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A Database of Antidiabetic Plant Species of Family Asteraceae, Euphorbiaceae, Fabaceae, Lamiaceae and Moraceae

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Plants are playing a great role in the fulfillment of day to day needs and are an integral component of the health care systems. Present review is concerned with the compilation of information related to antidiabetic activity of medicinal plants belonging to families Asteraceae, Euphorbiaceae, Fabaceae, Lamiaceae and Moraceae from the available literature. A detailed account of 88 plant species has been collected. This information is useful in different areas of research especially for the pharmaceutical industry. Based on this data, some species can thoroughly be explored and used for the preparation of additional or alternative antidiabetic drugs. The present review has also highlighted the richness of medicinal plants diversity for the management of diabetes.

Keyword: Antidiabetic activity, Database, Medicinal plants, Review.

1. Introduction

Millions of plants constitute the floristic treasure on the planet earth and are integral part of human life. They provide food, fodder, shelter, fibre, timber, construction material, furniture, dyes, gums, fuels and many other applications in daily life. Moreover, they are excellent source of various herbal medicines useful in the treatment of various human and animal diseases. Medicinal plants offer alternative remedies for different health problems. Diabetes mellitus is one of the major diseases affecting many people on the globe. More than 800 species have been identified throughout the world as medicines for the management of diabetes mellitus. Several drugs are available in the market for this disease^[1,2]. Traditional plant based remedies

are still the first choice in the developing countries because of their cost effectiveness, easy availability and minimum or no side effects^[3,4].

In the present investigation, an inventory of antidiabetic plant species has been prepared from the available literature. These antidiabetic plant species have been explored by many biomedical research groups of the world. We have enlisted 88 antidiabetic plant species. The botanical name, families, plant part used, solvent, active principle and test animals are recorded in Table 1. The number of antidiabetic species in different families' along with their genera is depicted in Fig. 1 and 2. Different plant parts or sometimes the whole plant has been used in the management of diabetes (Table 2). In this

compilation, an attempt has been made to record the anti-diabetic plant species. Sometimes we may come across some traditionally used plant species which have not been scientifically studied. Such species can provide new raw material for antidiabetic drugs. Therefore, any information related to plant based medicines should be compiled for the future generations.

In an attempt to document the plants with antidiabetic and other medical significance, 136 plants were recorded. Out of 136, eight, three two and one species from family's asteraceae, fabaceae, euphorbiaceae and moraceae were found to have antidiabetic properties^[5]. Besides many others, around six members of families' asteraceae, fabaceae and moraceae have been enlisted as herbal remedies for the management of diabetes^[6]. The information about the use of

herbal medicines for the treatment of diabetes was collected from the literature (1990 to 2000). Many other plants in addition to 11 species belonging to family Fabaceae, seven of Lamiaceae, six each of Asteraceae and Moraceae and five species of Euphorbiaceae have shown hypoglycaemic activity^[7]. The plant based remedies for the control of diabetes were reviewed by a research group. Five species from family fabaceae, two from euphorbiaceae and one species each from family's asteraceae, lamiaceae and moraceae along with many other species were reported to have antidiabetic activity^[8]. This shows the significance of plant species in the management of diabetes. This database will enable the biomedical researchers to plan their experiments to develop easily available antidiabetic formulations with high potency, and no or least side effects.

Table1: A database of an antidiabetic plant species

Botanical Name	Family	Active Principle	Solvent (S)*	TA**	PPU***	Ref.
<i>Abrus precatorius</i> L.	Fabaceae	Saponins, flavonoids, tannins and alkaloids	Aq.	MWR	S	[9]
<i>Acacia nilotica</i> L.	Fabaceae	Pods extract	Aq.: M	MR	Po.	[10]
<i>Acosmium panamense</i> (Benth.) Yacolev	Fabaceae	Bark extract	Aq. and B	MWR	B	[11]
<i>Ageratum conyzoides</i> L.	Asteraceae	Alkaloids, cardenolides, tannins, saponins and flavonoids	E	AR	Sh.	[12]
<i>Ajuga iva</i> (L.) Schreber	Lamiaceae	Plant extract	Aq.	WR	WP	[13]
<i>Anacyclus pyrethrum</i> L.	Asteraceae	Tannins, saponins, alkaloids, amino acids, steroids and terpenoids	Aq.	MWR	R	[14]
<i>Aporosa lindleyana</i> Baill.	Euphorbiaceae	Root extract	Aq. and Al.	MAWR	R	[15]
<i>Arctium lappa</i> L.	Asteraceae	Root extract	E	SDR	R	[16]
<i>Artemisia judaica</i> L.	Asteraceae	Flavonoids, saponins, terpenes and tannins	Aq. and E	Rats	AP	[17]
<i>Artemisia sphaerocephala</i> Krasch	Asteraceae	Seed extract	Aq.	MWR	S	[18]
<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Leaf extract	Ethl.ac.	MWR	L	[19]
<i>Bidens pilosa</i> L. var. <i>radiata</i>	Asteraceae	Plant extract	Aq.	db/db mice	WP	[20]

