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Anti-Diabetic Potential of Therapeutic Medicinal Plants: A Review

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Abstract

Drugs for diabetes are incredibly effective, but they also have serious adverse effects. Therapeutic plants, on the other hand, might function as an alternative source of antidiabetic mediators. With an emphasis on preclinical and scientific studies, therapeutic florae with antidiabetic potential are recognized. The mutual and concentrated act of their profile of organically energetic natural complexes defines the valuable probability of each specific plant condition. Due to its all-natural origins and absence of concomitant side effects, herbal medicine has become exponentially more appealing in recent years, gaining fame in both emerging and developed nations. A systematic education program was put in place to gather data on medicinal plants that are used to treat diabetes mellitus. The descriptions are in charge of providing details on the scientific and family names of the plants, plant parts, and research prototypes used. The enormous number of plants identified in this study demonstrated the importance of herbal plants in the prevention of diabetes. The characteristics of these herbs can help delay the onset of metabolic discrepancies and diabetes complications. This study motivates researchers to make additional changes to the upcoming utilization of medicinal plants with anti-diabetic properties.

Keywords

Medicinal plants, Anti-diabetic activity, Herbal medicine, Diabetes, Therapeutic Medicinal Plants

Cover Page Footnote

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ABSTRACT

Drugs for diabetes are incredibly effective, but they also have serious adverse effects. Therapeutic plants, on the other hand, might function as an alternative source of antidiabetic mediators. With an emphasis on preclinical and scientific studies, therapeutic florae with antidiabetic potential are recognized. The mutual and concentrated act of their profile of organically energetic natural complexes defines the valuable probability of each specific plant condition. Due to its all-natural origins and absence of concomitant side effects, herbal medicine has become exponentially more appealing in recent years, gaining fame in both emerging and developed nations. A systematic education program was put in place to gather data on medicinal plants that are used to treat diabetes mellitus. The descriptions are in charge of providing details on the scientific and family names of the plants, plant parts, and research prototypes used. The enormous number of plants identified in this study demonstrated the importance of herbal plants in the prevention of diabetes. The characteristics of these herbs can help delay the onset of metabolic discrepancies and diabetes complications. This study motivates researchers to make additional changes to the upcoming utilization of medicinal plants with anti-diabetic properties.

Keywords: Medicinal plants, Anti-diabetic activity, Herbal medicine, Diabetes, Therapeutic Medicinal Plants.

INTRODUCTION

Diabetes mellitus (DM) is a dangerous metabolic disease that is becoming more prevalent worldwide and poses a threat to public health. Typing I diabetes is characterized by the unique autoimmune mechanism that destroys the insulin-shielding cell in the pancreatic islets of Langerhans and by the suspected apoptotic death of pancreatic cells [1]. Insulin struggle, in which the most important insulin target tissues are inadequately sensitive to insulin attainment, may be linked to reduced insulin secretion brought on by a manageable loss of -cell function in type II diabetes, also known as noninsulin-dependent diabetic mellitus (NIDDM) [2]. Fast becoming the most common metabolic condition worldwide, type 2 diabetes mellitus (T2DM) is at the center of one of the biggest health experiments of the twenty-first century. According to the World Health Organization, there will be a 35% increase in the prevalence of diabetes [3].

History of Diabetics

Diabetic patient’s quantity more than 150 million worldwide. According to current projections, the number of type II diabetes patients wills more than double to 300 million by 2025. Diabetics interpretation for more than 30 million publics in India. The number of diabetics in India is estimated to grow to 57 million by 2025, creation it the country with the largest number of diabetics in the world [4]. Diabetes, with all of its small and large-scale problems, continues to be a major global therapeutic problem despite the arrival of numerous synthetic anti-diabetic medications to the market.

Modern diabetic treatments typically have disadvantages such laughably low effectiveness, exorbitant price, and a variety of adverse effects [5]. Since a successful solution has not yet been found, diabetes governance continues to be a major concern worldwide. Due to the aforementioned issues with synthetic drugs, therapeutic plants that have been shown to have anti-diabetic efficacy can be used as an alternative strategy in the management of diabetes, especially in developed nations, due to their rate efficacy, availability, broad cultural applicability, and lower side belongings [6].

