Plants with Anti-Diabetic Potential

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Abstract

The word 'Diabetes' has been taken from Greek word ('dia' means 'through' and 'betes' means 'pass'). It is severe metabolic disorder which affects 2.8 % of the world population. It is estimated that it can increase by 5.4 % till the year 2025. It is mainly a metabolic disorder of endrocrine system. It is fourth leading cause of death in the world. Mother Nature is blessed with some miraculous plants which have anti-diabetic property. The anti-diabetic action of these plants can be attributed to the presence of flavonoids, coumarins, flavonoids, terpenoids and other components that help in decreasing blood-sugar level. These plants are safe are used in the manufacturing of drugs for the treatment of diabetes. Meticulous researches on these plants can develop novel drugs or formulations to treat diabetes.

Introduction

The diabetes is the metabolic disorder in which one put ups with high glucose level of blood. It happens because of low production of insulin or poor response of cell to insulin. It has the severe effect on the retina of the eyes, nervous system and kidneys. It also leads to heart attack, stroke and peripheral vascular disease [1]. Various types of diabetes are type-one diabetes, type-two diabetes, prediabetes and gestational diabetes. In type one diabetes body doesn't produce insulin .It is mentioned as juvenile diabetes, insulin-dependent diabetes or early-onset diabetes. It is mainly in the teenagers. The people with type-one diabetes account for 10% of all diabetes. The only source of medication for type-one diabetes is the insulin injections on which they have to depend forever [2]. The people with type-two diabetes accounts to 77% globally (Fig. 1). During pregnancy the females get prone to diabetes which is known as gestational diabetes [3]. Prediabetes is type which mostly occurs in people with type two-diabetes. The cells become resistant to insulin [4]. The major symptoms of diabetes include excess urine production, excessive thirst, severe hunger, gain of weight, abnormal weight loss, more fatigue, irritability, blurred vision, delayed healing of cuts or bruise, itchy skin, frequent gum disease etc. [5].The major cause of type-one diabetes is that immune system destroys the cells of pancreas that produce the insulin. While, the type-two diabetes is caused by sedentary lifestyle, less resistant insulin cells [6]. The treatment for diabetes includes proper healthy diet, insulin intake, exercise, and medication [7].

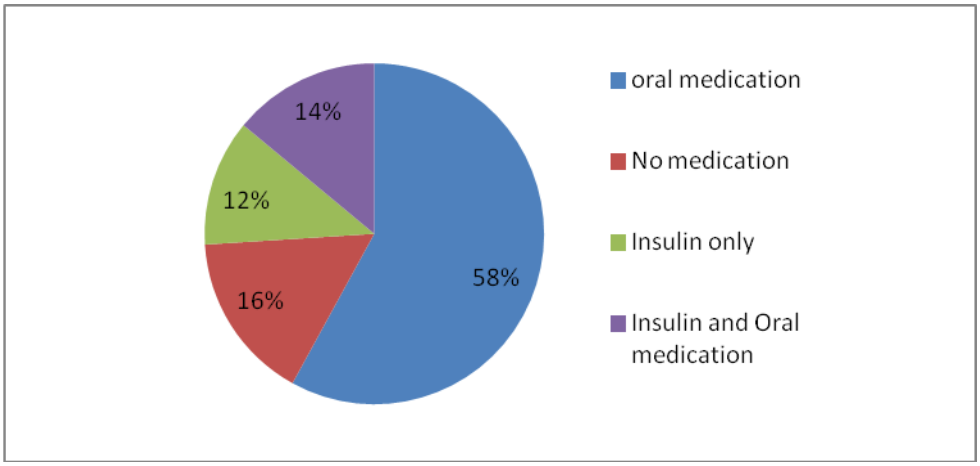

Fig.1. Diabetes statistics. The figure shows the percentage of people having type 1 or type 2 diabetes, (source: National diabetes fact sheet 2011).

