Therapeutic potential of medicinal herbs in diabetes

Mustaq Ahmad[*1], Yogesh Kumar[1], Sayed Md Mumtazd[1], Naseha Batul[2]

*[1]*Research Scholar, Department of Pharmacology (Master in Pharmacy), Delhi Pharmaceutical Sciences and Research University, New Delhi, 110017*

[2]*Research Scholar, Department of Clinical Research (Master in Pharmacy), Delhi Pharmaceutical Sciences and Research University, New Delhi, 110017*

Abstract

In the recent couple of years there has been an exponential development in the field of home grown pharmaceutical. Due to the effectiveness, safe perception, and natural remedy faith. Many drugs being used are taken from therapeutic plants, minerals and natural resources. In India it is expand their roots particularly in the urban territories. Despite the fact that there are different ways to deal with decrease the evil impacts of diabetes. World Health Organization (WHO) has recorded 21,000 plants, which are utilized for restorative purposes far and wide. Among these 2500 species are in India, out of which 150 species are utilized economically on a genuinely vast scale. India is the biggest maker of therapeutic herbs and collective list of curative plants with demonstrated anti diabetic and related valuable impacts and of natural medications utilized as a part of treatment of diabetes is gathered in this article.

Keywords: *Diabetes; Medicinal herbs; Prevalence; Microscopy; Morphology; Features*

1.Introduction

The exponential development a future mass of the high DM commonness is in charge of a huge portion of the mortality and dreadfulness rates around the world. The perilous sign of diabetes and its existing together maladies. From antiquated circumstances the India is fascination point for human transformation towards nature practice. We have rich history and information, all through the plants and creatures utilized as a part of solution framework. The plants are utilized as a part of prescription from the season of Ayurvedas, The old arrangement of India. With the goal that we found that the pharmaceutical arrangement of diabetes is for the most part relies on manufactured medications plan. Diabetes is a metabolic disorder described by expanding fasting and post prandial glucose levels. Diabetes has risen as a noteworthy medical issue influencing around 65 million individuals in India[1]. This number is probably going to two-fold by the year 2030.The world Health Organization (WHO) evaluated that diabetes would be the seventh driving reason for death by the year 2030 and recommended that solid way of life and right pharmaceutical can avert and stay away from the results of diabetes [2]. For a long time, restorative plants have been gainful assets for the treatment of diabetes. The herbal plants 21,000 plants, which are utilized for restorative purposes far and wide. Among these 2500 species are in India, out of which 150 species are utilized economically on a genuinely vast scale. In India, indigenous remedies have been used in the treatment of diabetes mellitus since the time of Charaka and Shusrutha. The ethno botanical information, about plants which may possess anti-diabetic potential has been found[3].

1.1 Pathophysiology: Diabetes mellitus has a reflective adverse effect on eminence of life in terms of social, psychological well-being as well as physical health. Diabetic difficulties are mostly mediated through oxidative stress such as increased production of ROS or impaired antioxidant defence systems, improvement of lipid per oxidation, modification in antioxidant enzymes and impaired glutathione metabolism are the main factors involved in the progress of diabetes [4].

1.2 Types of Diabetes: The most common types are type I, type II, and gestational diabetes. Type I Diabetes: It is also referred as IIDM (Insulin dependent diabetes mellitus or juvenile diabetes). Type II Diabetes: It is also referred as NIIDM (non-insulin dependent diabetes mellitus or "adult-onset" diabetes) Gestational Diabetes: Is when pregnant women, who had never diabetes before, have a high blood glucose level during pregnancy. It may precede development of type II DM. Other forms of diabetes mellitus include: Congenital Diabetes, Cystic fibrosis related diabetes[3].

