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Medicinal Plants From Twelve Families Having Antidiabetic Activity: A Review

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ABSTRACT

The plant based antidiabetic remedies are gaining popularity throughout the world. There is large number of medicinal plants which are traditionally used for the management of diabetes. These plants need detailed investigation for the quality and quantity of the concerned chemical compounds. The present review has highlighted 81 plant species belonging to 12 families and 68 genera. Amongst the various plant parts of these species, leaves have been utilized in almost 50% of the total medical preparations. Other plant parts also have their utility in antidiabetic formulations. This information is useful for the herbal practitioners, biomedical researchers and pharmaceutical industries.

Keywords: Active principle, diabetes, extracts, hypoglycemia, plant species.

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INTRODUCTION

Medicinal plants are potential curative agents for various health related disorders both of human and animals. The plants have been used for this purpose since ancient times. India is known for its rich floral diversity and this provides a huge variety of raw materials for the preparation of medicines[1]. Diabetes is a common disease affecting human population irrespective of their age in different countries of the world. This disease is still a major challenge for the researchers. Natural plant products possess antidiabetic activity and several studies have already confirmed the antihyperglycaemic potential of plants. Medicinal plants contain number of phytoconstituents. Many side effects of the presently used modern medicines for the management of diabetes have raised the demand of safe and cost effective remedial measures[2].

Medicinal plants are also playing a key role in the management of diabetes throughout the world especially in the developing countries. These are also known to correct the complications associated with the diabetes. Recently, some highly effective antidiabetic biomolecules were isolated from plant resources. Many of these biomolecules were said to be superior to the already known hypoglycaemic drugs. Further studies are required to characterise the activity of unexplored antidiabetic plants[3]. Medical researchers are working on various natural plant based products to manage the emerging epidemic of diabetes. There are large numbers of plants which have the antidiabetic activity. These plants have variable antidiabetic potential. Therefore, detailed investigations are required for the screening and separation of biomolecules of therapeutic importance. Sometime a formulation in the form of a mixture proved better than a medicine derived from a single plant[4].

The curative activity of different medicinal plants for the treatment of various human ailments was listed and 25 species from different families were designated as antidiabetic. Thorough studies using the latest technologies were recommended to understand the pharmacological properties of the traditionally used medicinal plants[5]. This shows the wealth of medicinal plants available for the management of diabetes. The documentation of medicinal plants in such form will help the biomedical researchers to carry out further investigations on these species for the preparatioin of new and efficient antidiabetic drugs.

RESULTS AND DISCUSSION

An effort has been made to record the number of medicinal plants having antidiabetic activity in twelve families. A total of 81 plant species have been enlisted (Table 1). It has been observed that leaves were the most frequently used part amongst the other plant parts. The leaves of 38

species were found to be useful in the treatment of diabetes. The other plant parts have proven their utility in the remaining species. This shows that different plant parts have their own medicinal significance. The roots (nine species), seeds (eight species), fruits (seven species), aerial parts, bark and flowers of four species each possess the chemical compounds responsible for antidiabetic activity. The stem and whole plant of two species have found their space in this documentation. The plant parts like corm, grain, nuts, peel and sepals each belonging to five different species have shown their utility in diabetes (Figure. 1).

In this review of antidiabetic medicinal plants, 10 species belongs to family Cucurbitaceae. Two families i. e. Asclepiadaceae and Malvaceae have nine species followed by Acanthaceae, Apocynaceae and Myrtaceae which are represented by eight species each. Other families like Anacardiaceae, Amaranthaceae, Meliaceae, Poaceae and Rutaceae are credited by five species each. The family Menispermaceae has contributed only four species (Figure. 2). The present review has presented 81 plant species from 68 genera and 12 families having antidiabetic activity (Figure. 3). Recently, 88 plant species belonging to families Asteraceae, Euphorbiaceae, Fabaceae, Lamiaceae and Moraceae were enlisted as antidiabetic[87].

