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A REVIEW ON ETHNOMEDICINAL PLANTS OF ASSAM (INDIA) USED IN THE TREATMENT OF DIABETES MELLITUS

Suman Kumar [*1], Dhritimoni Devi [1], Susankar Kushari [1], Sameeran Gam [2] and Himangshu Sarma [3]

Girijananda Chowdhury Institute of Pharmaceutical Science [1], Guwahati - 781017, Assam, India.
NETES Institute of Pharmaceutical Science [2], Mirza - 781125, Assam, India.
Life Sciences Division [3], Institute of Advanced Study in Science and Technology, Guwahati - 781035, Assam, India.

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Correspondence to Author:
Mr. Suman Kumar

Girijananda Chowdhury Institute of Pharmaceutical Science, Guwahati - 781017, Assam, India.

E-mail: smnkmr33@gmail.com

ABSTRACT: Diabetes mellitus is one of the most prevalent metabolic disorders and has been a leading cause of death in the last few decades. Oral hypoglycaemic agents are mostly used in the treatment of diabetes, but the main drawback of these agents is that they have some unavoidable side effects. Nowadays, researchers are mainly focusing on unexposed medicinal plant species as an alternative source for the treatment of diabetic mellitus. This review article aims to compile all the reported antidiabetic plants used by ethnic people of Assam as a folk remedy to cure diabetes mellitus and help the researcher investigate unexposed antidiabetic medicinal plants. In this concern, an extensive literature survey was carried out through different books and electronic search engines to understand the cause of diabetes mellitus and their traditional herbal remedy. Here listed 92 plant species belong to 45 families that claim ethnomedical indication to treat various diabetes mellitus. The roots, rhizomes, stems, leaves, barks, bulbs, flowers, and even the whole plant are utilized as folk remedies to cure diabetes mellitus in the form of crushed juice, infusion, and decoction. The wide variety of plants that are being utilized to cure diabetes mellitus in this area supports the traditional value in their primary health care system of the various rural communities of Assam. The information will help the researcher find unexplored medicinal plants to develop a new therapeutic approach to develop new chemical entities, which are safe, effective, and inexpensive for isolation and identification of novel bioactive compounds.

INTRODUCTION: The history of ethnomedicine is as old as human civilization. It is a component of ethnobotany, which refers to the use of plants by humans as medicine to treat various ailments of humans and animals. India is known for its traditional practices of medicine since the era of vedic.

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Medicinal plants based on traditional systems of medicines are playing a vital function in providing health care to a large section of population [1]. This indigenous system of medicine has been an integral part of Indian culture and constructed a bridge between herbal biodiversity and cultural bio-diversity. It is exciting that 25% of all prescription drugs are derived from plant sources [2].

People's belief in ethnomedicine has been due to its cost-effectiveness, minimal side effects, and easy accessibility [3]. So, investigation of indigenous knowledge on natural resources is essential to resilience activity on various diseases or disorders

and conserve our traditional knowledge, which could be a source for the scientists in new drug discovery.

Natural products have been used since ancient times in the traditional medicine system for the treatment, cure and prevention of various diseases or disorders, including diabetes and inflammatory diseases. Several experimental studies have validated the traditional use of antidiabetic medicinal plants by investigating the biologically active compound in the extracts, which is able to reduce postprandial blood sugar levels [4, 5]. Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia that results in a defect in secretion and insulin action. It is the most widespread endocrine disease all over the globe. According to the World Health Organization (WHO), the global diabetes prevalence in 2014 is 422 million compared to 108 million in 1980 [6]. Without interventions, the number of people with diabetes is expected to rise to 629 million by 2045 [7]. It is recognized as a global epidemic by the WHO. For the last few decades, researchers are searching for an antidiabetic drug to tackle this overgrowing disease in combination with proper eating habits and physical exercises [8]. The prevalence of diabetes mellitus has been rising more rapidly in middle and low-income countries like India, Bangladesh, Bhutan, Pakistan, *etc*. According to the National Diabetes and Diabetic Retinopathy, the prevalence of diabetes in India is 11.8% in 2019, including 77.2 million people with prediabetes cases. However, it affects people both in urban and rural, but the impact on the urban population is much higher than the rural one [9].