METHODOLOGY

This review considers biological mechanisms such as inhibition of α-amylase and α-glucosidase, along with antidiabetic, antihyperglycemic, and hypoglycemic effects. An analysis was conducted on the potential of most plant species to prevent diabetes. Diabetes treatment should be influenced by the plant species' harvesting technique. Thus, the plants from the Asian region that made it through screening were selected [7]. Next, the genus name was searched to determine whether any species from that genus were listed elsewhere. These plants are listed in Table (1]. The data collection period spanned from 2005 to 2023. Strong traditional medicinal systems like Chinese, Ayurvedic, and Unani have grown and prospered during the past 2500 years, primarily in the eastern region. Diabetes) was fairly acknowledged and understood as a distinct entity in India, based on historical texts [8]. Folklore states that the diabetes mellitus system has long been known to the Indians. In addition to having sweet urine, a person with madhumeha also has sweet breath, mucus, saliva, blood, and other physiological fluids. Juices from different plants decreased blood glucose levels by 10–20%. A list of 21,000 medicinal plants used worldwide has been compiled by the World Health Organization (WHO). There are 2,500 species in India, and 150 of them are widely used commercially [9].

Antidiabetic Actions

Vegetables and spices contain functional qualities such as antioxidant and antidiabetic activity in addition to their nutritional value, which was empirically proven. There is, however, little supporting research for these health impacts. The antioxidant activity and -glucosidase inhibition of 15 Indonesian vegetables and spices were investigated as part of our endeavor to uncover effective raw materials for the development of antidiabetic functional foods. Total phenolic content (TPC) analysis and 1H NMR fingerprinting were used to evaluate their phytochemical profiles. In accordance with the findings, Cosmos caudatus, Pluchea indica, Etlingera elaitor, and Syzygium polyanthum exhibited the highest GIAs (IC_{50} values of 11.76 0.32, 12.17 0.18, 53.13 2.87, and 61.33 1.21 g/ml, respectively). The four samples also had greater AA and TPC values than the others. The main difference between the active samples' 1H NMR profiles and those of the non-active samples was in the aromatic region. Further examination of the spectra revealed that P. indica had esculetin and caffeoylquinic derivatives, whereas S. polyanthum had gallic acid, syringic acid, and myricetin. Different mechanisms by which these substances exhibit antidiabetic action have been identified [10].

Table (1): List of plants having antidiabetic activity Review.

S. No	Plant name	Extract	Parts used	Study model (In-vitro / In-vivo)	Refe. No.
I	***α- Glucosidase inhibitory activity***				
1	*Bambusa vulgaris* Schrad. Ex.J.C. Wen dl.(Poaceae)	Petroleum ether	Leaves	In-vivo	[11]
2	*Ziziphus spina-christi L. Desf.* (Rhamnaceae)	Gelatin capsules	Leaves	In-vitro	[12]
3	*Tectona grandis L.f.(Lamiaceae)*	Methanol	Bark	In-vivo	[13]
4	*Embelia basal A.DC.(Myrsinaceae)*	Methanol	Fruit	In-vivo	[14]
5	*Phyllanthus emblica L. (Phyllanthaceae)*	Hydroalcoholic	Fruits	In-vitro	[15]
6	*Curcuma longa L.(Zingiberaceae)*	Hydroalcoholic	Roots	In-vitro	
7	*Tinospora cordifolia (Thunb.) Miers. (Menispermaceae)*	Aqueous	stem	In-vitro	

