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**Review Article**

# A Review on Antidiabetic Medicinal Plants

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**ABSTRACT**

Medicinal plants are being used from centuries for the treatment of various human ailments. Remedial preparations from plants are considered to be cost effective, safe and alternate for the treatment of diseases including diabetes mellitus. The purpose of the present article is to document the antidiabetic plant species. A total of 143 species and their constituents along with extracts have been reviewed. Plant part used, solvents and test animals have also been briefly described. The antidiabetic activity is attributed to the different phytochemicals present in medicinal plants.

**Key words:** Medicinal plants, diabetes mellitus**,** antidiabetic activity, active principle, review.

## INTRODUCTION

Medicinal plants are playing an important role in the growth and development of mankind. Herbal drugs have been used in traditional systems of medicines, since time immemorial in different parts of the world. Around 80% people in the developing countries rely on traditional medicines [26]. Medicinal plants have been used to manage the diabetes and associated complications. The medicinal plants provide cost effective, easily available alternative medicines with least or no side effects [67]. Medicinal plants or their secondary metabolites have been found to be responsible for medicinal activity. The chemical substances present in plants produce action on the human body. Alkaloids, tannins, flavonoids, phenolic compounds *etc.* were some of the major chemical compounds [49]. The aim of this review is to compile data on plants with hypoglycaemic activity. The antidiabetic plant species from seventeen families have earlier been recorded by Sidhu and Sharma [117, 118]. The database of important medicinal plants including antidiabetic is useful for researchers to design the future research experiments.

## RESULT

The paper has presented various plant species used in the management of diabetes. These species have been enlisted in Table 1. There are 143 species in this review that have antidiabetic properties. These plant species belongs to 84 families (Table 2). Out of these, four species belongs to each of families Combretaceae, Solanaceae and Verbenaceae. The families like Aizoaceae, Nyctaginaceae, Nymphaeaceae, Burseraceae, Cecropiaceae, Chenopodiaceae, Rosaceae, Rubiaceae, Ebenaceae, Urticaceae, Lauraceae, Liliaceae, Loganiaceae have three species each, followed by Annonaceae, Arecaceae, Berberidaceae, Bignoniaceae, Bombacaceae, Boraginaceae, Convolvulaceae, Costaceae, Hippocrateaceae, Iridaceae, Lythraceae, Mimosaceae, Oleaceae, Pandanaceae, Piperaceae, Polygonaceae, Portulacaceae, Ranunculaceae, Sapindaceae Sapotaceae, Scrophulariaceae, Sterculiaceae, Zingiberaceae and Zygophyllaceae credited with two species. In addition to this, one species have been reported from the families like Acoraceae, Agavaceae, Alangiaceae, Apiaceae, Araceae, Araliaceae, Balanitiaceae, Basellaceae, Capparidaceae, Caricaceae, Caryophyllaceae, Moringaceae, Musaceae,

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Myricaceae, Onagraceae, Orchidaceae, Oxalidaceae, Palmaceae, Passifloraceae, Polypodiaceae, Primulaceae, Punicaceae, Rhamnaceae, Crassulaceae, Elaegnaceae, Equisetaceae, Eucommiaceae, Flacourtiaceae, Fomitopsidaceae, Hericiaceae, Hypericaceae, Irvingiaceae, Juglandaceae, Melastomataceae, Melianthaceae, Salvadoraceae, Samydaceae, Sonneratiaceae, Symplocaceae, Thymelaeceae, Tiliaceae, Ulmaceae, Violaceae and Vitaceae having antidiabetic activity. Plants have also been categorized on the basis of plant part used. Leaves were found to be the most frequently used plant part (57) in the management of diabetes. Other plant parts i.e. bark (13), roots (14), fruits (11), seeds (11), whole plants (11), and aerial parts (9) have shown activity against diabetes. Rhizome (3), flower (4), root bark (3), stem (4), tubers (2), bulb (2) also possess antidiabetic activity. The plant parts like inflorescence, peel, spadix and stigma of one species each were found to be potential antidiabetic agents.


