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RESEARCH ARTICLE

FOLK ANTIDIABETIC PLANTS OF ASSAM: A SURVEY ON THEIR REPORTED ACTIVITY AND FUTURE POTENTIAL

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Abstract

Assam is a state in India's north-eastern region, known for its lush floral and cultural diversity. We combed through the literature and discovered that about 117 Assamese plant species had been shown to have antidiabetic potential in preclinical studies. Diabetes, in its many forms, has been a long-standing problem for doctors for decades. Many aspects of diabetes must be investigated, including the physiological actions of insulin and the different clinical features of the condition, such as tissue complications. Since diabetes is a lifestyle disease, careful care with regard to diet and anti-diabetic agents is essential. Herbal diabetes therapy is not a novel concept. Plants and plant extracts have been used to treat diabetes since 1550 B.C., with as many as 400 "prescribed" before the development of effective diabetes drugs earlier this century.

Introduction:-

Assam is a state in India's north-eastern region with a rich floral and cultural diversity. The state is situated in the Eastern Himalayan foothills, a biodiversity hotspot. Assam is divided into 27 districts. The majority of this region's ethnic tribes have their own herbal health-care programmes based on their original holistic culture. Assam is a land rich in biodiversity with a diverse sociocultural landscape. They treated diabetic patients with a specific crude plant extract. Diabetes, which is characterised by a high level of sugar in the blood, is a serious disease that claims thousands of lives each year, particularly in commercialised societies. Type 1 diabetes and type 2 diabetes are the two most common forms of diabetes. Diabetes type 1 is also known as insulin-dependent diabetes mellitus or Juva diabetes, and it affects 10% of the world's diabetics. This form of diabetes can only be treated with insulin injections. Diabetes Type 2 is a non-insulin-dependent Mellitus that affects 90 percent of the world's diabetic patients, or around 150 million people. Enough progress in the field of diabetes care has been created.

Herbal medicine is the world's oldest method of healthcare. Throughout history, herbs have been used by all civilizations. It played a crucial role in the evolution of modern society. The great variety of plants available to primitive man was noticed and appreciated. Food, clothes, shelter, and medicine were all provided by the plants. Most of the medicinal use of plants seems to have been established in the last few centuries. As time passed, each tribe added to its knowledge base the medicinal properties of the herbs found in their region. They collected data on herbs in a systematic manner and created well-defined herbal pharmacopoeias. Indeed, much of the pharmacopoeia of scientific medicine was derived from aboriginal peoples' herbal lore well into the twentieth century. Herbal medications make up a large portion of today's pharmaceuticals. Indeed, almost a quarter of all prescription

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medications in the United States contain at least one active ingredient derived from plant matter. Others are derived from plant extracts, while others are synthesised to closely resemble a natural plant compound.

According to the World Health Organization (WHO), 4 billion people, or 80% of the world's population, use herbal medicine for some form of primary health care. Herbal medicine is a popular ingredient of Ayurvedic, homoeopathic, naturopathic, traditional oriental, and Native American Indian medicine, and it is a major component of all indigenous peoples' traditional medicine. According to the WHO, about 74 percent of 119 plant-derived pharmaceutical medicines are used in modern medicine in ways that are closely linked to their traditional uses as plant medicines by native cultures. Major pharmaceutical companies are currently conducting comprehensive research into the therapeutic benefit of plant materials collected from rain forests and other locations. The aim of this article is to compile scattered scientific information on hypoglycemic herbs and to provide current status of plants that have been tested for antidiabetic operation.

Medicinal Plants Used To Treat Diabetes

Plants have long been a good source of medicines, and many of today's medications are extracted directly or indirectly from them. According to ethnobotanical data, about 800 plants may have anti-diabetic properties, with Momordica charantia, Pterocarpus marsupium, and Trigonella foenum greacum being particularly useful in the treatment of type 2 diabetes. When tested using various types of experimental methods, some of these herbs have demonstrated anti-diabetic efficacy. Alkaloids, glycosides, galactomannan gun, polysaccharides, peptidoglycans, hypoglycans, guanidine, steroids, carbohydrates, glycopeptides, terpenoids, amino acids, and inorganic ions are only a few of the plant-derived active principles that have demonstrated activity, including diabetes care. List of the medicinal plants having antidiabetic potential acording to the different part used and mode of action were presented in table below.