S. No	Plant name	Extract	Parts used	Study model (In-vitro / In-vivo)	Refe. No.
8	*Sclerocarya birrea (A. Rich) Hochst. (Anacardiaceae)*	Aqueous & Methanol	Bark	In-vitro	[16]
9	*Ziziphus mucronata Willd. ((Rhamnaceae)*	Methanol & Aqueous	Bark	In-vitro	
10	*Bauhinia purpurea L. (Fabaceae)*	Petroleum ether & Hexane	Stem bark	In-vitro	[17]
11	*Tridax procumbens L. (Asteraceae)*	Petroleum ether, Chloroform & Methanol	Whole plant	In-vitro	[18]
12	*Phyllanthus emblica L. (Phyllanthaceae)*	Methanol	Fruit	In silico and In-vivo	[19]
13	*Gongronema latifolium Benth. (Apocynaceae)*	Methanol	leaves	In-vivo	[20]
14	*Quercus infectoria Oliv. (Fagaceae)*	Aqueous	Mature gall	In- vitro / In- vivo	[21]
15	*Citrullus colocynthis L. (Schrad). (Cucurbitaceae)*	Hydro-ethanolic	Seeds	In-vivo	[22]
16	*Arbutus pavarii Pampan (Ericaceae)*	Methanol	Aerial parts	In-vivo	[23]
17	*Sarcopoterium spinosum (L.) Spach. Rosaceae*	Methanol	Aerial parts	In-vivo	
18	*Mangifera indica L. (Anacardiaceae)*	Aqueous extract	Leaves	In-vivo	[24]
19	*Selaginella tamariscina (P.Beauv.) Spring. Selaginellaceae*	Ethanol	Spring	In-vivo	[25]
20	*Gynostemma pentaphyllum (Thunb.) Makino (Cucurbitaceae)*	95% ethanol	Herb	In-Vitro /In-vivo	[26]
21	*Ipomoea batatas (L.) Lam. (Convolvulaceae)*	Ethanol	Leaves	In-vivo	[27]
22	*Talinum triangulare (Jacq.) Willd. (Talinaceae)*	Aqueous extract	Whole plant	In-vivo	[28]
23	*Pericampylus glaucus (Lam) Merr. (Menispermaceae)*	Ethanol	Leaves	In-vivo	[29]
24	*Polygonum senegalensis Juss. (Polygonaceae)*	Hydroalcoholic	Leaves	In-vitro	[30]
25	*Pseudocedrela kotschyi (Schweinf.) Harms. (Meliaceae)*	Hydroalcoholic	Root	In-vitro	
26	*Nigella sativa L. (Ranunculaceae)*	Aqueous	Leaves	In-vitro	[31]
27	*Eugenia jambolana (L.) Skeels. (Myrtaceae)*	Aqueous	Leaves	In-vitro	
28	*Andrographis paniculata (Burm f.) Nees. (Acanthaceae)*	Aqueous	Leaves	In-vitro	
29	*Gymnema sylvestre (R.) Br. (Apocyanaceae)*	Aqueous	Leaves	In-vitro	
30	*Ocimum basilicum L. (Lamiaceae)*	Methanol, Dichloromethane & Hexane	Aerial parts	In-vitro	[32]

S. No	Plant name	Extract	Parts used	Study model (In-vitro / In-vivo)	Refe. No.
II	***α-Amylase and α-Glucosidase inhibitors***				
31	*Mangifera indica L. (Anacardiaceae)*	Ethanol	Leaves	In-vitro	[33]
32	*Azadirachta indica A. Juss. (Meliaceae)*	Aqueous	Leaves	In-vitro	[34]
33	*Ocimum sanctum L. (Lamiaceae)*	Aqueous	Leaves	In-vitro	
34	*Psidium guajava L.(Myrtaceae)*	Methanol	Leaves	In-vitro	[35]
35	*Andrographis paniculata (Burm f.) Nees. (Acanthaceae)*	Petroleum ether, Methanol, Chloroform & Aqueous	Leaves	In-vivo /In-vitro	[36]
36	*Bombax ceiba L. (Malvaceae)*	Petroleum ether Ethyl acetate & Ethanol	Bark	In-vivo	[37]
37	*Antidesma bunius (L.) Spreng. (Phyllanthaceae)*	Hexane, Ethyl acetate & Methanol	Leaves	In-vitro	[38] [44]
38	*Antidesma montanum Blume. (Phyllanthaceae)*	Hexane, Ethyl acetate & Methanol	Leaves	In-vitro	
39	*Arcangelisia flava (L.) Merr. (Menispermaceae)*	Hexane, Ethyl acetate & Methanol	Leaves	In-vitro	
40	*Lagerstroemia speciosa (L.) Pers. (Lythraceae)*	Hexane, Ethyl acetate & Methanol	Leaves	In-vitro	
41	*Lunasia amara Blanco. (Rutaceae)*	Hexane, Ethyl acetate & Methanol	Leaves	In-vitro	
42	*Merremia mammosa (Lour.) Hallier f. (Convolvulaceae)*	Hexane, Ethyl acetate & Methanol	Leaves	In-vitro	
43	*Aegle marmelos (L.) Correa. (Rutaceae)*	Hexane, Ethyl acetate & Methanol	Leaves	In-vivo/In-vitro	[45]
44	*Sorghum halepense (L.) Pers. (Poaceae)*	Methanol	Aerial parts	In-vitro	[46]
45	*Nicotiana tabacum L. (Solanaceae)*	aqueous extract	Leaf	In-vivo/In-vitro	[47]
46	*Terminalia chebula Retz. (Combretaceae)*	Petroleum ether	Fruits	In-vivo/In-vitro	[48]
47	*Syzygium cumini (L.) Skeels. (Myrtaceae)*	Aqueous	Bark	In-vitro	[49]
48	*Thespesia populnea (L.) Sol. Ex Correa. (Malvaceae)*	Ethanol	Bark and leaf	In-vitro	[50]
49	*Helianthus annuus L. Asteraceae/ Compositae*	Ethanol	Seed	In-vitro	