## SUMMARY

Medicinal plants are playing an important role in human health care systems throughout the world. They are used in modern traditional medicines not only in developing but in the developed countries as well. Large number of medicinal plants is being used in the management of diabetes mellitus. Documentation of plants used in medicines is highly required to preserve this knowledge and conservation of plant species. In this paper, 143 antidiabetic plant species belonging to 84 families have been recorded. The Botanical name, family, plant part used, test animal, solvent used and active principle are also included. The documentation of antidiabetic medicinal plants may provide a raw material to the pharmaceutical industry for the preparation of new drugs.


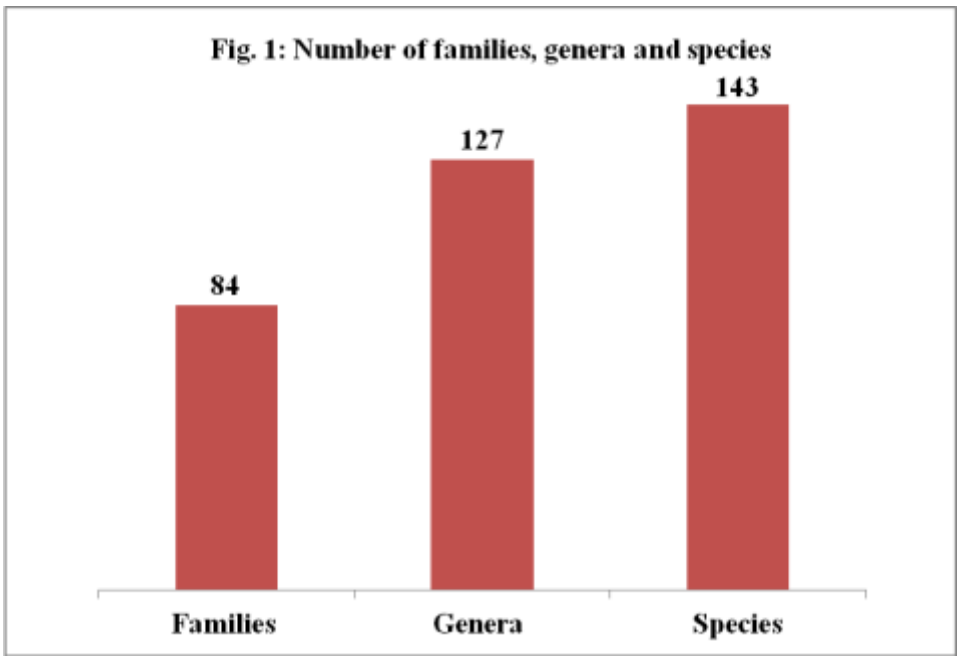

**Table1: Various plant parts used for the management of diabetes:**

| Botanical Name | Family | Active Principle | Solvent (s) | TA | Ref. |
|---|---|---|---|---|---|
| **Aerial Parts** | | | | | |
| *Bacopa monnieri* L. | Scrophulariaceae | Aerial parts extract | E | WAR | [40] |
| *Equisetum myriochaetum* Schlecht and Cham | Equisetaceae | Flavonol glycosides & one Caffeoylglycoside | Aq. & B | MWR | [22] |
| *Laportea ovalifolia* Scham and Thonn. | Urticaceae | Aerial part extract | Aq. | MAWR | [76] |
| *Lycium shawii* Roem and Schult | Solanaceae | Aerial part extract | E | MWR | [116] |
| *Salvadora oleoides* Decne | Salvadoraceae | Aerial part extract | E | AR | [140] |
| *Scoparia dulcis* L. | Scrophulariaceae | Alkaloids, carbohydrates, glycosides, flavonoids & tannins | E | SAM | [148] |
| *Suaeda fruticosa* Forssk. ex J. F. Gmel. | Chenopodiaceae | Aerial part extract | Aq. | MWR | [21] |
| *Zygophyllum gaetulum* Emb. and Maire | Zygophyllaceae | Aerial part extract | Aq. | MAWR | [51] |
| *Zygophyllum geslini* Coss. | Zygophyllaceae | Aerial parts extract | Aq. | MWR | [72] |
| **Bark** | | | | | |
| *Adansonia digitata* L. | Bombacaceae | Tannins, carbohydrates, terpenes, saponins, flavonoids & alkaloids | M | WR | [128] |
| *Albizia odoratissima* Benth. | Mimosaceae | Bark extract | M | Mice | [57] |
| *Cinnamomum verum* J. S. Presl | Lauraceae | Bark extract | Aq. | MAR | [37] |