LIST OF ANTIDIABETIC PLANT

SL NO.	Botanical name	Local name	Family	Parts used	Mechanism of action	Chemical constituent	Reference
1.	*Abies pindrow Royle*	Morinda / Rodha	Pinaceae	Entire plant	Insulin secretagogue activity	Volatile oil	1
2.	*Abroma augusta* Linn	Devil's cotton	Sterculiaceae	Roots & Leaves	Lowering blood sugar	Fixed oil, Alkaloid	2
3.	*Acacia arabica* willd	Babool	Leguminosae	Seed	Initiate release of insulin	arabin	3
4	*Achyranthus aspera L*	chirchiri	Amaranthaceae	Entire plant	Decrease blood sugar		4
5	*Agrimony eupatoria* L		Rosaceae	Leaves	Insulin releasing & insulin like activity		5
6	*Ajauga iva* wall.ex.Benth	Bugle weed	Labiatae	Entire plant	Decrease plasma glucose level		6
7	*Allium sativum* Linn.	Lehsun	Liliaceae	Roots	Antihyperglycemic and antinociceptive effect	v.oil, Allin, Allicin	7
8	*Allium cepa* Linn.	Pyaz	Liliaceae	Bulb	Stimulating effects on glucose utilization and antioxidant enzyme	Protein, carbohydrate, vit. A,B,C, Allyl propyldisulphide	8
9	*Aloe vera* Tourn. ex. Linn.	Gheequar	Liliaceae	Entire plant		Aloin glycoside	9,10,11
10	*Aloe barbadensis*	Gheequar	Liliaceae	Leaves	Stimulating synthesis and/or release of	Barbaloin, isobarbaloin, resin	12

	Miller				insulin		
11	*Amaranthus spinosus* Linn.	Kataili chaulai	Amarantha ceae	Stem			13
12	*Anacardium occidentale* Lin n	Kaju	Anacardiac eae	Entire plant		Flavonols, terpenoid, caumarin, phenolic compound,essenti al oil	14
13	*Andrographis paniculata Nees*	Kalmegh	Acanthacea e	Entire plant	Increase glucose metabolism	Diterpenoid lactone andrographoloid	15,16
14	*Annona squamosa*	Sharifa	Annonacea e	Leave s	Hypoglycemic and antihyperglycemic activities of ethanolicleaf-extract, Increased plasma insulin level	Acetogenins-squamosin B, squamosamide,ret iculatain-2,isosquamosin	17
15	*Artemisia pallens Wall*	Davana	Composita e	Aeria l parts	Hypoglycemic, increases peripheral glucose utilization or inhibits glucose reabsorption	Essential oil, davanone	18
16	*Averrhoa bilimbi*	Bilimbi	Oxalidacea e	Leave s	increase serum insulin level		19,20
17	*Azadirachta indica* A.juss.	Neem	Meliaceae	Leave s	Glycogenolytic effect due to epinephrine action was blocked	Nimbidin, Nimbin, Nimbidol, Nimbosterol	21
18	*Beta vulgaris* Linn	chukanda r	Chenopodi aceae	Leave s	Reduce blood glucose level by regeneration of β cells		22
19	*Bidens pilosa*		compositae	Aeria l parts		Polyacetylenic glucoside	23
20	*Bixa orellana L.*	Annotta	Bixaceae	Entire plant	Increase plasma insulin conc. & increase insulin binding on insulin receptor	Oleo-resin	24
21	*Boerhaavia diffusa L.*	Punarnav a	Nyctaginac eae	Leave s & Entire plant	Increase in hexokinase activity,decrease in glucose-6-phosphataseand fructose bis-phosphatase activity, increase plasma insulin level	Alkaloid punarnavaine, punarnavoside	25
22	*Brassica juncea* L.	Rai	Cruciferae	Leave s & seed	Food adjuvants for diabetic patients	Isothiocyanate glycoside singrin, protein, fixed oil	26
23	*Caesalpinia bonducella* Fle m.	Karanju	Leguminos e	Seed kerne ls	Free radicle scavenging	Fatty oil	27

