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Review Article

A REVIEW ON MEDICINAL PLANTS WITH ANTIDIABETIC ACTIVITY FROM RUBIACEAE FAMILY

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ABSTRACT

Medicinal plants play an important role in the management of diabetes mellitus, especially in developing countries. A comprehensive review is conducted to accumulate information about medicinal plants with hypoglycemic properties. Rubiaceae represents one of five families of the most species-rich flowering plants. The Rubiaceae family is the largest plant family of 617 genera and about 13,137 species found worldwide, especially in the tropics and subtropics. Based on searches in several scientific journals, 617 genera of authors get about 34 species of plants that have antidiabetic activity. This review aims to provide information on the antidiabetic activity of the Rubiaceae family based on primary data from various literature and scientific articles collected by the search through online sites. The profile presented includes information on scientific and family names, plant parts and test models used, dosage and active chemicals. Information on antidiabetic medicinal plants can stimulate researchers to conduct further research on the potential use of medicinal plants that have antidiabetic potential.

Keywords: medicinal plants, antidiabetic activity, hypoglycemic

INTRODUCTION

The need for antidiabetic drugs becomes very important as the prevalence of diabetes mellitus increases. Diabetes mellitus becomes a serious threat to humans so that this disease must be cautious, because both men and women, young or old can get this disease, and the symptoms are not recognized by the sufferer and when it is known that complications have occurred.[1] This problem will increase if there is no effort in terms of treatment and prevention.

The selection of diabetes mellitus drugs has now undergone many changes, as it needs to consider the efficacy, side effects caused long-term use and economic value. Oral antidiabetic drugs or exogenous insulin are commonly used in the therapy of diabetes mellitus pharmacologically. However, this pharmacological therapy when used over a long period of time will lead to some risk of side effects of drugs such as hypoglycemia, liver and kidney damage, weight gain, and lactic acidosis. [2]

The use of herbs and natural ingredients to treat and control the disease has been widely practiced by the world community. In recent years, there has been an increase in interest in herbal medicine in the care and management of diabetes both in developing and developed countries, due to its natural origin and its lesser side effects. [3,4,5] Most of these herbs refer to the use of roots, leaves, bark, flowers, seeds, and fruit for medicine. [6] Herbal treatment for diabetes mellitus has now been widely practiced, given the high potential of medicinal plants and not yet utilized all. Therefore, it is necessary to develop a new drug diabetes mellitus that is more efficacious with fewer side effects by using natural ingredients that are empirically useful as anti-diabetic.

About 800 plant species have been reported to have anti-diabetic properties. Several plant species have been used for the prevention or management of diabetes by Native Americans, Chinese, South Americans, Indians and Asians. [7] One of the most potent plants as antidiabetic comes from the Rubiaceae family. The Rubiaceae family contains a potent therapeutic agent that has been widely used in the global medical treatment and has attracted researchers to investigate the phytochemical content and some of its pharmacological activities. The Rubiaceae family is in the main group of angiosperms (flowering plants). Rubiaceae represents one of the five most species-rich flowering plant families, with 13,548 species classifying 617 genera and most taxa in the tropics or subtropics.[8] Of the 617 genera were obtained about 34 plant species that have been investigated, including the content of each part of the plant that has activity as antidiabetic. The existence of the plant's biological actions associated with a chemical composition rich in phenolics, alkaloids, flavonoids, terpenoids, and glycosides usually show acts as an antidiabetic.

In this review article, an attempt has been made to collect hypoglycemic plants from reported Rubiaceae families that are available in different scientific journals and may be beneficial to health professionals, scientists and scientists working in pharmacology and therapeutics to develop evidence-based alternative medicine for cure diabetes mellitus in humans. The results presented are primary data from various literature and scientific articles collected by the search through online sites.

DISCUSSIONS

Based on searches in several scientific journals, from 617 genera Rubiaceae families the authors get about 34 plant species that have activity as antidiabetic, can be seen in Table 1.