| | | | | | |
|---|---|---|---|---|---|
| *Commiphora africana* (A. Rich.) Engl. | Burseraceae | Alkaloids, tannins, flavonoids, steroids & saponins | Aq. & E | WR | [42] |
| *Crataeva nurvala* Buch. Ham. | Capparidaceae | Triterpenoids & flavonoids | P.E, Aq., Chlf. & Al. | WAR | [119] |
| *Diospyros melanoxylon* Roxb. | Ebenaceae | Triterpenoids, steroids, alkaloids, flavonoids & tannins | E | MAWR | [50] |
| *Helicteres isora* L. | Sterculiaceae | Bark extract | Aq. | MAWR | [59] |
| *Madhuca indica* J. F. Gmel. | Sapotaceae | Bark extract | M | WR | [25] |
| *Musanga cecropioides* R. Br. ex Bennet | Cecropiaceae | Bark extract | E & Aq. | MWR | [5] |
| *Parinari excela* Sougue | Rosaceae | Bark extract | Aq. | Rats | [85] |
| *Polyalthia longifolia* var. *angustifolia* Thw. | Annonaceae | Alkaloids, triterpenoids, flavonoids, steroids, saponins, glycosides & tannins | M | MAWR | [43] |
| *Strychnos henningsii* Gilg. | Loganiaceae | Flavonoids, tannins & saponins | Aq. | MWR | [92] |
| *Triplochiton scleroxylon* Schumann | Sterculiaceae | Bark extract | Aq. | MR | [100] |
| **Bulb** | | | | | |
| *Allium sativum* L. | Liliaceae | Bulb extract | Aq. | SDR | [133] |
| *Gladiolus psittascinus* Hook | Iridaceae | Bulb extract | M | WAR | [2] |
| **Flower** | | | | | |
| *Antigonon leptopus* Hook & Arn. | Polygonaceae | Flower extract | M | MAWR | [122] |