S. No	Plant name	Extract	Parts used	Study model (In-vitro / In-vivo)	Refe. No.
50	*Sapindus saponaria L. (Sapindaceae)*	Methanol 70%	Leaf	In-vivo/ In-vitro	[51]
51	*Pistacia lenticus L. (Anacardiaceae)*	Methanol 70%	Leaf	In-vivo/ In-vitro	
52	*Pistacia chinensis L. (Anacardiaceae)*	Methanol 70%	Leaf	In-vivo/ In-vitro	
53	*Terminalia muelleri Benth. (Combretaceae)*	Methanol 70%	Leaf	In-vivo /In-vitro	
54	*Cinnamomum tamala (Buch-Ham) T.Nees & C.H.Eberm (Lauraceae)*	Aqueous extract	Leaf	In-vivo/In-vitro	[52]
55	*Terminalia brownii Fresen. (Combretaceae)*	Crude extracts	Stembark	In-vivo/In-vitro	[53]
56	*Bauhinia racemosa Lam. (Fabaceae)*	Ethanol	Leaves	In-vitro	[54]
57	*Securigera securidaca (L.) Degen & Dorfl. (Leguminaceae)*	Aqueous	Seed	In-vivo	[55]
58	*Zingiber officinale Roscoe (Zingiberaceae)*	Aqueous	Ginger	In-vivo	[56]
59	*Jasminum sambac (L.) Aiton. (Oleaceae)*	Ethanol, Methanol, Acetone	Flowers and Leaves	In-vivo/In-vitro	[57]
III	***α-Amylase inhibition Activity***				
60	*Helicteres angustifolia L. (Malvaceae)*	70% ethanol	Leaves	In-vitro	[58]
61	*Benincasa hispida L. (Cucurbitaceae)*	Aqueous	Stem	In-vivo	[59] [65]
62	*Bryonia alba L. (Cucurbitaceae)*	Ethanol	Root	In-vivo	
63	*Citrullus colocynthis L. Cucurbitaceae)*	Aqueous	Seed	In-vivo	
64	*Citrullus lanatus (Thunb.) Matsum & Nakai. (Cucurbitaceae)*	Globulins	Seed	In-vivo	
65	*Coccinia grandis (L.) Vogit. (Cucurbitaceae)*	Methanol	Leaf	In-vivo	
66	*Coccinia indica (L.) Vogit.(Cucurbitaceae)*	60% Ethanol	Leaf	In-vivo	
67	*Cucumis callosus (Rottb.) Cogn. (Cucurbitaceae)*	Ethanol	Fruit	In-vivo	
68	*Cucumis sativus L. (Cucurbitaceae)*	Ethanol	Peel	In-vivo	
69	*Cucurbita pepo L. (Cucurbitaceae)*	Ethanol	Fruit	In-vivo	
70	*Momordica dioica Roxb. Ex. Willd. (Cucurbitaceae)*	Ethyl acetate	Seed	In-vivo	
71	*Sechium edule (Jacq.) Sw. (Cucurbitaceae)*	Ethyl acetate	Fruit	In-vitro	
72	*Trichosanthes dioica Roxb. (Cucurbitaceae)*	Aqueous	leaf	In-vivo	