2. Descriptions of the medicinal herbs used in the diabetes

2.1 *Cassia sophera* (Family: Fabaceae)
Hindi name: Kasaunda, Kasaundi, **Common name**: Kasunda, baner.
Cassia sophera is originated throughout India and in most tropical countries. It is widespread in waste lands, on road sides and in the forests. Leaves contain a flavanol-C-glycoside and sennosides. Root bark contains anthraquinones, chrysophanol and physcion and ß-sitosterol. Heartwood containschrysophanic acid, emodin, quercetin and ß-sitosterol. Flowers contain anthraquinone and flavanol glycosides, including chrysophanol, rhamnetin glucoside and sitosterol and fucosterol. *Cassia sophera* leaves have anti-asthmatic activity, hepatoprotective activity, anti-inflammatory activity, anti-diabetic and antioxidant activity. Seeds of *Cassia sophera* possess anticonvulsant and analgesic activity. The plant is credited with the same properties as *C. occidentalis.* Leaf juice is specific for ringworm; used in asthma, bronchitis and hiccup. Infusion of the leaves is useful in gonorrhoea and syphilitic sores. Bark, leaves and seeds are used as a cathartic; given in diabetes. Root bark ground into a paste is an application for ringworm, pityriasis and psoriasis [5].

2.1.1 Morphology of *Cassia sophera* seeds
Seeds are 30-40 in number, broadly ovoid, acute compressed, dark brown in colour, Thickness about 2mm, generally found in a size of 6 by 4 mm.

2.1.2 Microscopy of *Cassia sophera* seeds
The seeds have thick testa, seed coat, copious endosperm and prominent Embryo. The embryo has thick, solid radical and two folded cotyledons. The embryo is enclosed by dense mass of endosperm. Seed coat is thick or micropylar end and turn into slightly thinner towards opposite ends. The seed coat contains cuticle, epidermal layer and inner seed coat. Cuticle is the outermost waxy layer; it is enormously thick, measuring nearly 20µm thickness. Epidermal layer is also known as palisade layer. It is 50 µm thick. It consists of vertically lengthened, compact and columnar salaried. It has broad lignified call wall and fine lumen. Inner seed coat is an innermost part of the seed coat consists of four layers of polygonal, compact, thick walled cells. This inner seed coat is 80 µm thick [6].

2.2 *Cassia tora* (Family: Fabaceae)
Hindi name: Chakavad, Pavand, **Common name:** Sickle pod, coffee pod
Cassia tora is dispersed throughout India on waysides and waste places, on hills of low elevation up to 800m as well as in plains. It grows in dry soil throughout tropical parts of India, special middle and south India. *Cassia tora* chemical constituents are Fistucacidin, emodin, Rubro fusarin Torosachrysone, Isotoralactone, Questin, Obtusin, Obtusifolin, Alaternins Cassiaside etc. Chrysophenol is its marker compound. Seeds contain cinnamaldehyde, gum, tannins, mannitol, coumarins, aldehydes, eugenol and pinene, sugars, resins. Root contains Beta sitosterol, Beta-D glucoside, palmitic acid, stearic acid, uridine, quercitin, iso-quercitin. The pharmacological activities are anti-inflammatory, antinociceptive, hypolipidemic, estrogenic, anti-oxidant, antimicrobial, anti-helmintic, hepatoprotective. It is indicated in fever, skin disease, asthma, chronic respiratory disorders, cough, cold diabetes, UTI, anorexia.[6]

2.2.1 Morphology of *Cassia tora* root
It is an annual small plant that attains a highest height of 1 to 5 feet. Outer surface of root is dark brown, inner surface creamy with long fracture. The main root is bent to an angle of 30 degree near the foot region.

2.2.2 Microscopy study of *Cassia tora* root
Transverse section of root shows single layered epidermis collected of cubical cells. Epidermis is followed by 3-4 layers of parenchymatous cortex showing distinct endodermis with casparian dots on radial walls. Pericycle is single layered parenchymatous enclosing a diarch stele. Cork of mature root consists of 4-6 layers of narrow rectangular and tangentially elongated cells. Phelloderm consists of 12 layers of parenchymatous cells and long, moderately thick fibres. Crystals of calcium oxalate of rosette and prismatic type are distributed in phelloderm parenchyma. The secondary phloem consists of sieve tubes, companion cells and phloem parenchyma, traversed by medullary rays [8].

