxyursolic acid) triterpenes (ursolic acid, corosolic acid, asiatic acid and alphitolic acid), coumarin and one neolignan [216]. | Antioxidant, antibacterial, antiviral, antinociceptive, anti-diarrheal, cytotoxic, anti-inflammatory, Xanthine oxidase inhibition, anti-obesity, anti-fibrotic, and anti-diabetic [216]. | Leaves |
| 135 | *Enicostemma littorale*<br>Common name – White Head | | Swertiamarin, triterpene sapogenin, Monoterpene alkaloids like enicoflavin, gentiocrucine and flavonoids like apigenin, genkwanin, isovitexin, swertisin, saponarin, 5-o glucosylswertisin and 5-o glucosylisoswertisin, catechins, saponins, steroids, sapogenin, triterpenoids, flavonoids, Verticilliside and xanthones, vanillic acid, syringicacid, p-hydroxy benzoic acid, protocatechuic acid, p-coumaric acid and ferulic acid, aminoacids like L-glutamic acid, tryptophane, alanine, serine, aspartic acid, L-proline, L-tyrosine, threonine, phenyl alanine, L-histidinemonohydrochloride, methionine, isoleucine, L-arginine monohydrochloride, DOPA, L-Glycine, 2-amino butyric acid and valine [217]. | anti-inflammatory activity, tumour inhibition, central nervous system (CNS) depressant Antimicrobial activity, Antihelminthic activity, Antinociceptive, antioxidant, antiulcer, anti-inflammatory, antitumour, hepatoprotective, hepatomodulatory, antihyperlipidemic, hypoglycemic, and antihyperinsulinemic [217]. | Whole plant |
| 136 | *Eclipta Alba*<br>Common name – False Daisy | Asteraceae | Coumestans, alkaloids, flavonoids, glycosides, polyacetylenes, triterpenoids, stigmasterol, a-terthienylmethanol, wedelolactone, demethylwedelolactone, demethylwedelolactone-7-glucoside, hentriacontanol, heptacosanol, polyacetylene substituted thiophenes, P-amyrin in the n-hexane extract and luteolin-7-glucoside, P-glucoside of phytosterol, a glucoside of a triterpenic acid and | Anti-hepatotoxic, anti-hyperlipidemic, anaphylaxis activity, immunomodulatory, analgesic, anti-inflammatory, antidiabetic, and anticancer [218]. | Leaves |

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|---|---|---|---|---|---|
| | | | wedelolactone, cystine, glutamic acid, phenyl alanine, tyrosine, nicotine and nicotinic acid [218]. | | |
| 137 | *Cynodon dactylon*<br><br>Common name – Durva Grass | Poaceae | Carbohydrates, proteins,, mineral constituents, oxides of magnesium, phosphorous, calcium, sodium, potassium, alkaloids, β-sitosterol, flavanoids, glycosides, triterpenoides, carotene, vitamin C, fats and palmitic acid [219]. | Antidiabetic, diuretic, antioxidant, antidiarrheal, antiviral, immunomodulatory, antiulcer, antiarrhythmic, CNS depressant, hepatoprotective, wound healing, and cardioprotective [219]. | Root Stalks |
| 138 | *Cannabis indica*<br><br>Common name – Cannabis | Cannabaceae | Cannabidiol (CBD), cannabichromene (CBC), cannabicyclol (CBL), cannabinavarin (CBNV), cannabinol (CBN), cannabielsoin (CBE), cannabicyclol (CBL), cannabitriol (CBO) CBN variants, cannabielsoin (CBE), 1′-oxcannabinol, and 1′-hydroxycannabinol [220]. | Anti-inflammatory, anticonvulsant, antibiotic, antifungal,anxiolytic, antipsychotic, antioxidant, antispasmodic,euphoriant, and antiemetic [221]. | Leaves |
| 139 | *Brassica juncea*<br><br>Common name – Indian Mustard | Brassicaceae | Alkaloids, tannins and phenolic compound, triterpenoids, flavonoids and volatile oils [222]. | Antioxidant, antinociceptive, anticancer, and hyperglycemic activity [222]. | Seed |
| 140 | *Bixa orellana*<br><br>Common name – Annatto | Bixaceae | Delta-tocotrienol , apocarotenoids: methyl (9Z)-8'-oxo-6, 8'diapocarten-6-oate, methyl Z)-10'-oxo-6, 10'diapocaroten-6-oate, and methyl (9Z)-14'-oxo-6,14'-diapocaroten-6-oate, cartenoids, and geranylgeraniol. | Diuretic, antipyretic, antivenom, anticonvulsant, analgesic, antidiarrheal, enzyme inducing, and antimutagenic [223]. | Root |
| 141 | *Averrhoa bilimbi*<br><br>Common name – Bilimbi | Oxalidaceae | Amino acids, citric acid, cyanidin–3–O–h–D–glucoside, phenolics, potassium ion, sugars, vitamin A, alkolids, saponins, and flavonoids [224]. | Antidiabetic, antimicrobial, cytotoxic, antithrombotic, and antioxidant [224]. | Leaves |
| 142 | *Achyranthes aspera*<br><br>Common name – Aghata | Amaranthaceae | Saponins A (D-Glucuronic Acid ) and B (β-D-galactopyranosyl ester of D-Glucuronic Acid), oleanolic acid, amino acids, hentriacontane, 10-tricosanone, 10-octacosanone, 4-tritriacontanone, -L-rhamnopyranosyl-(1 4)-(β-D-glucopyranosyluronic acid)-(1 3)-oleanolic acid, -L-rhamnopyranosyl-(1 4)-(β-D-glucopyranosyluronic acid)-(1 3)-oleanolic acid-28-O-β-D-glucopyranoside and -L-rhamnopyranosyl-(1 4)-(β-D-glucopyranosyluronic acid)-(1 3)-oleanolic acid-28-O-β-D- glucopyranosyl-(1 4)-β-D-glucopyranoside, aliphatic fatty acid,sapogenin, strigmasta-5, 22-dien-3-β-ol, trans-13-docasenoic acid, n-hexacosanyl n-decaniate, n-hexacos-17-enoic acid and n-hexacos-11-enoic acid. Strigmasta-5, 22-dien-3-β-ol, 17-pentatriacontanol, tetracontanol-2, melting point 76-77C), 4-methoxyheptatriacont-1-en-10-ol (C 38 H76 O) and β-sitosterol, betaine, Saponins C and D, bisdesmosidic saponins (I-III), 20- | Spermicidal, antiparasitic, hypoglyceamic, cancer chemopreventive, hepatoprotective, analgesic, antipyretic, anti-inflammatory, anti-arthritic, antimicrobial, anti-oxidant, anti-depressant, diuretic, bronchoprotective, cardiovascular activity, anti-allergic, wound healing, immunomodulatory, and hypolipidemic [225]. | Whole plant |