The plants obtained have also been categorized based on the part of the plant used (Table 2). It was found that the leaf as the most frequently used part of the plant (17) in the management of diabetes, followed by bark (6), root (5), fruit (3), seeds (2), whole plants (1), aerial part (1), and stem bark (1) also has anti-diabetic activity.

The first important step in the preparation of plant formulations is the extraction process. Some researchers have done enough to find an efficient method of extraction in order to achieve high efficiency and efficacy.[49] The choice of the right solvent becomes very important because if the solvent selection is not appropriate then the results obtained are little or none even obtained because the solvent is not appropriate. In this review of 34 antidiabetic plants from the Rubiaceae family, the most popular solvent used to make plant extracts is 35% ethanol among 34 species, after which aqueous 30%, methanol 30%, Hydro-alcoholic 3% and Chloroform 2% respectively (Figure 1).

CONCLUSION

Regardless of the presence of antidiabetic drugs (oral antidiabetic drugs or exogenous insulin) known in the pharmaceutical market, natural resources are still regarded as potential candidates for drug discovery and play an important role in drug development programs to treat the disease. Many traditional plants are empirically used throughout the world to treat the disease because it is considered less toxic and free from side effects than synthetic drugs. One of the plants that potentially as antidiabetic is derived from the Rubiaceae family. Some researchers believe that the presence of bioactive chemicals is primarily responsible for this antidiabetic action. The effect of hypoglycemia on these plants is due to their ability to restore pancreatic tissue function by causing an increase in insulin output or decreased absorption of glucose in the intestine. most plants have been found to contain substances such as phenolics, alkaloids, flavonoids, terpenoids, glycosides, and others that are often considered to have antidiabetic effects. Further investigation in search of alternative treatments for diabetes mellitus from Rubiaceae and other plant families will continue throughout the world as the disease poses many challenges not only to physicians but also to researchers.

Table 1: Several plant species that have activity as antidiabetic from the Rubiaceae family

No.	Family	Botanical name	Parts used	Extracts	Active chemical constituents	Dose mg/kg	Test Model	Ref
1	Rubiaceae	*Adina cordifolia* (Roxb)	Leaf	Hydro-alcoholic	Tannin, saponins, flavonoids	250, 500	Alloxan-induced diabetic rats	[9]
2	Rubiaceae	*Canthium dicoccum*	Bark	Ethanol	Alkaloids, amino acids, Proteins, glycosides, phytosterols and saponins	200, 400	Alloxan induced diabetic albino rats and Oral glucose tolerance test (OGTT)	[10]
3	Rubiaceae	*Canthium parviflorum* Lam.	Leaf	Methanol	-	100, 200 and 400	Alloxan induced diabetic rat and Oral glucose tolerance test (OGTT)	[11]
4	Rubiaceae	*Cinchona calisaya* WEED	Bark	Aqueous	Alkaloids, flavonoids, saponins, and cardiac glycosides	50, 100	Alloxan induced diabetes mellitus in Wistar albino rats	[12]
5	Rubiaceae	*Coffea arabica*	Seed	Aqueous	Aliphatic and aromatic compounds, alkaloids, cafestol, chlorogenic acid	63,93	Alloxan-induced diabetic rats	[13]
			Seed	Ethanol	Aliphatic and aromatic compounds, alkaloids, cafestol, chlorogenic acid	200, 400	Streptozotocin-induced diabetic albino rats	[14]
6	Rubiaceae	*Crossopteryx febrifuga*	Root	Ethanol	-	100, 250 and 500	Alloxan-induced diabetic rats	[15]
7	Rubiaceae	*Fadogia agrestis* Schweinf	Stem	Aqueous	Saponins, alkaloids, flavonoids, and anthraquinone	18, 36, 72	Alloxan-induced diabetic rats	[16]
8	Rubiaceae	*Galium tricornutum* (Dandy)	Aerial part	Methanol	Flavonoids and tannins	200, 400	Alloxan induced diabetic Wistar albino rat and Oral glucose tolerance test (OGTT)	[17]
9	Rubiaceae	*Gardenia taitensis*	Leaf	Ethanol	Alkaloids, phytosterols, carbohydrate and saponins	400	Streptozotocin-induced rats	[18]
10	Rubiaceae	*Hamelia patens*	Stem	Ethanol	-	100, 400	Alloxan-induced diabetic rats	[19]