| | | | | | |
|---|---|---|---|---|---|
| *Kigelia pinnata* Jacq. | Bignoniaceae | Flower extract | M | WR | [63] |
| *Mimusops elengi* L. | Sapotaceae | Flower extract | M | AR & SAM | [145] |
| *Nymphaea stellata* Willd. | Nymphaeaceae | Flower extract | E | MWR | [103] |
| **Fruits** | | | | | |
| *Balanites aegyptiaca* (L.) Delile | Balanitiaceae | Fruit flesh extract | Aq. & E | MSDAR | [143] |
| *Diospyros lotus* L. | Ebenaceae | Fruit extract | Aq. | MAWR | [19] |
| *Fomitopsis pinicola* (Swartz. Fries) Karst. | Fomitopsidaceae | Fruit body extract | Aq. & Alkali | Rats | [65] |
| *Hericium erinaceus* (Bull.) Pers. | Hericiaceae | Fruiting bodies extract | M | MWR | [139] |
| *Musa paradisiaca* L. | Musaceae | Fruit extract | M | Mice | [89] |
| *Phaleria macrocarpa* (Scheff.) Boerl (Pm) | Thymelaeaceae | Flavonoids, terpenoids & tannins | M | MSDR | [9] |
| *Rosa canina* L. | Rosaceae | Fruit extract | E | MAWR | [91] |
| *Solanum nigrum* L. | Solanaceae | Alkaloids, flavonoids, phenolics & micronutrients | Aq.& hydroalcoholic | SDR | [74] |
| *Terminalia belerica* Roxb. | Combretaceae | Triterpenoids-arjungenin, bellericagenins & belleric acid | M | MWR | [110] |
| *Terminalia pallida* Brandis | Combretaceae | Flavonoids, phenolic acids, sterols/ triterpenoid, alkaloids, tannins & anthocyanins | E | MAWR | [106] |
| *Trapa natans* L. | Lythraceae | Fruit peel extract | M | MAWR | [28] |
| **Inflorescence** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| *Coptis chinensis* Franch | Ranunculaceae | Inflorescense extract | Aq. | Rats | [142] |
| **Leaves** | | | | | |
| *Aegiceras corniculatum* (L.) Blanco | Primulaceae | Leaf extract | E | MAR | [46] |
| *Aframomum melegueta* (Rosc.) K. Schum. | Zingiberaceae | Leaf extract | Aq. | MAR | [75] |
| *Alangium lamarckii* Thw. | Alangiaceae | Leaf extract | Al. | MACFR | [62] |
| *Aloe vera* (L.) Burm. Fil. | Liliaceae | Leaf extract | Aq. | MAR | [109] |
| *Anabasis articulata* (Forssk) Moq. | Chenopodiaceae | Saponins | Aq. | SAM | [53] |
| *Annona squamosa* L. | Annonaceae | Leaf extract | Aq. | WR & Rb. | [45] |
| *Areca catechu* L. | Palmaceae | Triterpenoids | P.E., Chlf. & M | MAWR | [78] |
| *Averrhoa bilimbi* L. | Oxalidaceae | Leaf extract | E | MSDR | [101] |
| *Basella rubra* L. | Basellaceae | Leaf pulp | Aq. | MAR | [86] |
| *Bersama engleriana* Gurke | Melianthaceae | Leaf extract | Aq. & M | MAWR | [87] |
| *Boerhaavia diffusa* L. | Nyctaginaceae | Alkaloids, sterols or triterpenoids | Aq. | Rb. | [56] |
| *Bougainvillea glabra* L. | Nyctaginaceae | Alkaloids, flavonoids, saponins & cardiac glycosides | Aq. | WR | [1] |
| *Bryophyllum pinnatum* (Lam.) Kurz | Crassulaceae | Flavonoids, polyphenols, triterpenoids & chemical constituents | Aq. | Rats | [88] |

| | | | | | |
|---|---|---|---|---|---|
| *Cardiospermum halicacabum* L. | Sapindaceae | Leaf extract | E | MAWR | [136] |
| *Cecropia obtusifolia* Bertol. | Cecropiaceae | Flavone, isoorientin & 3-caffeoylquinic | Aq. & B | MWR | [12] |
| *Cecropia pachystachya* Mart. | Cecropiaceae | Leaf extract | M | MWR | [14] |
| *Chamaerops humilis* L. | Arecaceae | Leaf extract | Aq. | MSR | [38] |
| *Cinnamomum tamala* Fr. Nees. | Lauraceae | Leaf extract | Aq. | MAWR | [23] |
| *Cissus sicyoides* L. | Vitaceae | Flavonoids & Hydrolyzable tannins | Aq. | MWR | [138] |
| *Clerodendrum capitatum* (Willd) Schumach et. Thonn. | Verbenaceae | Saponins, flavonoids, alkaloids, tannins, glycosides & reducing sugars | Aq. | MAWR | [4] |
| *Combretum micranthum* G. Don | Combretaceae | Leaf extract | Aq. | Rats | [24] |
| *Costus afer* Ker Gawl. | Costaceae | Alkaloids, flavonoids, tannins, phenols, glycosides & terpenoids | M | WAR | [77] |
| *Dolichandrone falcata* Seem. | Bignoniaceae | Steroidal compounds, flavonoids, tannins & sugars | Aq. | AR | [80] |
| *Eucommia ulmoides* Oliv. | Eucommiaceae | Powdered as well as leaf extract | Aq. | MSDR | [64] |
| *Flacourtia jangomas* Raeusch. | Flacourtiaceae | Flavonoids, saponins, carbohydrates, steroids, tannins & phenolic compounds | M | WAR | [121] |
| *Gardenia taitensis* A. P. de Candolle | Rubiaceae | Alkaloids, phytosterols, carbohydrates & saponins | E | MWR | [68] |
| *Hedera helix* L. | Araliaceae | Leaf extract | E | Rb. | [144] |