2.3 *Ficus bengalensis* (Family: Moraceae)
Hindi name: Bargad; **Common name:** Indian Banyan tree
Plants grow throughout India and in the Indian tradition it is considered as a holy tree.Bark and young buds contain milky latex, tannins and wax. Bark also contains a hypoglycaemic glycoside, half as potent as tolbutamide, bengalenoside, methy ether of leucoanthocyanidin, three leucoanthocyanins, delphinidin-3-o-a-L- rhamnoside (I), pelargonidin-3-o-a-L-rhamnoside (II) and leucocyanidin-3-o- β-D-galactosylcellobioside (III). Leaves contain friedelin, β-sitosterol, quercetin-3-galactoside and rutin. The pharmacological action such as antioxidant, anticancer, analgesic, anti-inflammatory and antipyretic activities. Latex of the plant is aphrodisiac, tonic, vulnerary and maturant; used in toothache, dysentery, diarrhoea, piles and diabetes; applied externally to cracked or reddened soles, to alleviate rheumatic pains and lumbago[7, 8].

2.3.1 Morphology of *Ficus benghalensis*
Fully grown bark is 12-18mm thick, grey, closely adhered ashy white, light bluish-green or grey patches, a little curve, width vary with the age of the tree. Surface is deeply fissured and rough due to the occurrence of longitudinal and transverse row of lenticels, mostly circular and prominent, fractures short in outer 2/3 of bark even as inner portion shows a fibrous fracture.

2.3.2 Microscopy of *Ficus benghalensis*

Barks differentiate into external bark or rhytidome and internal bark or secondary phloem. Outer bark measures 288-576 mm. width and inner bark measures 2.9-3.5mm. periderm is deeper in origin and consists of discontinues irregular bands of sequential periderm and originates from the deeper part of secondary phloem. Periderm consists of phellem and phelloderm. Phellem cells are homogeneous thin walled rectangular and suberised. Phelloderm cells are turned into cubical sclereidsin order in radial files. Secondary phloem is differentiated into internal intact non- collapsed zone. In the non- collapsed zone phloem elements occur in small clusters and consist of sieve tube members, companion cells, and axial parenchyma. The ray cells are turned into thick walled lignified sclerenchyma cells in the peripheral part of the bark. The phloem rays are uniseriate or multiseriate. The multiseriate rays are 72mm in breadth and upto 900mm in height. The sieve tube members have 288-360 mm height. Laticifers are abundant in the internal bark [7].

2.4 *Ficus racemose* (Family: Moraceae)

Hindi name: Gular **Common name**: Goolar (gular)

In India, the tree and its fruit are called gular in the north and atti in the south. The fruits are a favourite staple of the common Indian macaque. Fruit contains glauanol, hentriacontane, β-sitosterol, glauanolacetate, glucose, tiglic acid (E), esters of taraxasterol, lupeol acetate (D), friedelin (F), higher hydrocarbons and other phytosterol.Pharmacological activities are Antidiuretic, Antitussive, Anthelmintic, Anti-inflammatory, Antidiarrheal, Anti-filarial, Antipyretic, Antibacterial, Antiulcer, Hepatoprotective, Hypolipidemic, Hypoglycaemic, Antifungal. It used in traditional system of medicine for a long time, for the treatment of various disorders like diabetes, liver disorders, diarrhoea, inflammatory conditions, haemorrhoids, respiratory and urinary diseases.[9]

2.4.1 Morphology of *Ficus racemosa*

The bark of *Ficus racemosa* has a width of about 6 to 15 mm and is greyish- green with a moderately smooth and soft surface, with minute unravelling papery flakes of white tissue emerging out from outer surface. Inner surface light brown.

2.4.2 Microscopy of *Ficus racemosa*

The transaction of bark measuring about 8mm width consists of an external periderm measuring 72 mm thick. The rest of the bark consist a secondary phloem. The periderm is superficial in origin. It consists of regular ingeniously arranged thin layers of cells. The older layers of phellem exfoliate in the form of thin, membrane due to separations of tangential walls between consecutive layers of cells. Phelloderm is evident and consists of a few layers of cubical parenchymatous cells.

2.5 *Hibiscus rosasinensis* (Family*: Malvaceae)*

Hindi name *:*Jasum, Gulhar, **Common name:** China rose, shoe flower

Hibiscus rosasinensis are native to Tropical Asia. A native of south eastern Asia (China), the plant is commonly found throughout the tropics and as a house plant throughout the world.Leaves and stems contain β-sitosterol, stigmasterol, taraxeryl acetate and three cyclopropane compounds and their derivatives. Flowers contain cyanidin diglucoside, 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 have been isolated from deep yellow flowers. Analgesic activity, Androgenic effect, Anticonvulsive activity, Anti-FSH activity, Anti-estrogenic effect, Anti-fertility effect, Anti-fungal activity, Anti-gonadotropin effect, Anti-hypertensive activity, Anti-implantation effect, Anti-inflammatory activity, Anti-ovulatory effect, Antipyretic activity, Anti-spasmodic activity, Anti spermatogenic effect, Anti-viral activity [10].