24	*Camellia sinensis*	Green tea (chai)	Theaceae	Leaves	Increase insulin secretion	Polyphenolic constituents (EGCG)	28
25	*Capparis deciduas* Edgew	Karer	Capparidaceae	Powder	Hypoglycemic,antioxidant, hypolipidaemic		29
26	*Capsicum frutescens* Linn.	Mirch	Solanaceae	Entire plant	Increase insulin secretion & reduction of insulin binding on the insulin receptor	Capsaicin,pritein	30
27	*Carum carvi* Linn.	Shia jira	Umbelliferae	Fruits		V.oil, resin, carvone, fixed oil	31
28	*Cassia alata*	Ringworm senna	Caesalpiniaceae	Leaves			32
29	*Cassia auriculata*	Tarwar	Caesalpiniaceae	Flower	Increase utilization of glucose through increase glycolysis		33
30	*Catharanthus roseus* G.Don	Sadabahar	Apocynaceae	Leaves, twig & flower	Increase metabolisation of glucose	Indole alkaloid, vincristine vinblastin	34
31	*Cinnamomum zeylanicum Nees*	Dalchini	Lauraceae	Bark	Elevation in plasma insulin	V.oil, tannin, mannitol, ca.oxalate,	25
32	*Clausena anisata* Burm.f.		Rutaceae	Roots	Stimulate secretion of insulin		36
33	*Coriandrum sativum* Linn.	Dhania	Umbelliferae	Seed		V.oil, fixed oil, protein	37
34	*Coscinium fenestratum Calebr*	Jharhaldi	Menispermaceae	Stem	Increase enzymatic antioxidants	Barberine ,glycoside,saponin	38
35	*Croton cajucara Benth*	Jamalgota	Euphorbiaceae	Bark		Fixed oil	39
36	*Cryptolepis sanguinolenta* R.	Anantmul	Asclepidaceae	Entire plant	Increase glucose uptake by 3T3-L1 cells	Cryptolepine	40
37	*Eclipta alba* Linn.	Bhringraj	Compositae	Leaves	Decrease activity of glucose-6-phosphatase& fructose-1-6,bisphasphatase	Ecliptin alkaloid	41
38	*Embellica officinalis Gaertn.*	Amla	Euphorbiaceae	Fruits	Reduce 5-hydroxymethylfurfural,creatinine albumin level	Vit.C, tannin	42
39	*Enicostemma littorale Blume*	Chhota chirayata	Gentianaceae	Entire plant	Decrease glycosylated Hb & glucose 6 phosphatase	Swertiamarine glycoside	43,44,45
40	*Eugenia jambolana* Lam.	Jamun	Myrtaceae	Seed, fruit , leaves, kernel	Lowers plasma glucose level		46,47,48