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|---|---|---|---|---|---|
| *Holoptelea integrifolia* (Roxb.) | Ulmaceae | Steroids & glycosides | M & P.E | MAWR | [114] |
| *Hypericum perforatum* L. | Hypericaceae | Leaf extract | Ethl.ac. | MAWR | [16] |
| *Juglans regia* L. | Juglandaceae | Leaf extract | M | MWR | [130] |
| *Lagerstroemia speciosa* (L.) Pers. | Lythraceae | Leaf powder or decoction | Aq. | MICRR | [129] |
| *Memecylon umbellatum* Burm. F. | Melastomataceae | Leaf extract | Al. | SAM | [10] |
| *Mimosa pudica* L. | Mimosaceae | Leaf extract | E | WR | [126] |
| *Mimusops elengi* L. | Sapotaceae | Leaf extract | M | AR & SAM | [145] |
| *Moringa oleifera* Lam. | Moringaceae | Leaf extract | Aq. | Rb. | [69] |
| *Myrcia uniflora* Barb. Rodr. | Myricaceae | Leaf extract | Aq. | Rats | [95] |
| *Nauclea latifolia* Sm. | Rubiaceae | Leaf extract | Aq. | WAR | [41] |
| *Nelumbo nucifera* Gaertn. | Nymphaeaceae | Flavonoids | E | Mice | [147] |
| *Neolamarckia cadamba* (Roxb.) Bosser | Rubiaceae | Leaf extract | M | MSAM | [6] |
| *Olea europaea* L. | Oleaceae | Leaf extract | Al. | Rats | [35] |
| *Passiflora mollissima* Bailey | Passifloraceae | Alkaloids, tannins & flavonoids | E | MWR | [34] |
| *Piper betle* L. | Piperaceae | Leaf extract | Aq. & E | MAR | [15] |
| *Pisonia alba* Span. | Nyctaginaceae | Vitamin A, alkaloids, proteins & fats | E | MAWR | [125] |
| *Premna corymbosa* (Burm. F.) Rottl | Verbenaceae | Alkaloids, flavonoids, glycosides, saponins, terpenes & steroids | E & Aq. | MAWR | [132] |
| *Salacia fruticosa* Heyne ex Lawson | Hippocrateaceae | Alkaloids, carbohydrates, phytosterols, glycosides, saponins & phenolic | M | MAWR | [137] |

| | | | | | |
|---|---|---|---|---|---|
| | | compounds | | | |
| *Salacia reticulata* Wight | Hippocrateaceae | Leaf extract | Aq. | MddYM | [141] |
| *Solanum nigrum* L. | Solanaceae | Alkaloids, flavonoids, phenolics & micronutrients | Aq. & hydro-alcoholic | SDR | [74] |
| *Solanum trilobatum* L. | Solanaceae | Leaf extract | Aq. | WAR | [31] |
| *Sonneratia alba* Sm. | Sonneratiaceae | Leaf extract | M | Mice | [79] |
| *Spinacia oleracea* L. | Chenopodiaceae | Leaf extract | E | MWR | [61] |
| *Symplocos cochinchinensis* (Lour.) S. Moore. | Symplocaceae | Leaf extract | H | Rats | [124] |
| *Talinum portulacifolium* Forssk. | Portulacaceae | Steroids, triterpenoids & flavonoids | M | WAR | [108] |
| *Urtica dioica* L. | Urticaceae | Leaf extract | Aq. | MLER | [27] |
| *Urtica parviflora* roxb. | Urticaceae | Alkaloids, reducing sugars, polysaccharides, tannins, saponins, glycosides & flavonoids | Aq. | Rats | [111] |
| *Withania somnifera* (L.) Dunal | Solanaceae | Flavonoids | E | MAWR | 134] |
| *Zizyphus sativa* Gaertn. | Rhamnaceae | Leaf extract | Al. | Rats | [11] |
| **Peel** | | | | | |
| *Punica granatum* L. | Punicaceae | Peel extract | Aq. | MAR | [54] |
| **Rhizome** | | | | | |
| *Acorus calamus* L. | Acoraceae | Rhizome extract | M | MAWR | [99] |
| *Alpinia galanga* Willd. | Zingiberaceae | Rhizome extract | M & Aq. | Rb. | [7] |