2.5.1 Morphology of *Hibiscus rosasinensis*

The leaves are uncomplicated, alternate, cauline, petiolate, stipulate. Lamina is simple, ovate to oblong- lanceolate in shape having acuminate apex, symmetric base and hairy surface, having whole margin in the lower half part and being dentate in the upper half one, green in colour and the superior surface is darker than the lower one. It measures 2-7cm long and 2-4cm broad. The venation is pinnately reticulate and the midrib and large veins are prominent on the lower surface than the superior one. The stipules are linear, acute, green in colour and measuring 0.7- 1.5sm long and 0.2-0.4cm broad.

2.5.2 Microscopy of *Hibiscus rosasinensis*

A transverse section of the leaf is biconvex in draw. It shows superior and inferior epidermis carrying glandular and non-glandular trichomes. The lamina has dorsiventral structure with one row of upper palisade being discontinuous in the midrib region. The midrib is well-known on the both surfaces showing sub epidermal collenchymas, cortical tissues and large central collateral vascular bundle. Cluster crystals of calcium oxalate are spotted in the cortical tissue as well as in the mesophyll and phloem. Secretory glands and mucilage are also, present in the parenchymatous tissues [11].

2.6 *Lawsonia inermis* (Family: Lyrthaceae)

Hindi name: Henna, **Common name:** Mehendi

Heena grows throughout most of India mainly in northern regions like Punjab, Rajasthan etc. The phytochemicals that are present in the Henna are phenols, anthroquinones and glycosides. Lawsone is the active constituent of the Henna leaves. The other chemical constituents of Henna are gallic acid, white resin, sugars, tannins and xanthones. Lawsone is the main colouring constituent of the Henna and is obtained by the degradation of hennosides A, B and C. The plant has been reported to have analgesic, hypoglycemic, anti-malarial, hepatoprotective, nootropic, immunostimulant, anti-

inflammatory, antibacterial, antimicrobial, antifungal, antiviral, anti-parasitic, anti-trypanosomal, anti-dermatophytic, antioxidant, anthelmintic, anti-fertility, tuberculostatic and anti-cancer properties. This plant is useful in certain ailments like dysentery, liver disorders, baldness, headache, skin disease, sore throat and as a colouring agent[12].

2.6.1 Morphology of *Lawsonia inermis*

The leaf of *Lawsonia inermis* L. is tiny, smooth, compound, ovate-lanceolate, acute, symmetrical, entire, pinnate, opposite, sweet smelling, characteristics or bitter in taste and varies in length. Lawsone is principally present in the marginal vein or petiole in large quantity.

2.6.2 Microscopy of *Lawsonia inermis*

The leaf of *Lawsonia inermis* L. is short and smooth. The midrib is distinct from the lamina. It is generally shallow on the adaxial side and convex on the abaxial side. It has a single layered polygonal epidermal cell containing cuticle on outer layer only. It also consists of unicellular covering trichome. Diacytic stomata are present on both the surface. The leaf of *Lawsonia inermis* L. is dorsiventral as oblong palisade cells are present below the upper epidermis and absent on lower epidermis. The cells are circular or angular and compact. Tannin is seen in some of the cells. The vascular strand is single, small, collateral and hemispherical in shape. It consists of a thick horizontal band of xylem and a fairly wide band of phloem. Xylem elements are narrow, angular, thin walled and somewhat diffuse[12].