<i>Bridelia grandis</i> Pierre	Euphorbiaceae	Stem bark extract	M	ob/ob and db/db mice	B	[21]
<i>Butea monosperma</i> Lam.	Fabaceae	Leaf extract	E	MSAM	L	[22]
<i>Caesalpinia bonduc</i> L.	Fabaceae	Seed extract	Aq.-M	MAWR	S	[23]
<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Saponins, tannins, terpenoids and resins	M	SAR	L	[24]
<i>Cajanus scarabaeoides</i> L.	Fabaceae	Flavonoids	M	MWR and MSAM	WP	[25]
<i>Calendula officinalis</i> L.	Asteraceae	Carotenoids, flavonoids, glycosides, steroids and sterols	Aq.: Al.	WAR	L	[26]
<i>Cassia grandis</i> L.	Fabaceae	Stem extract	Aq. and E	AR	St.	[27]
<i>Cassia italica</i> Miller.	Fabaceae	Plant extract	Aq. and E	Rb.	WP	[28]
<i>Cassia occidentalis</i> L.	Fabaceae	Anthraquinones, saponins, terpenoids, glycosides and flavonoids	M fraction	MAWR	L	[29]
<i>Cichorium intybus</i> L.	Asteraceae	Plant extract	E	MSDR	WP	[30]
<i>Clitoria ternatea</i> L.	Fabaceae	Leaf and flower extract	Aq.	MWR	L and Fl.	[31]
<i>Cnidioscolus chayamansa</i> Mc Vaugh	Euphorbiaceae	Plant extract	E	MAWR	WP	[32]
<i>Dalbergia sissoo</i> L.	Fabaceae	Leaf extract	E	MWR	L	[33]
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	Fabaceae	Leaf extract	M	MSAM	L	[34]
<i>Detarium microcarpum</i> Guill and Perr	Fabaceae	Carbohydrates, terpenoids, flavonoids, proteins, resins, saponins and glycosides	M and its fraction	AR	R	[35]
<i>Dorstenia picta</i> Bureau	Moraceae	Polyphenol, phenol, flavonoids, saponins, triterpenes and glycosides	M	MWR	Tw.	[36]
<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	Tannins and flavonoids	Aq.: M	MAWR	L	[37]
<i>Erythrina variegata</i> L.	Fabaceae	Leaf extract	M	Rats	L	[38]
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Leaf extract	E	MWR	L	[39]
<i>Ficus arnottiana</i> Miq.	Moraceae	Sterols, carbohydrates, alkaloids, phenols and tannins	P.E., Chlf. and M	WAR	B	[40]
<i>Ficus benghalensis</i> L.	Moraceae	Stem bark extract	Aq.	MSDR	B	[41]
<i>Ficus hispida</i> L.	Moraceae	Bark extract	E	WAR	B	[42]
<i>Ficus krishnae</i> L.	Moraceae	Leaf extract	P.E.	WAR	L	[43]
<i>Ficus nervosa</i> Heyne ex Roth	Moraceae	Leaf extract	E	WAR	L	[44]
<i>Ficus racemosa</i> Roxb.	Moraceae	Bark extract	E and Aq.	SDR	B	[45]
<i>Ficus religiosa</i> L.	Moraceae	Fruit extract	E	WAR	L and Fr.	[46]
<i>Ficus sycomorus</i> L.	Moraceae	Flavonoids, glycosides, reducing sugars, tannins, resins and saponins	M	WAR	B	[47]
<i>Glochidion velutinum</i> Wight	Euphorbiaceae	Leaf extract	E	WAR	L	[48]