| | | | | | |
|---|---|---|---|---|---|
| *Sansevieria roxburghiana* Schult. and Schult. f. | Agavaceae | Alkaloids, triterpenes, steroids, flavonoids & saponins | Aq. & E | MAWR | [47] |
| **Roots** | | | | | |
| *Anthocleista djalonensis* A. Chev | Loganiaceae | Flavonoids, saponins, tannins, cardiac glycosides & anthraquinones | E | SAM & Rats | [90] |
| *Asparagus racemosus* Willd. | Liliaceae | Root extract | E | MLER | [48] |
| *Berberis lyceum* Royle | Berberidaceae | Root extract | E & Aq. | WR | [44] |
| *Casearia esculenta* Roxb. | Samydaceae | Alkaloids, glycosides, saponins, phytosterols, tannins & amino acids | E | WR & SAM | [17] |
| *Costus speciosus* (Koen ex.Retz.) | Costaceae | Root extract | E | MWR | [20] |
| *Lantana aculeata* L. | Verbenaceae | Root extract | E | MAWR | [60] |
| *Merremia tridentata* (L.) Hall. f. | Convolvulaceae | Root extract | Aq. | Rats | [18] |
| *Nyctanthes arbor-tristis* L. | Oleaceae | Root extract | M | MAWR | [115] |
| *Pandanus fascicularis* Lam. | Pandanaceae | Carbohydrates, proteins, amino acids, saponins, tannins, phenolic compounds, alkaloids & flavonoids | Aq & E | MAWR | [104] |
| *Pandanus odorus* RIDL. | Pandanaceae | Root extract | Aq. | Rats | [96] |

| | | | | | |
|---|---|---|---|---|---|
| *Potentilla fulgens* L. | Rosaceae | Root extract | CM | FSLM | [127] |
| *Tectona grandis* L. | Verbenaceae | Root extract | M | MAWR | [98] |
| *Withania somnifera* (L.) Dunal | Solanaceae | Flavonoids | E | MAWR | [134] |
| *Zaleya decandra* L. N. Burm. f. | Aizoaceae | Root extract | E | Rats | [73] |
| **Root Bark** | | | | | |
| *Blighia sapida* K. Kong | Sapindaceae | Alkaloids, saponins, cardiac glycosides, reducing sugars, carbohydrates, flavonoids, phenols & tannins | Aq. | AR | [112] |
| *Ceiba pentandra* (L.) Gaertner | Bombacaceae | Root bark extract | Mthl. Cl. & M | MWR | [30] |
| *Euclea undulata* Thunb. var *myrtina* | Ebenaceae | Root bark extract | Act. | MWR | [29] |
| **Seeds** | | | | | |
| *Brassica juncea* L. | Brassicaceae | Seed extract | Aq. | MAWR | [131] |
| *Carica papaya* L. | Caricaceae | Alkaloids, flavonoids, saponins, tannins, anthraquinones, anthocyanosides & reducing sugars | Aq. | WR | [3] |
| *Carum carvi* L. | Apiaceae | Carvone, limonene, carveol, dihydrocarveol & thymol | E | MWR | [36] |
| *Hippophae rhamnoides* L. | Elaegnaceae | Seed extract | Aq. | MSDR | [146] |
| *Irvingia gabonensis* (Aubry-Lecomte) Baill. | Irvingiaceae | Seed extract | Aq. | MWR | [93] |