2.7 Ocimum sanctum (Family: Lamiaceae)

Hindi name: Tulsi; **Common name:** Holy Basil

It is a tropical annual herb grown all over India and use for household remediation. Tulsi is cultivated for religious and medicinal purposes and for its essential oil. It is widely known across the Indian subcontinent as a medicinal plant and an herbal tea, commonly used in Ayurveda. Some of the active chemical constituents of tulsi are oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, β-caryophyllene. The pharmacological activities such as antibacterial, antiviral, antifungal, anti-protozoal, anti-malarial, anti-inflammatory, anti-diarrheal, analgesic, antipyretic, anti-inflammatory, anti-allergic, antihypertensive, cardioprotective, central nervous system (CNS) depressant, memory enhancer, anti-hypercholesterolaemic, hepatoprotective, anti-diabetic, anti-asthmatic, antithyroidic, antioxidant, anticancer, chemo preventive, radioprotective, immunomodulatory, anti-fertility, antiulcer, anti-arthritic, adaptogenic / anti-stress, anti-cataract, anti-leucodermal and anticoagulant activities. Tulsi are useful in skin disorders, skin rashes, insect bites, itching, ring worm infection, it also acts as nerve tonic and are beneficial in indigestion, intestinal parasites, constipation, fever, cough, bronchitis [13, 14].

2.7.1 Morphology of *Ocimum sanctum*

It has an annual shrub that has a height of 2 to 4 feet. The whole plant is of purple colour. Leaves are 1 to 2½ inch long, oval in shape and are dentate. It has a bud at the apex of the petiole. The plant has two categories according to the colour of the leaves-

1-shayamtulsi (black tulsi)
2-shwettulsi (tulsi)

2.7.2 Microscopy of *Ocimum sanctum*

The leaf consists of a thick plano convex midrib. The adaxial part of the midrib is slightly raise band bears non-glandular Trichomes. The basal part is wide and thick and semicircular in outline. The midrib is 550um thick and 700um wide. The adaxial part consist of epidermis and a thick mass of collenchymas cells. The basal part has thin epidermal layer of small, squarish thick-walled cells. The vascular strand is single bowl shaped and prominent. It is 400um wide, 150um thick. Xylem elements which are narrow, angular and thick walled. The xylem elements are 20um wide along the adaxial part of the vascular strand occurs small nest of phloem elements. Epidermal trichomes are densely distributed both on the adaxial and abaxial surfaces of the lamina [14].

2.8 *Punica granatum (*Family: Punicaceae)

Hindi name: Anar, **Common name:** Pomegranate

The pomegranate originated in the region extending from modern-day Iran to northern India, Today, it is widely cultivated throughout the middle-east and Caucasus region, north and tropical Africa, the Indian subcontinent, central Asia the drier parts of Meditation basin.

Peels of the pomegranate covers around 60% of the fruit and they hold various types of ingredients including flavonoids, ellagitannins and proanthocyanidin compounds and minerals such as calcium, magnesium, phosphorus, potassium and sodium. The pharmacological activities of pomegranate are antioxidant, hepatoprotective, anti-diabetic, anti-analgesic, anti-diarrhoeal, anti-fungal, anti-bacterial, anti-microbial, anti-viral. Pomegranates have the potential to thin the blood, increase blood flow to the heart, reduce blood pressure, reduce plaque in the arteries, and reduce bad cholesterol while increasing good cholesterol. A decoction of seed is used to treat syphilis. Juice used to treat jaundice and diarrhoea. Juice of flower is used to treat nose bleeds. The fruit pulp and the seed are stomachic. Dried, pulverized flower buds are employed as a remedy for bronchitis [15].

2.8.1 Morphology of *Punica granatum*

Outer most layer of *Punicagranatum* was red in colour and seed were also red coloured. The fruit was 10cm long and was having width of 7.5cm. the cut pieces of fruit rind were having width of 3cm. fresh seeds were 7 to 10mm in length, 5-8mm in width, while dried seeds are 6-7mm in length, 1.5 to 3 mm width and thickness.

2.8.2 Microscopy of *Punica granatum*

Transverse section of *Punicagranatum* fruit showed outer epicarp followed by mesocarp and endocarp. Epicarp single layered, containing square shaped cells compactly arranged, some of the cells filled with red colouring matter and some of the cells fikked with yellow colouring matter. Epidermises were found covered with thick cuticle. Mesocarp made up of parenchyma cells and occupies most of the section. Groups of sclerides and stone cells were found distributed all over the mesocarp. Vascular bundles were open and collateral. Xylem war arranged radially with xylem fibres. Phloem was situated above the xylem with some sieve elements and fibres. Endocarp single layered, consisting simple and compound starch grains and transversely barreled shaped cells [15].