<i>Glycine max</i> Merrill	Fabaceae	Seeds extract	Chlf. and Al.	MR	S	[49]
<i>Hyptis suaveolens</i> Poit.	Lamiaceae	Carbohydrates, alkaloids, flavonoids, tannins, steroids and terpenes	M	WAR	L	[50]
<i>Indigofera pulchra</i> Willd.	Fabaceae	Alkaloids, flavonoids, saponins, steroids and tannins	M: Aq.	WR	L	[51]
<i>Inula japonica</i> Thunb.	Asteraceae	Flower extract	Aq.	MM	Fl.	[52]
<i>Inula racemosa</i> Hook. f.	Asteraceae	Root extract	M	WAR	R	[53]
<i>Ixeris gracilis</i> DC.	Asteraceae	Leaf extract	Aq.	FSAM	L	[54]
<i>Leucas lavandulaefolia</i> Willd.	Lamiaceae	Flower extract	Chlf.	MAWR	Fl.	[55]
<i>Medicago sativa</i> L.	Fabaceae	Flower extract	Aq.	Mice	Fl.	[56]
<i>Melanthera scandens</i> Schumach and Thonn.	Asteraceae	Leaf/ fractions extract	E	SAM	L	[57]
<i>Morus alba</i> L.	Moraceae	Alkaloids, steroids, flavonoids, tannins, saponins and glycosides	M and Aq.	Rats	L	[58]
<i>Mucuna pruriens</i> Bak.	Fabaceae	Flavonoids, saponins, tannins, cardiac glycosides, triterpenes and reducing sugars	E	WAR	L	[59]
<i>Ocimum basilicum</i> L.	Lamiaceae	Plant extract	Aq.	MWR	WP	[60]
<i>Ocimum sanctum</i> L.	Lamiaceae	Saponins, triterpenes and flavonoids	E and its fraction	LER	L	[61]
<i>Ocimum suave</i> Willd.	Lamiaceae	Leaf extract	Aq.	MAWR	L	[62]
<i>Ougeinia oojinensis</i> (Roxb.)	Fabaceae	Flavonoids, saponins, alkaloids, mucilage, tannins and phenolic compounds	E	MSAM and WR	B	[63]
<i>Parthenium hysterophorus</i> L.	Asteraceae	Flower extract	Aq.	WAR	Fl.	[64]
<i>Peltophorum pterocarpum</i> (DC.) K. Heyne	Fabaceae	Flavonoids and steroids	M: ethl ac.	MSAM	R	[65]
<i>Phyllanthus amarus</i> Schum. Thonn.	Euphorbiaceae	Phyllanthin, hypophyllarntin, nirulin, flavonoids, terpenes and alkaloids	E	MSAM	L	[66]
<i>Phyllanthus debilis</i> L.	Euphorbiaceae	Plant extract	Aq.	Mice	WP	[67]
<i>Phyllanthus reticulatus</i> Poir.	Euphorbiaceae	Terpenoids, glycosides, proteins and carbohydrates	P.E and E	Mice	R	[68]
<i>Phyllanthus sellowianus</i> Muller Arg.	Euphorbiaceae	Stem bark extract	Aq.	MWR	B	[69]
<i>Phyllanthus niruri</i> L.	Euphorbiaceae	Aerial parts extract	M	AR	AP	[70]
<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Lamiaceae	Leaf extract	E	WAR	L	[71]
<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae	Flavonoids, triterpenoids, carbohydrates, tannins, phytosterols and traces of alkaloids	P.E., Chlf., Al. and Aq.	WAR	L	[72]