11	Rubiaceae	*Hedyotis leschenaultiana*	Whole plant	Ethanol	Alkaloid, catechin, coumarin, flavonoid, tannin, saponin, steroid, phenol, glycoside, terpenoid and xanthoprotein	150, 300	Alloxan-induced diabetic rats	[20]
12	Rubiaceae	*Heinsia crinata*	Leaf	Ethanol	Flavonoids and terpenes	450, 900, 1350	Alloxan induced diabetic rat	[21]
13	Rubiaceae	*Himalrandia tetrasperma* (Roxb.)	Leaf, Bark and Seed	Methanol	Alkaloids, saponins, flavonoids and tannins	250	Alloxan induced diabetic rat	[22]
14	Rubiaceae	*Hintonia standleyana*	Leaf	Methanol	6″-*O*-acetyl-5-*O*-_-D-galactopyranosyl-7,4′-dihydroxy-4-phenylcoumarin (**1**) and 6″-*O*-acetyl-5-*O*-_-D-galactopyranosyl-7,3′,4′-trihydroxy-4-phenylcoumarin (**2**)	100, 300	Streptozotocin (STZ)-induced diabetic rats	[23]
			Stem Bark	Methanol	4-phenylcoumarins and cucurbitacin glycosides.	100	Streptozotocin (STZ)-induced diabetic rats	[24]
15	Rubiaceae	*Ixora pavetta*	Leaf	Ethanol	Alkaloids, flavonoids, steroids/terpenoids, phenolic compounds	250, 500	Streptozotocin (STZ)-induced diabetic rats, Oral glucose tolerance test (OGTT)	[25]
16	Rubiaceae	*Meyna spinosa* Roxb	Leaf	Methanol	Alkaloids, glycosides, triterpenoids, tannins, and flavonoids	75, 150	Alloxan-induced diabetic rats	[26]
17	Rubiaceae	*Mitracarpus scaber* Zucc	Leaf	Ethanol	Alkaloids, tannins, saponins and cardiac glycosides	100, 200, 300, 400, 500	Streptozotocin (STZ)-induced diabetic rats	[27]
18	Rubiaceae	*Mitracarpus scabrum*	Leaf	Methanol and Aqueous	-	300	Alloxan-induced diabetic rats	[28]
19	Rubiaceae	*Mitragyna inremis* (Wild) O. Kundze	Fruit	Aqueous	-	400	Streptozotocin (STZ)-induced diabetic rats and Oral glucose tolerance test (OGTT)	[29]
20	Rubiaceae	*Morinda citrifolia* Linn	Leaf	Ethanol	Flavonoid, xeronine, and amino acids	400, 800, 1.600	Alloxan induced diabetic mice	[30]
			Fruit	Ethanol	Flavonoids, Saponins, Triterpenoids	500, 1000	Alloxan induced diabetic mice and Oral glucose tolerance test (OGTT)	[31]
			Fruit	Ethanol	Xeronin	125, 250, 500	Alloxan-induced diabetic rats	[32]
			Fruit	Fruit Juice	-	2 ml/kg	Alloxan-induced diabetic rats	[33]
21	Rubiaceae	*Myrmecodia pendens*	Root	Aqueous	Tannins, flavonoids, saponins, and quinones	13, 26, 52	Oral glucose tolerance test (OGTT)	[34]
22	Rubiaceae	*Nauclea diderrichii*	Bark and Leaf	Aqueous	Alkaloids and saponins	50, 100, 200, 400	Streptozotocin (STZ)-induced diabetic rats	[35]
23	Rubiaceae	*Nauclea latifolia*	Root	Chloroform	Alkaloids, flavonoids, saponins, steroids and cardiac glycosides	200	Alloxan-induced diabetic rats	[36]
24	Rubiaceae	*Paederia foetida* Linn	Leaf	Methanol	Iridoid glycoside, sitosterol, alkaloids, carbohydrate, β-sitosterol, ascorbic acid, flavonoids, amino acids, stigmasterol, D/L galacturonic acid and volatile oil	100, 250, 500	Streptozotocin (STZ)-induced diabetic Swiss albino rats	[37]