2.9 *Tinospora cordifolia* (Family: Menispermaceae)

Hindi name: Giloy, **Common name:** Giloy

The plant is distributed throughout the tropical region of India up to 1,200 m above sea level from Kumaon to Assam, in north extending through West Bengal, Bihar, Deccan, Konkan, Karnataka and Kerala. The plant mostly contains alkaloids, glycosides, steroids, sesquiterpenoid, aliphatic compound, essential oils, mixture of fatty acids and polysaccharides. The alkaloids include berberine, bitter gilonin, non-glycoside giloningilosterol. The major phytoconstituent in Tinosporacordifolia include tinosporine, tinosporide, tinosporaside, cordifolide, cordifol, heptacosanol, clerodane furano diterpene, diterpenoid furanolactonetinosporidine, columbin and b-sitosterol. Berberine, Palmatine, Tembertarine, Magniflorine, Choline, and Tinosporin are reported from its stem. The pharmacological activites of T. cordifolia are anti-diabetic, anticancer, antiallergic, anti-inflammatory, anti-oxidant, wound healing. Giloy is a famous Ayurvedic herb, used extensively in treatment for fever, diabetes, urinary tract disorders, anemia, jaundice, asthma, cardiac disorders, etc[16, 17].

2.9.1 Morphology of *Tinospora cordifolia*

Tinosporacordifolia is a large deciduous, extensively spreading climbing shrub with a number of coiling branches. Stem of this plant is rather succulent with long, filiform, fleshy and climbing in nature. Aerial roots arise from the branches. The bark is creamy white to grey in colour and deeply left spirally and leaves of this plant are simple, alternate, exstipulate, long petioled approximately 15cm, round, pulvinate, heart shaped, twisted partially and half way round. Lamina is ovate, 10-20cm long, 7 nerved and deeply cordate at the base and membranous.

2.9.2 Microscopy of *Tinospora cordifolia*

Stem shows 2-3 layers of cork followed by 4-5 layered phellogen. Outer most layer of cork is differentiating into outer zone of thick walled brownish and compressed cells, inner zone of thin walls colourless, tangentially arranged 3-4 rows of cells. Cork is broken at some places due to opening of lenticles. Cortex is wide parenchymatous zone contain large columnar type cells filled with mucilage. Xylem is stellate in structure. Xylem is united at the centre, thereby completely obliterating the pith and giving xylem a stellate appearance with the phloem at the ends of radii [18].

2.10 *Emblica officinalis* (Family: Euphorbiaceae)

Hindi name: Amla; **Common name**: Amla

Emblica officinalis found throughout India, the sea-coast districts and on hill slopes up to 200 meters, also cultivated in plains. The fruits of *Emblica officinalis* are rich in tannins. The fruits have 28% of the total tannins distributed in the whole plant. The fruits contain two hydrolysable tannins emblicanin Aand B which have anti-oxidant properties, one on hydrolysis gives Gallic acid, ellagic acid and glucose.The pharmacological activities like antimicrobial, antioxidant, anti-inflammatory, radio-protective, hepatoprotective, antitussive, immunomodulatory, hypolipidemic and many other activities. This medicinal plant is also reported to have anticancer, anti-HIV-reverse transcriptase, antidiabetic, antidepressant, antiulcerogenic, wound healing activities. It is useful in diabetes, cough, asthma, bronchitis, cephalalgia, ophthalmopathy, dyspepsia, colic, flatulence, hyperacidity, peptic ulcer, skin diseases, leprosy, haematogenesis, inflammation, anaemia, hepatopathy, jaundice, strangury, diarrhoea, haemorrhages, cardiac disorders, and greyness of hair[19, 20].

2.10.1 Morphology of *Emblica officinalis*

The tree is small to medium in size, reaching 1-8m (3ft 3in-26 ft 3in) in height. The branchlets are 10-20cm long. Usually deciduous; the leaves are simple, sub sessile and closely set along branchlets, light green, resembling pinnate leaves. The flowers are greenish-yellow. The fruits are nearly spherical, light greenish yellow, quite smooth and hard on appearance, with six vertical stripes or furrows.