S. No	Plant name	Extract	Parts used	Study model (In-vitro / In-vivo)	Refe. No.
73	*Luffa acutangula (L.) Roxb. (Cucurbitaceae)*	Chloroform and Ethyl acetate	Fruit	In-vitro	
74	*Spondias pinnata (L.f.) Kurz. Anacardiaceae*	Methanol	Bark	In-vitro	
75	*Melia azedarach L. Meliaceae*	Methanol	Bark	In-vitro	
76	*Psidium guajava L. Myrtaceae*	Methanol	Bark	In-vitro	[66] [67]
77	*Agerantina adenophora L. (Asteraceae)*	Methanol	Whole plant	In-vitro	
78	*Utrica dioica L. (Urticaceae)*	Methanol	Root	In-vitro	
79	*Bauhinia variegata L. (Fabaceae)*	Methanol	Bark	In-vitro	
80	*Achyranthes aspera L. (Amaranthaceae)*	Methanol	Whole plant	In-vitro	
81	*Curcuma longa L. (Zingiberaceae)*	Methanol	Rhizome	In-vitro	
82	*Eleocarpus anjastifolius L. (Elaeocarpaceae)*	Methanol	Seed	In-vitro	
83	*Alchornea cordifolea L. (Euphorbiaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
84	*Anacardium occidentale L. (Anacardiaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
IV	***Diterpenes as Antidiabetic Agents***				
85	*Anthocleista djalonensisL. (Gentianaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	[68] [75]
86	*Bridelia ferruginea L. (Phyllanthaceae)*	Ethanol, Methanol and Distilled water	Leaf, Seed and Stem bark	In-vitro	
87	*Carica papaya L. (Caricaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
88	*Ceiba pentandra L. (Malvaceae)*	Ethanol, Methanol and Distilled water	Stem, Bark	In-vitro	
89	*Citrus paradisi L. (Rutaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
90	*Cnestis ferruginea L. (Connaraceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
91	*Ficus asperifolia L. (Moraceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
92	*Ficus exasperata Vahl. (Moraceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	

S. No	Plant name	Extract	Parts used	Study model (In-vitro / In-vivo)	Refe. No.
93	*Gongronema latifolium (Endl.) Decne (Apocyanaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
94	*Hibiscus sabdariffa L. (Malvaceae)*	Ethanol, Methanol and Distilled water	Stem, bark	In-vitro	
95	*Hunteria umbellata (K. Schum.) Hallier f. (Apocynaceae)*	Ethanol, Methanol and Distilled water	Seed	In-vitro	
96	*Indigofera pulchra Willd. (Fabaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	[76] [77]
97	*Khaya senegalensis (Desr.) A. Juss. (Meliaceae)*	Ethanol, Methanol and Distilled water	Leaf and stem bark	In-vitro	
98	*Mangifera indica L. (Anacardiaceae)*	Ethanol, Methanol and Distilled water	Leaf and stem bark	In-vitro	
99	*Morinda lucida L. (Rubiaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
100	*Nauclea latifolia Smith. (Rubiaceae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
101	*Ocimum gratissimum L. (Labiateae)*	Ethanol, Methanol and Distilled water	Leaf	In-vitro	
102	*Parkia biglobosa (Jacq.) R.Br. Ex. G.Don. (Fabaceae)*	Ethanol, Methanol and Distilled water	Stem bark	In-vitro	
103	*Viscum album L. (Santalaceae)*	Ethanol, Methanol and Distilled water	Leaf and Seed	In-vitro	
104	*Kalanchoe pinnata L. (Crassulaceae)*	Water:Ethanol (70:30)	Leaves	In- vivo	[78]
105	*Callicarpam acrophylla Vahl. (Verbenaceae)*		Bark	In-vitro	[79]
106	*Bauhinia purpurea L.(Fabaceae)*		Bark	In-vitro	
107	*Acacia nilotica (L.) Delile (Fabaceae)*	Methanol	Bark	In-vitro	
108	*Portulaca oleracea L.(Portulacaceae)*	Methanol	Leaves	In- vivo	[80]
109	*Carthamus tinctorius L.(Compositae/Asteraceae)*	Methanol	Flower	In- vivo	
110	*Punica granatum L. (Lythraceae)*	Methanol	Leaves	In-vivo	[81]
111	*Alocasia Sanderiana W. Bull*	Ethanol	Leaves, root, steam	In-vivo	(82)