Insulin and oral medication are deployed for treating diabetes, but these are expensive. Since the aged times the way to treat the disorder is by the traditional ways. They are the cheaper modes for treating the disease [8]. More than 400 plants have medicinal value to treat the diabetes which finds its value in the market [9]. In treating diabetes there are expansive plant obtained active components which possess great biological tendency. The active components include glycosides,galactomannan,alkaloids,peptidoglycans,polysaccharides,hypoglycans,guanidine,steroids,amino acids, glycopeptides ,carbohydrates, terprnoids, inorganic ions.10]. The anti-hyperglycemic effects that outcomes due to the plant treatment is ability to enhance the activity of pancreatic tissue. It uplifts the secretion of insulin or lessens the absorption of glucose .The population affecting with diabetes are increasing at an alarming rate and causes rise in concern in coming times in whole world. So the people are more dependent on anti-diabetic medicines which are prepared from natural sources [11]. The names of scientists who have reported anti-diabetic potential of plants are enlisted in table 1. Table 2 shows a non-exhaustive list of plants with known ant-diabetic potential.

Table 1 Scientists who reported anti-diabetic potential of plants [12]

Name of investigator	Year	No. of Plants
Nadkarni	1954	42
Mukherji	1957	12
Aiman	1970	35
Chaudhury and Vohra	1970	21
Karnick	1972	16
Israili	1977	100
Nagarajan *et al*	1982	76

Tomoda *et al*	1987	20
Handa *et al*	1988	150

Table 2 Plants with antidabetic property

S. No	Plant species	Common name	Family	Description	Plant part used	Active Chemical Constituents	Reference
1	*Acacia arabica*	Indian gum arabica	Fabaceae	5 to 20 cm high, fissured bark, leaves are bipinnate, flower in globolous heads and are axillary	Seed, bark	Polyphenols, tannins	[1]
2	*Cassia auriculata*	Tanner's cassia	Fabaceae	Branched shrub, 1-1.5 cm in height, smooth reddish brown bark, pinnate leaves	Flower	Sterols, flavonoids, tannins	[13]
3	*Allium cepa*	Onion	Alliaceae	Biennial plant,15-45 cm in height, yellowish to bluish green,fibrous roots	Bulb	Allyl propyl disulphide	[14]
4	*Allium sativum*	Garlic	Alliaceae	Bulbous plant, hermaphrodite flowers pollinated by bees	Rhizome	Diallyl disulphide oxide,S-allyl cysteine	[15]
5	*Aloe vera*	Barbados aloe	Liliaceae	Stemless, l eaves are thick and fleshy, leaf margins are serrated	Leaf	Pseudoprototin, Osponin, prototinosponin	[16]
6	*Aegle marmelos*	Golden apple	Rutaceae	Bark is pale brown ,smooth, leaf is trifoliate and alternate, flowers are pale yellow	Leaf, seeds, fruits	Aegeline, Coumarin, Flavonoids, alkaloids	[17]
7	*Murraya koenigii*	Curry leaves	Rutaceae	Small tree 4 to 6 m tall, aromatic, leaves are pinnate, small white flowers contains single large viable seed	Leaves and fruit	Carbazole, alkaloids	[18]
8	*Beta vulgaris*	Beet root	Chenopodia ceace	Herbaceous plant upto 120 cm height, roots are brown and fibrous, leaf blade is oblanceolate to heart shaped	Whole plant	Sugarbeet pectin, polydectrose	[19]
9	*Withania somniferum*	Winter cherry	Solanceae	Perennial shrub, 35 to 75 cm tall, leaves are dull green, elliptic, flowers are small green and bell shaped	Leaf	Withanoli-de-alkaloids	[20]