<i>Prosopis cineraria</i> Druce	Fabaceae	Bark extract	E	MSAM	B	[73]
<i>Prunella vulgaris</i> L.	Lamiaceae	Spike extract	Aq-E	MICRM	Sp.	[74]
<i>Pseudarthria viscida</i> L.	Fabaceae	Flavonoids and Tannins	E	WAR	R	[75]
<i>Pterocarpus marsupium</i> Roxb.	Fabaceae	Alkaloids, coumarins, flavonoids, glycosides, tannins, phenols, saponins and steroids	E	WAR	W and B	[76]
<i>Quercus infectoria</i> Olivier	Fabaceae	Root extract	M	Rats	R	[77]
<i>Rosmarinus officinalis</i> L.	Lamiaceae	Leaf extract	Aq.	MAR	L	[78]
<i>Salvia officinalis</i> L.	Lamiaceae	Sage leaf extract	E	MWR	L	[79]
<i>Securigera securidaca</i> L.	Fabaceae	Seed extract	Aq. and Al.	MWR	S	[80]
<i>Senecio mikanioides</i> Otto	Asteraceae	Leaf and stem extract	Chlf.	MSDR	L and St.	[81]
<i>Senna auriculata</i> (L.) Roxb.	Fabaceae	Leaf extract	E	MAWR	L	[82]
<i>Sesbania sesban</i> (L.) Merr.	Fabaceae	Triterpenoids, carbohydrates, vitamins, amino acids, proteins, tannins, saponins, glycosides and steroids	Aq.	MAWR	L	[83]
<i>Stevia rebaudiana</i> Bert. (Bertoni)	Asteraceae	Leaf extract	Be: Act.	WAR	L	[84]
<i>Streblus asper</i> Lour.	Moraceae	Root bark extract	M	MAWR	RB	[85]
<i>Sutherlandia frutescens</i> R. Br.	Fabaceae	Leaf extract	Aq.	WR	L	[86]
<i>Tamarindus indica</i> L.	Fabaceae	Seed extract	Aq.	MAWR	S	[87]
<i>Tephrosia purpurea</i> Taub	Fabaceae	Leaf extract	Aq.	MAWR	L	[88]
<i>Tetrapleura tetraptera</i> (Schum. and Thonn.) Taub.	Fabaceae	Fruit extract	Aq.	MWR	Fr.	[89]
<i>Thymus serpyllum</i> L.	Lamiaceae	Plant extract	Aq.	Rb.	WP	[90]
<i>Tragia cannabina</i> L. f.	Euphorbiaceae	Root extract	E	MWR	R	[91]
<i>Trigonella foenum-graecum</i> L.	Fabaceae	Seed extract	E	MAR	S	[92]
<i>Uraria crinita</i> (L.) Desv. ex DC.	Fabaceae	Plant extract	Aq.	MM	WP	[93]
<i>Vatairea macrocarpa</i> (Benth.) Ducke	Fabaceae	Stem bark extract	E	Rats	B	[94]
<i>Vernonia amygdalina</i> Delile	Asteraceae	Alkaloids, tannins, saponins and cardiac glycosides	Aq.	AR	L	[95]
<i>Vernonia colorata</i> (Willid.) Drake (Composees)	Asteraceae	Leaf extract	Aq.	Rats	L	[96]

Abbreviations

*S (Solvents)	Al.- Alcohol, Aq.- Aqueous, B- Butanol, Be- Benzene, Chlf.- Chloroform, E- Ethanol, Ethl.ac.-Ethyl acetate, M.- Methanol, PE- Petroleum Ether.
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<p>**TA (Test Animals)</p>	<p>AR- Albino Rats, FSAM- Female Swiss Albino Mice, LER- Long Evans Rats, MAR- Male Albino Rats, MAWR- Male Albino Wistar Rats, MICRM-Male ICR Mice, MM- Male Mice, MR- Male Rabbits, MSAM- Male Swiss Albino Mice, MSDR- Male Sprague Dawley Rats, MWR- Male Wistar Rats, Rb.- Rabbits, SAM- Swiss Albino Mice, SAR- Swiss Albino Rats, SDR- Sprague Dawley Rats, WAR- Wistar Albino Rats, WR- Wistar Rats.</p>
<p>***PPU (Plant Parts Used)</p>	<p>AP- Aerial Parts, B- Bark, Fl.- Flowers, Fr.- Fruits, L- Leaves, Po- Pods, RB- Root Bark, R- Roots, S- Seeds, Sh.- Shoots, Sp.- Spike, St.- Stem, Tw.- Twigs, WP- Whole Plant, W- Wood.</p>