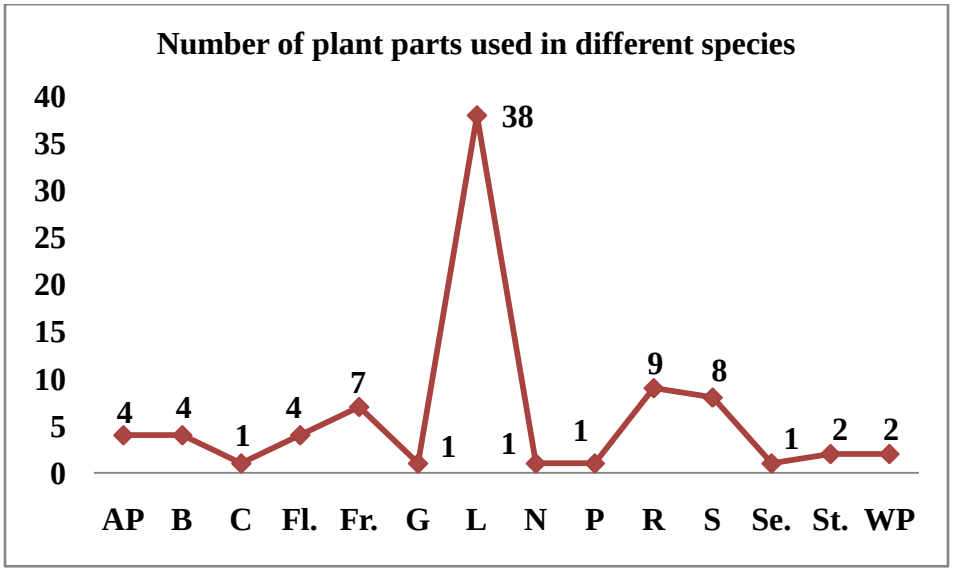

Figure 1: Number of plant parts used in different species

Table 1: A list of antidiabetic medicinal plants

Botanical Name	Active Principle	Solvent (S)*	TA[@]	PPU[#]	Ref.
Acanthaceae					
Adhatoda zeylanica L.	Leaf extract	E	WAR	L	[6]
Andrographis paniculata (Burm.f.) Wall. Ex Nees	Root extract	Chlf.	SDR	R	[7]
Barleria prionitis L.	Leaf extract	Al.	AR	L	[8]
Justicia beddomei (C. B. Clarke) Bennet	Tannins	E	WR	L	[9]
Pseuderanthemum palatiferum (Nees) Radlk.	Leaf extract	E	MAWR	L	[10]
Rhinacanthus nasutus (L.) Kurz.	Leaf extract	M	MAWR	L	[11]
Ruellia tuberosa L.	Alkaloids, flavonoids, triterpenoids, sterols and phenolics	M & (n-H & ethl ac.)	MR	WP	[12]
Thunbergia laurifolia L.	Leaf extract	Aq.	Rats	L	[13]
Amaranthaceae					
Achyranthes aspera L.	Plant extract	Aq.	WAR	WP	[14]
Achyranthes rubrofusca L.	Leaf extract	Aq. & E	MAWR	L	[15]
Aerva lanata (L.) A. L. Juss. Ex J. A. Schultes	Sterols, glycosides, flavonoids, carbohydrates and tannins	Al.	SAM	L	[16]
Amaranthus spinosus L.	Alkaloids, glycosides, terpenes and phytosterol	M	MAWR	St.	[17]
Celosia argentea L.	Seed extract	Al.	MSAR	S	[18]
Anacardiaceae					
Anacardium occidentale L.	Leaf extract	M & fractions	MWR	L	[19]
Mangifera indica L.	Leaf extract	Aq., E and H	WAR	L	[20]
Sclerocarya birrea (A.Rich.) Hochst.	Stem bark extract	Aq.	WR	B	[21]
Semecarpus anacardium L.	Dried nuts extract	E	Rats	N	[22]
Spondias mombin L.	Leaf extract	M & its Chlf. fraction	Rats	L	[23]
Apocynaceae					
Alstonia scholaris L.	Bark extract	Aq.	MWR	B	[24]