Mechanism of Actions of Medicinal Plants

Diabetes mellitus is one of the most serious health problems on the planet due to its rising incidence and mortality. Poor blood sugar regulation poses major health hazards. Conventional diabetic treatments are effective, but they have unfavorable side effects. Still another source of compounds with antidiabetic properties could come from therapeutic plants. Examples of medicinal plants that may lower blood sugar are provided, with a focus on preclinical and clinical experiments. Each plant's physiologically active chemical profile acts in conjunction with one another to define the possible benefits of each plant matrix[83].

Reactive oxygen species are the primary cause of many degenerative illnesses, including diabetes, yet human bodies have both enzymatic and non-enzymatic antioxidative systems that reduce their production. The illness is spreading quickly over the world and is already present everywhere [84]. Diabetes patients with high blood glucose levels have an insulin insufficiency. 90%–95% of instances of diabetes in which the body does not make enough insulin or uses it adequately are type 2 diabetes, also known as non-insulin-dependent diabetic mellitus. By 2025, there may be 300 million or more diabetics worldwide, according to the World Health Organization. Insulin and several oral antidiabetic medications such sulfonylureas and glinides are being used to treat diabetes. One of the key areas of research is the hunt for more powerful and secure hypoglycemic agents because many of them have a lot of dangerous side effects. The polyol pathway's essential enzyme, aldose reductases, catalyzes the conversion of glucose to sorbitol [85].

RESULTS AND DISCUSSION

The combination of phytochemicals or individual components of the herbal extracts are thought to be responsible for the therapeutic medicinal florae's anti-diabetic effect. The phytochemicals that are typically responsible for an anti-diabetic effect are stilbenes, phenolic acids, flavonoids, glycosides, alkaloids, saponins, polysaccharides, and tannins. There is a significant difference in the extraction techniques used in the numerous animal inquiry reports using various shrubberies, which affects the phytochemical composition of the extracts. The genetic characteristics, the plant organs employed, the growing, drying, and storing circumstances, as well as other endogenous and external characteristics, all have a significant impact on the phytochemical plant structure. Stress variables, like unfavorable climatology and infections, have an impact on the plant and affect the phytochemical results. Despite this, these educations continue to be helpful in identifying a new, conventional anti-diabetic drug that has limitless potential. As discussed, the ineffectiveness and health risks of the hundreds of millions of people who already take anti-diabetic medications have led to diabetes management being a top priority health concern [86].

According to the conclusions, 110 plant species from 46 relations are commonly used to treat diabetes. The advantages of therapeutic plants with hypoglycaemic properties in the treatment of diabetes mellitus are verified in the majority of studies. Among the 46 different plant families recorded in the study area Cucurbitaceae topped the list with 15 species predominated by Anacardiaceae, Fabaceae, Phyllanthaceae, Malvaceae, Asteraceae, Compositae, Combretaceae, Myrtaceae, Apocynaceae, Lamiaceae, Menispermaceae, Ericaceae, Selaginellaceae, Talinaceae, Polygonaceae, Ranunculaceae, Solanaceae, Sapindaceae, Lauraceae, Leguminaceae, Oleaceae, Urticaceae, Elaeocarpaceae, Gentianaceae, Caricaceae, Connaraceae, Labiateae, Santalaceae, Crassulaceae, Verbinaceae and Portulacaceae. The following plants used for the diabetes, Citrullus colocynthis, Mangifera indica, Acacia nilotica, Achyranthes aspera, Syzygium cumini, Aegle marmelos, Azadirachta indica, Ocimum sanctum, Psidium guajava and Tridax procumbens seems to be most general plants used to delicacy diabetes and are available universally. The detailed therapeutic herbs not only used for the behaviour of diabetes, but also treated for other ailments also. The leaves were utmost generally used herbal parts and other parts (fruit, root, stem, bark, flower, and whole plant) were also beneficial for preserving.