| | | | | | |
|---|---|---|---|---|---|
| *Lepidium sativum* L. | Brassicaceae | Seed extract | Aq. | MWR | [32] |
| *Nigella sativa* L. | Ranunculaceae | Essential oils, proteins, alkaloids & saponins | Aq. | Rats | [71] |
| *Persea americana* Mill. | Lauraceae | Seed extract | E | MAWR | [33] |
| *Spergularia purpurea* (Pers.) G. Don. Fil | Caryophyllaceae | Saponins & flavonoids | Aq. | MWR | [52] |
| *Strychnus potatorum* L. | Loganiaceae | Seed extract | E & Aq. | SDR | [102] |
| *Terminalia chebula* Retz. | Combretaceae | Seed extract | Chlf. | MSDR | [107] |
| **Spadix** | | | | | |
| *Cocos nucifera* L. | Arecaceae | Spadix extract | Aq.-M | WAR | [84] |
| **Stem** | | | | | |
| *Berberis aristata* DC. | Berberidaceae | Alkaloids, glycosides, carbohydrates, bitter principles & saponins | M | MAWR | [135] |
| *Flacourtia jangomas* Raeusch. | Flacourtiaceae | Flavonoids, saponins, carbohydrates, steroids, tannins & phenolic compounds | M | WAR | [121] |
| *Nervilia plicata* (Andrews) Schltr. | Orchidaceae | Stem extract | Al. | Rats | [58] |
| *Tournefortia hirsutissima* L. | Boraginaceae | Stem extract | Aq. & B | Rats | [13] |
| **Stigma** | | | | | |
| *Crocus sativa* L. | Iridaceae | Stigma extract | M | MWR | [55] |
| **Tubers** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| *Anaphyllum wightii* Schott. | Araceae | Tuber extract | E | WAR | [70] |
| *Nymphaea pubescens* Willd. | Nymphaeaceae | Alkaloids, flavonoids,, glycosides, terpenoids, tannins, phenols, saponins & steroids | E | MAWR | [113] |
| **Whole Plant** | | | | | |
| *Heliotropium zeylanicum* (Burm. F) Lamk | Boraginaceae | Plant extract | M | MAWR | [82] |
| *Hemionitis arifolia* (Burm.) Moore. | Polypodiaceae | Plant extract | Aq. | IWR, SAM | [83] |
| *Hybanthus enneaspermus* (L.) F. Muell | Violaceae | Flavonoids, terpenes, phenols, anthraquinones, glycosides, polyoses, alkaloids, saponins & tannins | E | MAWR | [94] |
| *Jussiaea suffruticosa* L. | Onagraceae | Plant extract | M | Rats | [81] |
| *Merremia emarginata* Burm. F. | Convolvulaceae | Plant extract | M | MWR | [39] |
| *Mollugo nudicaulis* Lam. | Aizoaceae | Plant extract | E | Rats | [120] |
| *Piper sarmentosum* Roxb. | Piperaceae | Plant extract | Aq. | Rats | [97] |
| *Polygala javana* DC. | Polygalaceae | Alkaloids, catechism, tannins, saponins, steroids, flavonoids, phenols, sugar, glycosides & xanthoprotein | E | MAWR | [8] |
| *Portulaca oleracea* L. | Portulacaceae | Plant extract | Chlf: M | MM | [66] |
| *Trianthema portulacastrum* L. | Aizoaceae | Alkaloids, flavonoids, saponins, phenolic compounds & terpenoids | M | MAWR | [123] |
| *Triumfetta pilosa* Roth | Tiliaceae | Plant extract | E | MAWR | [105] |