10	*Punica granatum*	Pomegranate	Punicaceae	Small tree, leaves are narrow, oblong, bright red coloured flowers	Fruit	Tannins	[21]
11	*Azadirachta indica*	Neem	Meliaceae	15 to 20 m height , evergreen pinnate leaves, branches are wide and spreading	Leaves and seeds	Nimdidine	[22]
12	*Coriandrum sativum*	Coriander	Apiaceace	50 cm tall, leaves are variable in shape, flowers are borne in small numbers, fruit is globular	Whole plant	Alanine	[23]
13	*Curcuma longa*	Tumeric	Zingiberaceae	Rhizomatous perennial plant, herbaceous	Rhizome	Curcuminoid	[24]
14	*Zingiber officinale*	Ginger	Zingiberaceae	Herbaceous, perennial, narrow, green leaves, yellow flowers	Rhizome	Gingerol	[25]
15	*Cinnamomum zevlanicum*	Cinnamon	Lauraceae	Evergreen tree, oval shaped leaves, thick bark	Leaf and bark	Cinnamaldehyde	[1]
16	*Ficus bengalensis*	Banyan tree	Moraceace	Largest tree, leaves large ,elliptical, glossy, aerial roots present	Bark	Leucopelargonidin	[26]
17	*Ficus carica*	Anjir	Moraceace	Deciduous tree with smooth white bark, fragrant leaves	Leaves and fruit	Invert sugar	[27]
18	*Artocarpus heterophyllus*	Jack fruit	Moraceace	Found in tropical lowland, oblong to cylindrical,30 to 40 cm in length, simple and alternately arranged leaves	Seed and fruit	Sapogenin	[28]
19	*Hordeum vulgaris*	Barley	Poaceace	Annual grass stem, madeup of nodes and internodes ,inflorescence is spike of spikelets	Seed	Betaglucan	[29]
20	*Triticum vulgaris*	Wheat	Poaceace	Smooth stem with linear leaves, flowers are grouped together in spikelet	Whole plant	Albumin	[30]
21	*Mentha piperita*	Peppermint	Lamiaceae	Herbaceous, rhizomatous, perennial plant, fibrous roots, flowers are purple	Leaf	Terpene	[31]
22	*Ocimum sanctum*	Tulsi	Lamiaceae	Branched subshrub, hairy stem, leaves are petioled	Leaf	Eugenol	[32]
23	*Salvia officinalis*	Salvia	Lamiaceae	Perennial subshrub, evergreen, leaves are oblong, woody stem	Leaf	Eugenol	[33]
24	*Terminalia catappa*	Indian almond	Combretaceae	Tree is monoecious, branches are distinctively arranged in tiers, leaves are large and board	Fruit	Oleic acid	[34]
25	*Eucayptus globulus*	Blue gums	Myrataceae	Evergreen tall tree, narrow and	Leaf	Eucalyptol	[35]

				sickle shaped leaves, white flowers			
26	*Embica officinalis*	Amla	Euphorbiaceae	Branchlets are not glabrous,leaves are simple & pinnate	Fruit	Tannoids	[36]
27	*Stevia rebaudiane*	Candy leaf	Asteraceae	Perennial, don't produce seeds, leaves are sweet in taste	Leaf	Stevioside , Rebaudioside	[37]
28	*Tinospora crispa*	Glloy	Menispermaceae	Large deciduous shrub, leaves simple & alternate, exstipulate, flowers unisexual	Leaves & stem	Tinosporside, Tinosporic acid	[38]
29	*Syzgigum cumini*	Java plum	Myrtaceae	Slow growing, dense foliage upto 30 m in height,bark is rough dark gray	Fruit, seed	Mallic acid,oxalic acid	[39]
30	*Bauhinia variegata*	Kachnar	Caesalpiniaceace	Medium sized tree, deciduous, leaves are long, flowers are bright	Leaf, Fruit	Favlone, tirterpene	[40]

Conclusion

There are different types of diabetes mainly Type 1 diabetes, Type 2 diabetes, Gestational diabetes & Prediabetes. Because of the fear of side-effects of synthetic drugs, in order to control this type of metabolic disorder, there is demand of natural therapies. The natural therapies include anti-diabetic plants which aid in controlling this disorder. Plants have high medicinal value and thus may be recommended as cheap food supplements in treating diabetes. More than 1200 species of plants have been included in treatment of diabetes. Curing diabetes without any side-effect is possible only in traditional medicines by using plants. The bio-active compounds (terpenes, eugenol, terpenoids, alkaloids etc.) present in plants are responsible for the hypoglycemic effect. Thus, the plant extracts and standard drug can synergistically reduce the blood glucose level and increase in hexokinase activity. However, there is still scope of research and clinical trials for developing a fully effective and safe herbal anti-diabetic drug.

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