41	*Eucalyptus globulus* Labill.	Eucalyptus	Myrtaceae	Leaves	Increase insulin secretion from clonal pancreatic beta line (BRIN-BD 11)	Essential oil , cineol	49
42	*Euphrasia officinale*	Eyebright	Scrophulariaceae	Leaves			50
43	*Ficus religiosa* Linn.	Peepal	Moraceae	Entire plant	Initiating release of insulin	Tannin	51
44	*Ficus bengalensis* Linn.	Bargad	Moraceae	Bark	Rising serum insulin	Tannin	52
45	*Ficus carica*	Anjir	Moraceae	Leaves			53
46	*Gymnema montanum* hook f.		Asclepiadaceae	Leaves	Antioxidant& antiperoxidative		54
47	*Gymnema sylvestre* R.	Gudmar	Asclepiadaceae	Leaves	Lowers plasma glucose level	Gymnemic acid, quercital	55,56,57,58
48	*Gentiana olivier*Griseb.		Gentianaceae	Flowers	Lowers plasma glucose level	Iso-orientin C-glycoside	59
49	*Glycerrhiza glabra* Linn.	Mulethi	Leguminosae	Root	Lowers plasma glucose level	Triterpenoid,saponin, glycerrhizin	60
50	*Gynura procumbens*		Compositae	Leaves	Lowers plasma glucose level		61
51	*Hibiscus rosa sinensis* Linn.	Gudhal (china rose)	Malvaceae	Entire plant	Stimulate insulin secretion from beta cells	Vit.B,C, Fat,	62
52	*Helicteres isora* Linn.	Indian screw tree	Sterculiaceae	Root	Decrease plasma triglyceride level & insulin sensitizing activity	Saponin ,tannin, lignin	63
53	*Hordeum vulgare*	Jau	Graminaeae	Barley seed			64
54	*Hovenia dulcis Thunb*	Sicka	Rhamnaceae	Entire plant		flavonoids	65
55	*Ipomoea aquatica* Forsk.	Kalmisag	Convolvulaceae	Leaves	Reduce fasting blood sugar level & serum glucose level	Carotene	66
56	*Ipomoea batata* Linn.	Shakarkand	Convolvulaceae	Tubers	Reduce insulin resistance & blood glucose level		67
57	*Juniperus communis* Linn.	Hauber	Pinaceae	Fruits	Increase peripheral glucose consumption & induce insulin secretion		68
58	*Lupinus albus* Linn.	Turmas	Fabaceae	Seed	Lower serum glucose level	Alkaloid , fatty oil, asparagines	69
59	*Luffa aegyptiaca* Mill.	Ghiatori	Cucurbitaceae	Seed	Lactigogue activity	Fatty oil	70
60	*Leucas lavandulaefolia Rees*	Kumbha	Labiatae	Entire plant	Reduce blood glucose level		71

61	*Lagerstronemia speciosa*	Jarul	Lythraceae	Leaves			72
62	*Lepidium sativum*	Halim, hurf	Cruciferae	Seeds			73
63	*Mangifera indica* Linn.	Mango	Anacardiaceae	Leaves	Reduction of intestinal absorption of glucose	Mangiferin	74
64	*Myrtus communis L.*	Vilayati mendhi	Myrtaceae	Leaves	Lower blood glucose level	V.oil mirtii oleum	75
65	*Memecylon umbellatum Burm*	Anjani	Melastomataceae	Leaves	Lower serum glucose		76
66	*Momordica cymbalania Fenzl ex naud in*	kadavanchi	Cucurbitaceae	Fruit powder	Reduce blood glucose level		77
67	*Mucuna pruriens L.*	Kiwach	Leguminosae	Seed	Reduce blood glucose level		78
68	*Musa sapientum* Linn.	Banana	Musaceae	Flower	Reduce blood glucose &glycosylated Hb		79
69	*Momordica charantia* Linn.	Karela	Cucurbitaceae	Fruit	Reduce blood glucose level	Momordicine alkaloid, ascorbic acid	80
70	*Morus indica L.*	Shehtoot	Moraceae	Leaves	Increase glucose uptake		81
71	*Murraya koeingii (L)spreng*	Curry leaf	Rutaceae	Leaves	Increase glycogenesis , decrease glycogenolysis & gluconeogenesis		82
72	*Nelumbo nucifera* Gaertn.	Lotus	Nymphaeaceae	Rhizome	Reduce blood sugar level	Nuciferin, nornuciferin	82
73	*Ocimum sanctum* Linn.	Tulsi	Labiatae	Leaves	Lowering blood sugar level	V.oil, phenol, aldehyde, fixed oil, alkaloid, tannin, ascorbic acid	84
74	*Olea europia* Linn.	Olive	Oleaceae	Leaves	Potentiation of glucose , induced insulin released , & increase peripheral uptake of glucose	Oleuropeoside	85
75	*Opuntia Ficus indica Mill*	Indian fig	Cactaceae	Stem			86
76	*Pandanus odorus* Linn.	Kevra	Pandanaceae	Root	Decrease plasma glucose level	Essential oil	87
77	*Panax ginseng* Mey.	Pannag	Araliaceae	Root & entire plant	Lowering blood sugar level	Glycans, panaxans I,J,K & L	88
78	*Punica granatum Linn*	Anar	Punicaceae	Seed	Reduce blood sugar level	Vit.C, protein, tannin, gallic acid, pelletierine	89
79	*Picrorrhiza kurroa Royle*	Katuka	Scrophulariaceae	Entire plant	Decrease serum glucose	Picrorrhizin, kutkin	90