| Meaning | Abbreviations |
|---|---|
| S- Solvent | Acetone- Act., Al.- Alcohol, Aq.- Aqueous, B- Buthanol, Chlf.- Chloroform, CM- Crude Methanol, E- Ethanol, Ethl.ac.-Ethyl acetate, H- Hexane, M.- Methanol, Methl. Cl.- Methyl Chloride, PE- Petroleum Ether. |
| TA- Test Animal | AR- Albino Rats, FSLM- Female Swiss Labial Mice, IWR- Inbred Wistar Rat, MACFR- Male Albino Rats of Charles Foster Strain, MAR- Male Albino Rats, MAWR- Male Albino Wistar Rats, MddYM- Male ddY Mice, MICRR- Male ICR Strain Rat, MLER- Male Long Evans Rats, MM- Male Mice, MR- Male Rabbits, MSAM- Male Swiss Albino Mice, MSDAR- Male Senile Diabetic Albino Rats, MSDR- Male Sprague Dawley Rats, MSR- Merione Shawi Rats, MWR- Male Wistar Rats, Rb.- Rabbits, SAM- Swiss Albino Mice, SDR- Sprague Dawley Rats, WAR- Wistar Albino Rats, WR- Wistar Rats. |

**Table 2: Number of species in different families**

| | | | | | |
|---|---|---|---|---|---|
| Acoraceae | 1 | Eucommiaceae | 1 | Piperaceae | 2 |
| Agavaceae | 1 | Flacourtiaceae | 1 | Polygonaceae | 2 |
| Aizoaceae | 3 | Fomitopsidaceae | 1 | Polypodiaceae | 1 |
| Alangiaceae | 1 | Hericiaceae | 1 | Portulacaceae | 2 |
| Annonaceae | 2 | Hippocrateaceae | 2 | Primulaceae | 1 |
| Apiaceae | 1 | Hypericaceae | 1 | Punicaceae | 1 |
| Araceae | 1 | Iridaceae | 2 | Ranunculaceae | 2 |
| Araliaceae | 1 | Irvingiaceae | 1 | Rhamnaceae | 1 |
| Arecaceae | 2 | Juglandaceae | 1 | Rosaceae | 3 |
| Balanitiaceae | 1 | Lauraceae | 3 | Rubiaceae | 3 |
| Basellaceae | 1 | Liliaceae | 3 | Salvadoraceae | 1 |
| Berberidaceae | 2 | Loganiaceae | 3 | Samydaceae | 1 |
| Bignoniaceae | 2 | Lythraceae | 2 | Sapindaceae | 2 |
| Bombacaceae | 2 | Melastomataceae | 1 | Sapotaceae | 2 |
| Boraginaceae | 2 | Melianthaceae | 1 | Scrophulariaceae | 2 |
| Burseraceae | 3 | Mimosaceae | 2 | Solanaceae | 4 |
| Capparidaceae | 1 | Moringaceae | 1 | Sonneratiaceae | 1 |
| Caricaceae | 1 | Musaceae | 1 | Sterculiaceae | 2 |
| Caryophyllaceae | 1 | Myricaceae | 1 | Symplocaceae | 1 |
| Cecropiaceae | 3 | Nyctaginaceae | 3 | Thymelaeceae | 1 |
| Chenopodiaceae | 3 | Nymphaeaceae | 3 | Tiliaceae | 1 |
| Combretaceae | 4 | Oleaceae | 2 | Ulmaceae | 1 |
| Convolvulaceae | 2 | Onagraceae | 1 | Urticaceae | 3 |
| Costaceae | 2 | Orchidaceae | 1 | Verbenaceae | 4 |
| Crassulaceae | 1 | Oxalidaceae | 1 | Violaceae | 1 |
| Ebenaceae | 3 | Palmaceae | 1 | Vitaceae | 1 |
| Elaegnaceae | 1 | Pandanaceae | 2 | Zingiberaceae | 2 |
| Equisetaceae | 1 | Passifloraceae | 1 | Zygophyllaceae | 2 |

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