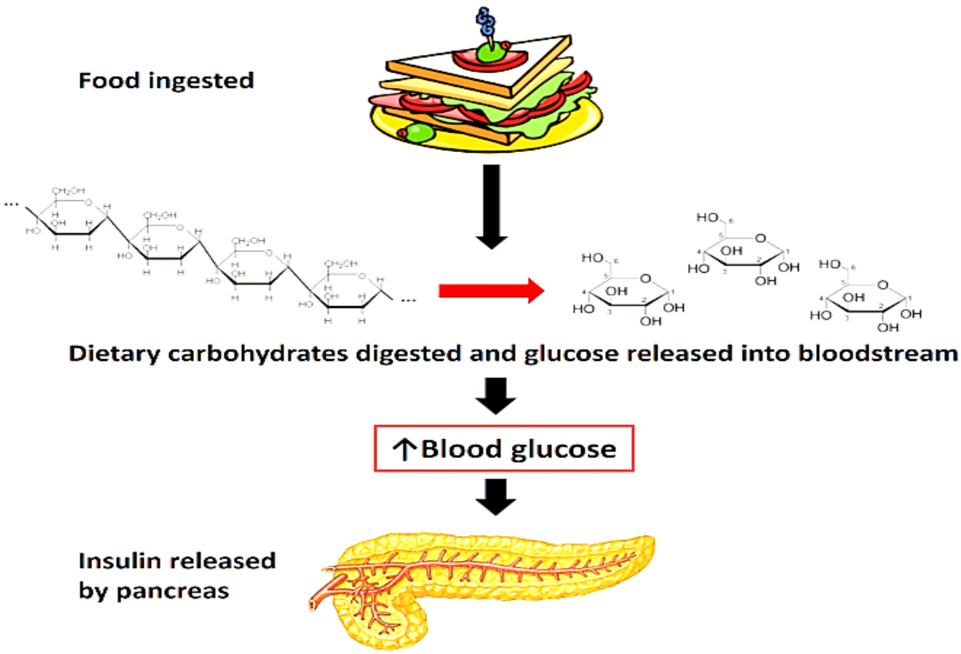

Figure (1): Insulin relesed by pancreas through Medicinal Plants.

CONCLUSION

The goal of the current evaluation is to assist pharmacologists, innovators, and fitness authorities working in the field of pharmacology and therapeutics in their efforts to develop better antidiabetic drugs. In order to achieve therapeutic benefits, we consider traditional medicinal herbs in our work. Several floras have been reported to have α-amylase and α-glycosidase inhibition, as well as antidiabetic, antihyperglycemic, and hypoglycaemic properties. plants with anti-diabetic properties that can be used to treat diabetes mellitus. Though many plants and the active compounds obtained from them are still poorly understood, floras have long been recognized as excellent sources of drugs for a wide range of ailments. To pinpoint the precise mode of action of therapeutic floras with anti-diabetic qualities, more research is required. Despite the common belief that plants are safe, many of its constituent parts are poisonous to humans, which is why toxicity tests should be carried out before ingestion. The variety of herbal plants that have been shown to have anti-hyperglycemic effect are the topic of the current review. While many plants are mentioned, more pharmacological and chemical research needs to be conducted to clarify the precise mechanism of hypoglycemic activity.

Ethics approval and consent to participate

Not Applicable

Consent for publication

The authors given the publisher the Authors permission to publish the work

Data Availability and materials

All data generated for this study are included in the article

Author's contribution

P. Selvakumar: Conceptualization, writing original draft, data curation, supervision, data formal analysis, investigation, methodology.

Competing interest

The authors state that they have no known competing financial interests

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Abbreviation: WHO-World Health Organization, **T2DM-**Type 2 diabetes mellitus, **NIDDM**-Noninsulin-dependent diabetes mellitus, **DM**-Diabetes mellitus.

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