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| | | | hydroxyecdysone, andquercetin-3-O-β-D-galactoside,β-D-glucopyranosyl3 β-[O- -L-rhamnopyranosyl- (1 3)-O-β-D-glucopyranuronosyloxy]machaerinate, β-D-glucopyranosyl3 β-[O-β-D- galactopyranosyl-(1 2)-O- -D-glucopyranuronosyloxy] machaerinate, β- D-glucopyranosyl-3β[O- -L-rhamnopyranosyl-[1 3)- O-β-D-glucopyranuronosyloxy] oleanolate, β-D-glucopyranosyl3-β-[O-β-D-galactopyranosyl (1 2)-O-β-D-glucopyranuronosyloxy] oleanolate, β-D- glucopyranosyl 3 β-[O-β-D-glucopyranuronosyloxy] oleanolatep-benzoquinone, hydroquinone, spathulenol, nerol, -ionone, asarone, and eugenol [225]. | | |
| 143 | *Adhatoda vasica*<br><br>Common name – Adosa | Acanthaceae | Quinazoline alkaloid-vasicinone, deoxyvasicine, maiontone, vasicinolone and vasicinol [226]. | Anti-asthmatic, bronchodilator, wound healing, anti-ulcer, insecticidal, cholagogue, anti-allergy, anti-bacterial, anti-tubercular, abortifacient, and uterotonic activity [226]. | Leaves |
| 144 | *Allium Sativum*<br><br>Common name – Garlic | Alliaceae | Sulphur thiosulphinate and Allicinalliin [227]. | Antihypertensive, wound healing, antidiabetic, anticancer, antiatherosclerosis, antifungal, hypolipidemic, antimicrobial, immunomodulatory, antioxidant, antiinflammatory, hepatoprotective, antihelmentic, anticoagulant, and fibrinolytic [228]. | Bulb |
| 145 | *Althaea officinalis*<br><br>Common name – Garden Hollyhock | Malvaceae | Pectins, starch, glucoronic acid, galacturonic acid, rhamnose, alkaloids, carbohydrates, phenolic compounds, galactose, mono-and di-saccharide saccharose, mucilage, flavonoids (Hypolaetin-8-glucoside, isoquercitrin, kaempferol, caffeic, pcoumaric acid), coumarins, scopoletin, phytosterols, tannins, asparagine and many amino acids,valine, threaonine, methionine, isoleucine, leucine, lysine, phenylalanine, histidine and arginine [229]. | Antimicrobial, antiinflammatory, immuno modulatory, demulcent, soothing, and antittusive [229]. | Leaves and whole plant |
| 146 | *Andrographis paniculata*<br>Common name – Kalmegh | Acanthaceae | Diterpenes, lactones, flavonoids, alkanes, ketones, aldehydes, lactone and rographolide named kalmeghin. Four lactones – Chuanxinlian A (deoxyandrographolide), B (andrographolide), C (neoandrographolide) and D (14-deoxy-11, 12-didehydroandrographolide), diterpene glucoside (deoxyandrographolide- 19beta-D-glucoside), (bis-andrographolides A, B, C, and D), 5, 7, 2', 3'- tetramethoxyflavanone and 5-hydroxy-7, 2', 3'- trimethoxyflavone [230]. | Hepatoprotective, antimicrobial, anti-parasitic, antioxidant, anti-inflammatory, antihyperglycemic, and hypoglycaemic [230]. | Leaves |