			Stem	Methanol	-	50, 100, 250, 500	Oral glucose tolerance test (OGTT)	[38]
25	Rubiaceae	*Pausinystalia yohimbe*	Bark	Methanol	Alkaloids	5, 10, 20, 40, 80	Oral glucose tolerance test (OGTT)	[39]
26	Rubiaceae	*Pavetta indica* Linn	Leaf	Methanol	Carbohydrate, Glycosides, Phytosterols, Saponins, Flavonoids, and Alkaloids	250, 400	Alloxan-induced diabetic rats	[40]
27	Rubiaceae	*Pentas schimperiana* (A. Rich) Vatke	Leaf	Methanol	Flavonoids, saponins, steroids, and tannins	500, 1000	Alloxan-induced diabetic rats	[41]
28	Rubiaceae	*Psychotria octosulcata* Linn.	Whole plant	Ethanol	-	200, 400	Streptozotocin (STZ)-induced diabetic Wistar rats	[42]
29	Rubiaceae	*Randia dumetorum*	Leaf	Ethanol	-	500	Streptozotocin (STZ)-induced diabetic rats	[43]
30	Rubiaceae	*Randia nilotica* Stapf.	Fruit	Aqueous	-	400	Streptozotocin (STZ)-induced diabetic rats and Oral glucose tolerance test (OGTT)	[44]
31	Rubiaceae	*Rothmannia hispida*	Leaf	Aqueous	Alkaloid and flavonoid	250, 500	Alloxan-induced diabetic rats	[45]
32	Rubiaceae	*Rubia cordifolia* Linn	Root	Aqueous	-	1000	Streptozotocin (STZ)-induced diabetic rats	[46]
33	Rubiaceae	*Sarcocephalus latifolus*	Root	Aqueous	Alkaloids, tannins, saponins, terpenoids, reducing sugars, carbohydrate, and glycosides	250	Streptozotocin (STZ)-induced diabetic rats	[47]
34	Rubiaceae	*Sarcocephalus pobeguinii*	Bark	Aqueous	Alkaloids and saponins	50, 100, 200, 400	Streptozotocin (STZ)-induced diabetic rats	[48]

Table 2: **Various parts of the plant are used and the number of plant species**

Plant Parts Used	Number of Species
Leaf	17
Bark	6
Root	5
Fruit	3
Seed	2
Whole plant	1
Aerial part	1
Stem bark	1

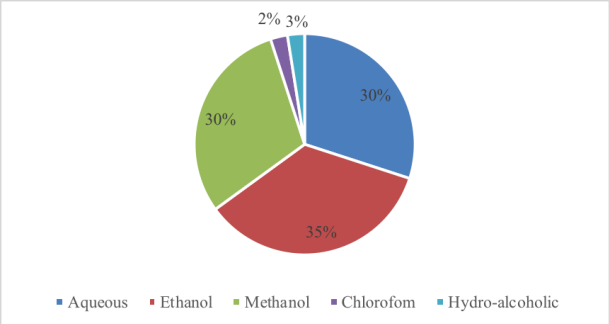

Figure 1: Different uses of solvent to make plant extract

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