Catharanthus roseus G. Don.	Leaf extract	DCM: M	MAWR	L	[25]
Chonemorpha fragrans (Moon) Alston	Alkaloids, tannins, saponins and phytosterols	Al.	WAR	R	[26]
Holarrhena antidysenterica (Roxb. ex Fleming) Wall.	Seed extract	M	MWR	S	[27]
Hunteria umbellata K. Schum	Alkaloids, flavonoids, tannins and glycosides	Aq.	FWR	S	[28]
Ichnocarpus frutescens (L) R. Br.	Root extract	Aq.	MAWR	R	[29]
Rauwolfia serpentina Benth. ex Kurz	Root extract	M	MAWR	R	[30]
Wrightia tinctoria L.	Carbohydrates, gums and mucilage, fixed oils, alkaloids, glycosides, steroids and triterpenoids	P.E.	WAR	L	[31]
Asclepiadaceae					
Calotropis gigantea L.	Leaf and flower extract	Chlf.	WAR	L & Fl.	[32]
Calotropis procera (Ait.) R. Br.	Alkaloids, flavonoids, glycosides, saponins and terpenes	M, Aq. & P.E	MAWR	L	[33]
Caralluma tuberculata N. E. Br.	Aerial part extract	M	MAWR	AP	[34]
Gongronema latifolium Benth.	Alkaloids, flavonoids, terpenoids, saponins, steroids and proteins	Aq.	AR	L	[35]
Gymnema montanum Hook. f.	Leaf extract	Al.	Rats	L	[36]
Gymnema sylvestre R. Br.	Leaf extract	Aq.	WAR	L	[37]
Hemidesmus indicus R. Br.	Root extract	Aq.	MAWR	R	[38]
Parquetina nigrescens (Afz.) Bullock	Leaf extract	Aq.	MWR	L	[39]
Wattakaka volubilis (L. F) Stapf.	Alkaloids, coumarins, flavonoids, glycosides, terpenoids, tannins, phenols, saponins and steroids	E	MAWR	L	[40]
Cucurbitaceae					
Citrullus colocynthis Schrad.	Glycosides, triterpenoids, alkaloids, flavonoids and resins	Aq.	WR & SAM	R	[41]
Coccinia indica Wight and Arn.	Triterpenes	Al.	Rats	AP	[42]
Cucurbita ficifolia Bouche.	Fruit extract	M	MWR	Fr.	[43]
Cucurbita pepo L.	Fruit powder		MWR	Fr.	[44]

Lagenaria siceraria (Mol.) Standley	Polyphenolics, flavonoids, glycosides, triterpenoids, saponins and carbohydrates	M	WAR	AP	[45]
Luffa aegyptica Mill.	Flavonoids	Aq. & E	SDR	L	[46]
Momordica charantia L.	Alkaloids, carbohydrates, flavonoids, fatty acids, saponins, steroids and terpenoids	Ethl.ac. & E	WAR	Fr.	[47]
Momordica dioica Roxb. ex. Wild.	Steroids , triterpenoids and their glycosides	Al. & Ethl. ac.	MWR	Fr.	[48]
Telfairia occidentalis Hook. f.	Alkaloids, steroids, tannins and terpenes	E	WAR	S	[49]
Trichosanthes dioica Roxb.	Leaf extract	Aq.	MAR	L	[50]
Malvaceae					
Abelmoschus esculentus (L.) Moench.	Peel and seed powder		MAWR	P & S	[51]
Abutilon indicum (L.) Sweet	Leaf extract	Aq. & Al.	WR	L	[52]
Hibiscus cannabinus L.	Flavonoids	M	FSAM	L	[53]
Hibiscus platanifolius L.	Carbohydrates, gums, proteins, amino acid, steroids, alkaloids, tannins and flavonoids	E & Aq.	MWR	L	[54]
Hibiscus rosa sinensis L.	Flower extract	E	MWR	Fl.	[55]
Hibiscus tiliaceus L.	Flower extract	M	WR	Fl.	[56]
Salmalia malabarica (DC.) Schott and Endl.	Sepal extract	Aq. & M	MAWR	Se.	[57]
Sida rhombifolia L. ssp. *Retusa*	Leaf extract	Aq.	WR & SAM	L	[58]
Thespesia populnea Soland ex Correa	Carbohydrates, proteins, tannins, phenols, flavonoids, terpenes, saponins and gums	E	WR	L & B	[59]
Meliaceae					
Azadirachta indica A. Juss.	Leaf extract	E	WAR	L	[60]
Melia dubia CAV	Fruit extract	P.E, Aq., Al. & Chlf.	Mice	Fr.	[61]
Pseudocedrela kotschyi (Schweinf.) Harms	Leaves extract	Aq.	WAR	L	[62]
Swietenia macrophylla King	Seed extract	M	WAR	S	[63]
Swietenia mahagoni L. Jacq.	Bark extract	M	Rats	B	[64]