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| 147 | *Anemarrhena asphodeloides*<br><br>Common name – NA | Liliaceae | Steroidal saponins (timosaponin BII (1), anemarsaponin BIII, timosaponin AIII (3) and timosaponin E1), flavonoids, pigments, polysaccharides, organic acids, amino acids, nucleosides, and oligosaccharides [231]. | Anti-dementia and anti-microbial [231]. | Rhizome |
| 148 | *Annona Muricata*<br><br>Common name – sour-sop | Annonaceae | Annomuricatin C, annomuricatin B, Cohibins A and B, Sabadelin, muricoreacin and murihexocin C, Murihexol, donhexocin, annonacin A and Annonacin, murihexocins A and B, Annohexocin and annomuricatin A [232]. | Cytotoxicity, antileishmanial, anti-viral, anticarcinogenic, genotoxic, wound healing, and anti-microbial [232]. | Seeds, bark, roots |
| 149 | *Annona squamosa*<br><br>Common name – custared apple | Annonaceae | Glycoside, alkaloids, saponins, flavonoids, tannins, carbohydrates, proteins, phenolic compounds, phytosterols, amino acids, anonaine, aporphine, coryeline, isocorydine, norcorydine, glaucine, 4-(2-nitro-ethyl 1)-1-6-((6-o-β-D- xylopyranosy1-β-D-glucopyranosyl)-oxy)benzene, Anonaine, Benzyltetrahydroisoquinoline, Borneol, Camphene, Camphor, car-3-ene, Carvone, β- Caryphyllene, Eugenol, Farnesol, Geraniol, 16- Hetriacontanone, Hexacontanol, Higemamine, Isocorydine, Limonine, Linalool acetate,Menthone, Methyl anthranilate, Methylsalicylate, Methylheptenone, p-(hydroxybenzyl)-6,7-(2-hydroxy,4-hydro)isoquinoline, n-Octacosanol, a- Pinene, b-Pinene, Rutin, Stigmasterol, β-Sitosterol, Thymol and n-Triacontanol, annonaine, 1H-cycloprop(e) azulene, germacrene D, bisabolene, caryophyllene oxide, bisabolene epoxide, kaur-16-ene, Coumarinoligans, Annotemoyin-1, Annotemoyin-2, squamocin, cholesteryl, glucopyranoside, β caryophyllene, pinene, -humulene, gurjunene, and Annotemoyin [233]. | Antioxidant, antidiabetic, hepatoprotective, cytotoxic, anti-genetoxicity, antitumour, antilice, antibacterial, antihyperlipidemic, cytotoxic, chemopreventive, antilipidperoxidative, antiplasmodial, vasorelaxant, anti-platelet, anthelmintic, antifertility, and molluscicidal [233]. | Fruit |
| 150 | *Artemisia herba-alba*<br><br>Common name – white worm wood | Asteraceae | 1,8-cineole, alpha and beta-thujone, oxygenated monoterpenes including terpinen-4-ol, camphor and borneol, Davanone, chrysanthenone, cis-chrysanthenol Eudesmanolide, germacranolide, and sesquiterpenes. | Antioxidant, anti-venom, antifungal, nematicidal, antibacterial, antispasmodic, anthelmintic, antileishmanial, neurological, neurological, cytotoxicity, and gene induction. | Aerial Parts |
| 151 | *Artemisia pallens*<br><br>Common name – Davana | Asteraceae | Terpenoids and flavanoids [234]. | Immunomodulating, anthelmintic, antipyretic, and wound healing [234]. | Aerial Parts |

## Results and Discussion

Data from 151 plants traditionally used in diabetes management were illustrated in the above Table 1. The number of diabetic studies both completed and on-going is increasing day-by-day, in which herbal-based researches have major importance. All the herbs reviewed in the study have scientific background in the field of diabetes management (either pre-clinically or clinically). The 151 antidiabetic herbs listed in this review belongs to 72 families with the most predominant family with hypoglycemic activity is Leguminosae (12 herbs) followed by Asteraceae (10 herbs) followed by Fabaceae, Malvaceae, Cucurbitaceae, Myrtaceae, and Lythraceae (4 herbs) followed by other families with three, two, and one herb in each family, which is listed in Table 2.