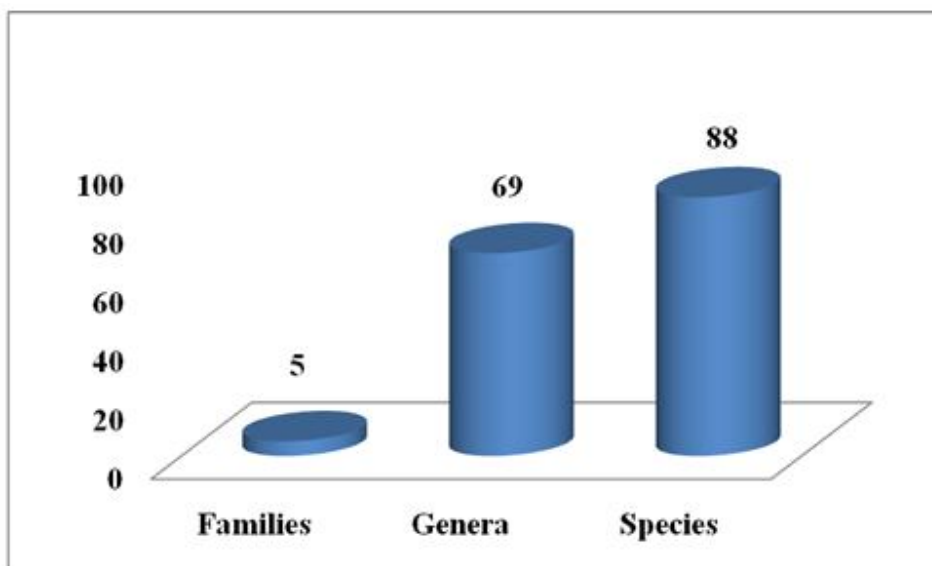


Fig. 1 Number of families, genera and species

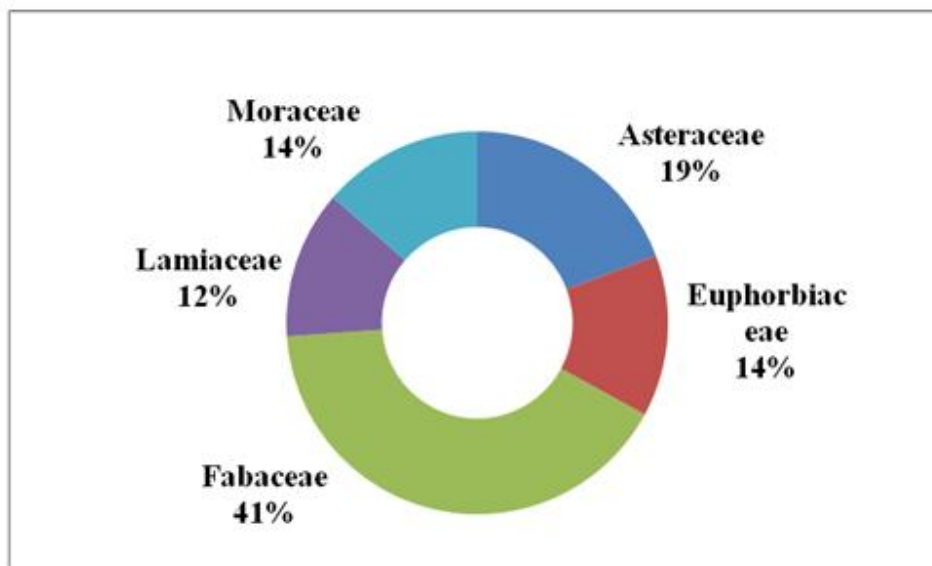


Fig. 2 Number of species in different families

Table 2: Useful plant parts of different antidiabetic species

Plant parts used	Number of species	Plant parts used	Number of species
Aerial parts	2	Seeds	7
Bark	12	Shoots	1
Flowers	5	Spike	1
Fruits	2	Stem	2
Leaves	36	Twigs	1
Pods	1	Whole plant	10
Roots	12	Wood	1
Root bark	1		

2. Conclusion

Diabetes is one of the serious disease affecting individuals of every age. Hence its management is of great concern to the human population. Wide ranges of medicines are available in the market to control diabetes. The biomedical researchers are always in search of alternative and more effective curative agents. They can best use the existing plant resources having antidiabetic potential for the preparation of new medical formulations. The present database is an excellent source of information for them. The antidiabetic plant species which has yet not been fully explored needs detailed investigation so that these can be used in the designing of antidiabetic drugs.

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