Menispermaceae					
Cocculus hirsutus (L.) Diels	Aerial part extract	M	MAR	AP	[65]
Sphenocentrum jollyanum Pierre	Alkaloids, saponins, terpenoid compound, anthraquinones, flavonoids, tannins, cardiac glycosides and reducing sugar	Aq.	Rb.	R	[66]
Stephania hernandifolia (Willd.) Walp.	Corm extract	E & Aq.	MAWR	C	[67]
Tinospora cordifolia (Willd.) Miers ex Hook. F. and Thoms.	Stem extract	M	MAWR	St.	[68]
Myrtaceae					
Campomanesia xanthocarpa Berg	Leaf decoction	Aq.	MWR	L	[69]
Cleistocalyx operculatus (Roxb.) Merr and Perry	Flower bud extract	Aq.	Rats	Fl.	[70]
Eucalyptus citriodora Hook.	Leaf extract	Aq.	AR	L	[71]
Eucalyptus globulus Labill.	Leaf extract	Aq.	MWR	L	[72]
Eugenia floccosa Bedd.	Alkaloids, catechin, coumarin, tannins, saponins, steroids, flavonoids, phenols, sugar, glycosides, xanthoprotein and fixed oil	E	MAWR	L	[73]
Psidium guajava L.	Unripe fruit peel extract	Aq.	MAWR	Fr.	[74]
Syzygium alternifolium (Wt.) Walp.	Seed extract	Aq, E & H	Rats	S	[75]
Syzygium cumini L.	Seed powder and seed extract	E	LER	S	[76]
Poaceae					
Ampelodesma mauritanica T., Durand and Schinz	Root extract	M	SAR	R	[77]
Bambusa arundinacea Willd.	Leaf extract	Aq	MWR	L	[78]
Bambusa vulgaris Schrad.	Phytosterols and tannins	P.E	FSAM	L	[79]
Cynodon dactylon Pers.	Alkaloids, carbohydrates, phytosterols, glycosides, saponins, flavonoids, triterpenoids and phenolic compounds	E	WAR	R	[80]
Paspalum scrobiculatum L.	Grains extract	E & Aq.	MAWR	G	[81]
Rutaceae					
Aegle marmelos (L.) Corr. Ex. Roxb.	Leaf extract	M	MWR	L	[82]
Citrus limetta Risso	Flavonoids, alkaloids, tannins and saponins	M	MAWR/ SAM	Fr.	[83]

Citrus maxima (J. Burm.) Merr.	Alkaloids, flavonoids and steroids	M	WAR	L	[84]
Murraya koenigii (L.) Spreng.	Leaf extract	Aq.	MWR	L	[85]
Toddalia asiatica (L.) Lam	Alkanoids, terpenoids, cumarins, flavonoids and phenolic compounds	Ethl.ac.	Rats	L	[86]

Solvent (S)*	Al.- Alcohol, Aq.- Aqueous, Chlf.- Chloroform, DCM- Dichloromethane, E- Ethanol, Ethl.ac.-Ethyl acetate, H- Hexane, M.- Methanol and PE- Petroleum Ether.
TA[@]	AR- Albino Rats, FSAM- Female Swiss Albino Mice, FWR-Female Wistar Rats, LER- Long Evans Rats, MAR- Male Albino Rats, MAWR- Male Albino Wistar Rats, MR- Male Rabbits, MSAR- Male Swiss Albino 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.
PPU[#]	AP- Aerial Parts, B- Bark, C- Corm, Fl.- Flowers, Fr.- Fruits, G- Grains, L- Leaves, N- Nuts, P- Peel, R- Roots, S- Seeds, Se.- Sepal, St.- Stem, W- Wood and WP- Whole Plant.