**Table 2 Number of species in each Family**

| S.No | Name of the Family | Number of herbs |
|---|---|---|
| 1 | Leguminosae | 12 |
| 2 | Asteraceae | 10 |
| 3 | Fabaceae | 5 |
| 4 | Malvaceae | 5 |
| 5 | Cucurbitaceae | 5 |
| 6 | Myrtaceae | 5 |
| 7 | Lythraceae | 5 |
| 8 | Liliaceae | 4 |
| 9 | Caesalpinaceae | 3 |
| 10 | Rosaceae | 3 |
| 11 | Brassicaceae | 3 |
| 12 | Euphorbiaceae | 3 |
| 13 | Moraceae | 3 |
| 14 | Nymphaeaceae | 3 |
| 15 | Alliaceae | 3 |
| 16 | Sapindaceae | 2 |
| 17 | Lauraceae | 2 |
| 18 | Rutaceae | 2 |
| 19 | Berberidaceae | 2 |
| 20 | Oxalidaceae | 2 |
| 21 | Rubiaceae | 2 |
| 22 | Capparaceae | 2 |
| 23 | Verbenaceae | 2 |
| 24 | Ranunculaceae | 2 |
| 25 | Amaranthaceae | 2 |
| 26 | Anacardiaceae | 2 |
| 27 | Asclepiadaceae | 2 |
| 28 | Umbelliferae | 2 |
| 29 | Oleaceae | 2 |
| 30 | Araliaceae | 2 |
| 31 | Convolvulaceae | 2 |
| 32 | Cannabinaceae | 2 |
| 33 | Combretaceae | 2 |
| 34 | Poaceae | 2 |
| 35 | Apocyanaceae | 2 |
| 36 | Annonaceae | 2 |
| 37 | Acanthaceae | 2 |
| 38 | Adiyantaceae | 1 |
| 39 | Asphodelaceae | 1 |
| 40 | Meliaceae | 1 |
| 41 | Nyctaginaceae | 1 |
| 42 | Samydaceae | 1 |
| 43 | Burseraceae | 1 |
| 44 | Ephedereaceae | 1 |
| 45 | Sapotaceae | 1 |
| 46 | Bignonaceae | 1 |
| 47 | Menispermaceae | 1 |
| 48 | Bombacaceae | 1 |
| 49 | Solanaceae | 1 |
| 50 | Arecaceae | 1 |
| 51 | Phyllanthaceae | 1 |
| 52 | Apocynaceae | 1 |
| 53 | Apiaceae | 1 |
| 54 | Papilionaceae | 1 |
| 55 | Discoreaceae | 1 |
| 56 | Musaceae | 1 |
| 57 | Lamiaceae | 1 |
| 58 | Chinensis | 1 |
| 59 | Chenopodiaceae | 1 |
| 60 | Celastraceae | 1 |
| 61 | Cornaceae | 1 |
| 62 | Fumariaceae | 1 |
| 63 | Clusiaceae | 1 |
| 64 | Hypoxidaceae | 1 |
| 65 | Boraginaceae | 1 |
| 66 | Cactaceae | 1 |
| 67 | Paeoniaceae | 1 |
| 68 | Scrophulariaceae | 1 |
| 69 | Polyporaceae | 1 |
| 70 | Graminae | 1 |
| 71 | Compositae | 1 |
| 72 | Bixaceae | 1 |

The literatures show that herbal drugs exert their anti-diabetic effect by their activities over pancreatic beta cells (synthesis, release and cell regeneration/reactivation), protective/inhibitor effect against insulinase, and the increase of the insulin sensitivity or insulin-like activity, increase of synthesis hepatic glycogen, decrease in glycogenolysis acting on enzymes, inhibition in renal glucose reabsorption, increasing the size and number of cells in the islets of Langerhans, stimulation of glycogenesis, preventing pathological conversion of starch to glucose, inhibition of beta-galactosidase and glucosidase, cortisol lowering activity, inhibition of alpha-

amylase. The herbs listed above in Table 1 exert their hypoglycaemic activity by any one of the above mechanisms. The major advantage of botanicals is that they have less or no side effects than their synthetic counterpart. There are many more plants around us, which are not explored and screened for anti-diabetic properties. More preclinical researches are needed for proper exploration of anti-diabetic potential of new plants/herbs that are not yet studied. There is also a need of clinical validation of anti-diabetic herbal drugs, which shows promising results in their preclinical studies.

## Conclusion

In conclusion, this review presented a list of hypoglycemic plants used in the treatment of diabetes mellitus. It showed that many of the plant derived products are effective than oral hypoglycemic agents, however, many other active agents obtained from plants have not been well characterized. A detailed investigation should be held to ascertain the mechanism of action and toxic effect of these plants.

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