	ex. Benth						
80	*Phyllanthus amarus*	Bhui amla	Euphorbiaceae	Entire plant	Decrease blood glucose level	Alkaloids	91
81	*Phaseolus vulgaris*	Lobia	Papilionaceae	Pod, seed, whole plant	Hypoglycemic, hypolipidemic, inhibit alpha amylase activity,antioxidant.		92,120
82	*Salacia oblonga*	Chundan	Celastraceae	Root	inhibition of alpha glucosidase activity		93
83	*Salacia reticulata* Wight.	Anukudu chettu	Celastraceae	Stem & root	inhibition of alpha glucosidase activity		94
84	*Swertia chirayata* Roxb. ex.Flem	Chirayata	Gentianaceae	Entire plant	Stimulates insulin release from islets	Zanthone mangiferin, gentianine, swerchirin	95
85	*Syzygium cumini Linn*	Jamun	Myrtaceae	Seed	Decrease blood glucose level		96
86	*Scoparia dulcis* Linn.	Mithi patti	Scrophulariaceae	Leaves	Decrease glycosylated Hb & Inc. total Hb, Insulin-secretagogue activity		97
87	*Trigonella foenum graceum*	Methi	Leguminosae	Seed	Decrease blood glucose concentration	Protein, fat, V.oil, fixed oil, carbohydrate	98
88	*Tribulus terrestris* Linn.	Gokhru	Zygophyllaceae	Saponin	Decrease serum glucose	Harmine	99
89	*Tinospora crispa* Linn.	Giloe	Menispermaceae	Stem	Anti-hyperglycemic, stimulates insulin release from islets		100
90	*Tinospora cardifolia* Willd.	Giloe	Menispermaceae	Root	Decrease blood glucose & brain lipid	Berberine, starch	101
100	*Tamarindus indica* Linn.	Imli	Caesalpimiaceae	Seed			102
110	*Teramnus labialis* (Roxb) Benth	Mashoni	Fabaceae	Aerial parts		Caumarin - fraxidin	103
111	*Urtifca dioica* Linn.	Bichhu booti	Urticaceae	Leaves	Increase insulin secretion	Fatty oil	104
112	*Viscum album* Linn	Vadank	Loranthaceae	Entire plant	Alpha glucosidase inhibitor		105
113	*Vinca rosea*	Sadabahar	Apocynaceae	Leaves	Beta cell rejuvenation, regeneration, & stimulation	Vincristine , vinblastine	106
114	*Withania somnifera* Dunal	Ashwagandha	Solanaceae	Root	Decrease blood sugar level	Withanine, somnine, withaferine, withanolides	107
115	*Xanthium strumarium*	Chhota gokhru	Compositae	Fruits	Increase glucose utilization	Phenolic compound ,caffeic acid	108
116	*Zingiber officinale Roscoe*	Adrak	Zingiberaceae	Rhizome	Increase insulin level & decrease fasting glucose level	Sesquiterpene	109

117	*Zizyphus sativa Gaertn*	Pitni-ber	Rhamnaceae	Leaves	Dose dependent reduction in blood glucose level	Tannin	110

Conclusion:-

Diabetes is a carbohydrate, fat, and protein metabolism disorder caused by a decrease in insulin production or an increase in insulin resistance. Patients with insulin-dependent and non-insulin-dependent diabetes, diabetic retinopathy, diabetic peripheral neuropathy, and other conditions have benefited from herbal diabetes therapies. Scientific validation of several Indian plant species has proved the efficacy of the botanicals in reducing the sugar level.

There are several plants known for their antidiabetic activity, with different mode of action and phytoconstituents. This is an attempt to simplify the phytoconstituents of a particular family with a specific mode of action in order to lower plasma glucose levels. Based on studies on their possible efficacy against diabetes, it is thought that botanicals play a significant role in diabetes treatment, which requires further investigation in order to produce the appropriate drugs and nutraceuticals from natural resources.

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