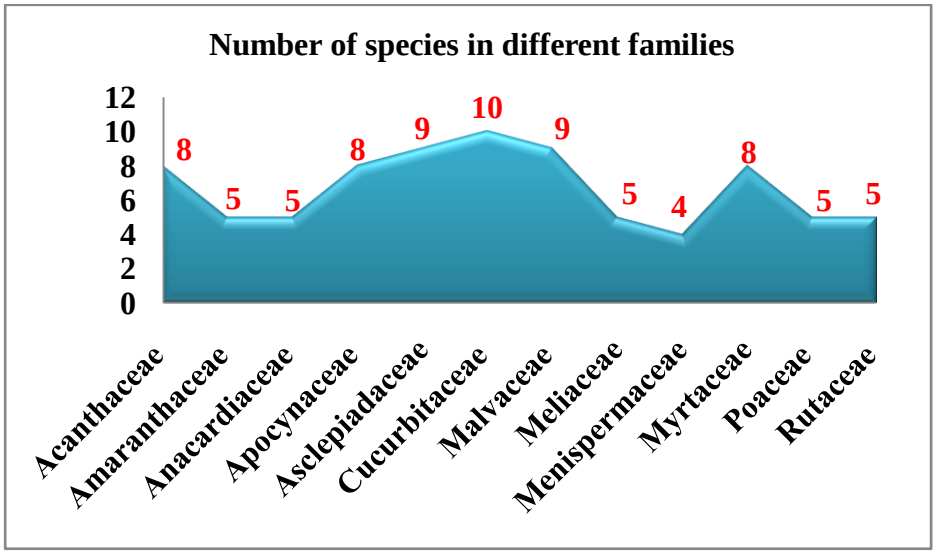

Figure 2: Number of species in different families

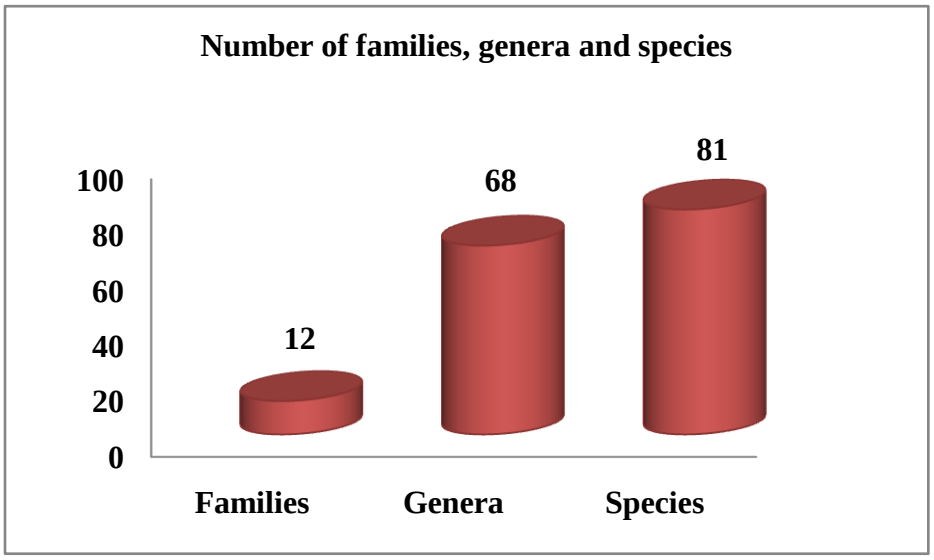

Figure 3: Number of families, genera and species

CONCLUSION

Medicinal plants have their own significance in the management of various diseases including diabetes since time immemorial. There are large number of plants which have been explored for their contribution in the treatment of diabetes. Enlisting of such plants will help the researchers to focus their studies accordingly. Presently more than 80 species have been found to be utilised as an antidiabetic. This review has also suggested the various chemical compounds present in the used plant parts. This shows the availability and richness of plant based materials that can be used in the preparation of new and alternative antidiabetic medicines. Further studies are required to select the plants on the basis of quantity and quality of phytochemicals imparting antidiabetic activity.

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