2.10.2 Microscopy of *Emblica officinalis*

The pericarp consisted of epicarp and mesocarp. The epicarp was represented by a single epidermal layer. The epidermal cells were very narrowly oblong and had prominent cuticle. Beneath the epidermis was a layer of sub-epidermal cells which were wider. Mesocarp was the widest part of the fruit. It consisted of several layers of parenchyma cells. The cells were homogeneous, thin walled, polyhedral in shape and compact. The vascular bundles were small and varied in size and shape. Each strand had a cluster of xylem elements and a small group of phloem elements. Xylem elements were highly thick walled. Phloem consisted of fairly sieve tubes and companion cells [19, 20].

3. Conclusion

Plants are the basic source of knowledge of modern and traditional medicine. The relatively lower incidence of adverse reactions to plant preparations compared to modern conventional pharmaceuticals, coupled with their reduced cost, is encouraging both the consuming public and national health care institutions to consider plant medicines as alternative to synthetic drugs. Now a-days herbal drugs are prescribed widely even when their biologically active compounds are unknown because of their effectiveness and no side effect in clinical experience. Natural products are considered to be the best option as they have less harmful. From the above bunch knowledge of plants, it is concluded that these all plants have great potential use as Phyto-constituents as they have, anti-diabetic and antioxidant activities. So, these plants can be used to discover bioactive natural products that may serve as feeds for the development of new pharmaceuticals compounds. Development of Phyto-constituents is relatively inexpensive and less time consuming and also suitable to our economic condition.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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Figures

Fig- 1 Medicinal herbs used in the diabetes

Cassia sophera *Cassia tora*

Ficus bengalensis *Ficus racemose*

Lawsonia inermis

Punica granatum

Hibiscus rosasinensis

Ocimum sanctum

Tinospora cordifolia

Emblica officinalis

Table

Table- 1 List of Medicinal plants useful in diabetes.

S.no	BOTANICAL NAME	FAMILY	LOCAL NAME	PART USED	MODE OF APPLICATION	ACTIVE CONSTITUENTS
1.	*Cassia sophera*	Fabaceae	Kasaundi	Seed	Bark infusion is given in diabetes.	ascorbic acid, dihydroascorbic acid and β-sitosterol
2.	*Cassia tora*	Fabaceae	Chakavad, Pavand	Root	Root juice i.e. 10g. of root in 400ml of water, isboiled and taken orally once a day for about 15days.	anthraquinone, leucopelargonidine and β-Sitosterol
3.	*Ficusbenghalensis*	Moraceae	Bargad	Bark	Ground powder mixed along with honey is given twice a day for about 21 days.	Anthocyanidine derivatives, beta-sitosterol,glucoside and mesoinsitol
4.	*Ficusracemosa*	Moraceae	Gular	Fruit	Dried fruits taken with warm water are helpful in diabetes.	Gluanol acetate, glucanol, tiglic acid, taraxasterol, lupeol acetate, friedelin
5.	*Hibiscus rosa-sinensis*	Malvaceae	Gulhar	Leaf	Tender leaf used to treat diabetes.	β-sitosterol, stigmasterol, taraxeryl acetate

6.	*Lawsoniainermis*	Lythraceae	Mehndi	Flower and leaf	Decoction prepared and is taken once a day for about 14-21 days to treat diabetes.	Lawsone, gallic acid, white resin, sugars, tannins and xanthones
7.	*Ocimum sanctum*	Lamiaceae	Tulsi	Leaf	Leaf powder is taken orally with honey.	oleanolic acid, ursolic acid, rosmarinic acid,[25]eugenol, carvacrol, linalool, β-caryophyllene
8.	*Punicagranatum*	Punicaceae	Anar	Fruit	Fruits used to treat diabetes	phenolics, flavonoids, ellagitannins, and proanthocyanidin compounds
9.	*Tinosporacordifolia*	Menispermaceae	Giloe	Stem, leaf	300mg stem extract taken daily	Berberine, choline, Tembetarine, Palamtine, Jatrorrhizine
10.	*Emblica Officinalis*	Euphorbiaceae	Amla	Fruit	1to 3gm of powdered, dried fruit consumed daily in 30 ml of water	Gallic acid, Tannins

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