India is one of the seventeen mega biodiversity hotspots globally and accounts for 7-8% of the recorded species [10, 11]. Northeast India is a part of both the Himalayas and Indo-Burma biodiversity hotspot [12]. Assam is the second largest state of Northeast India, situated in the extreme of the Himalayan, resulting in an abundant source of medicinal plants [13, 14]. The people of Assam inhabit a multi-ethnic, multi-linguistic, and multi-religious society along with several tribes with their own traditions and culture. From a very early age, these ethnic people of Assam are dependent on traditional medicine for their primary healthcare problem. According to a survey of the Indian Council of Medical Research (ICMR) the prevalence of diabetes mellitus in Assam has rapidly increased, and it was revealed that 5.5% of the total population is suffering from diabetes mellitus. The inhabitant of this region uses different plant parts along with available formulations for the treatment of this disease. Nowadays, it is imperative to conserve this precious knowledge of traditional medicine, which has been gradually descending through generation by generation because of the negligence of the younger generation and lack of proper documentation. So, documentation and conservation of such valuable information are essential, which could help the researcher identify, isolate bioactive constituents, and formulated new cost-effective dosage forms.

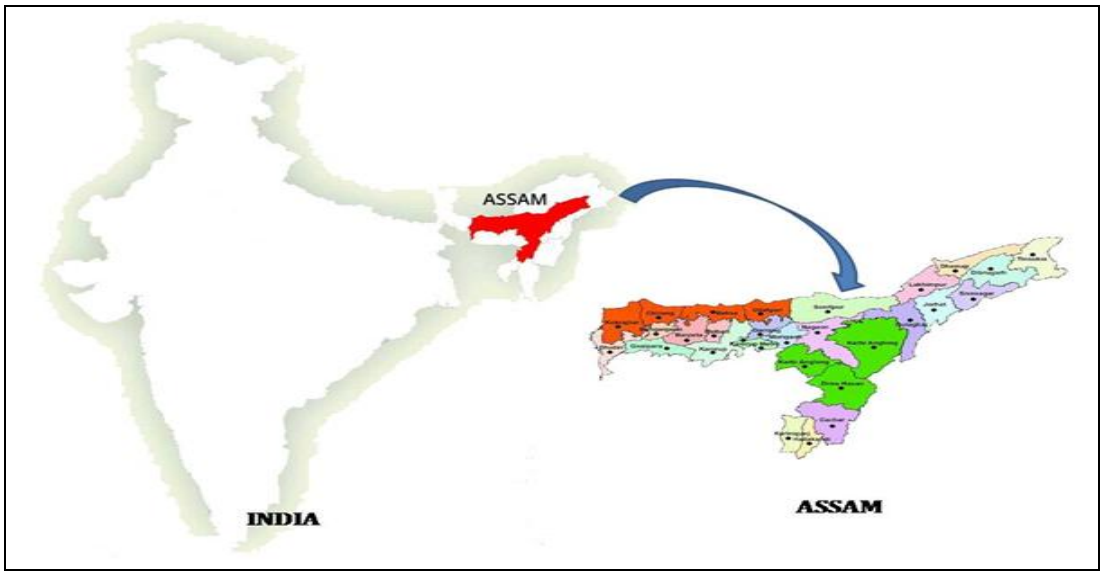

FIG. 1: GEOGRAPHICAL LOCATION OF ASSAM

Geographical Description: Assam is one of the eight states of northeast India situated between 24º2´-28ºN latitude & 89º8´-96ºE longitude, covering 78,438 sq. km [15, 16]. The state shares an international border with Bangladesh in the west and Bhutan in the north. The national border with Arunachal Pradesh in the north and east, West-Bengal, Meghalaya in the west, and Nagaland, Mizoram, Manipur, Tripura in the south **Fig. 1**. The state has 33 districts that are distributed in Brahma-putra valley, Barak valley, and the mountainous ranges. The capital of Assam is Dispur. It possesses a unique geomorphic environment with broad plains and hills. The state climate is subtropical with heavy rainfall and humidity, which supports various habitats and the wetland ecosystem [17]. As far as the climate is concerned, the state has pleasant weather. During summer, the temperature goes around 35-38 °C, and in winter, the temperature reaches a minimum of 6-8 °C. The climate is characterized by heavy monsoon downpours reducing summer temperatures and foggy nights and mornings during winters [18]. Approximately 35.48% of the total area is covered with forest. This area is mainly comprised of five national parks, twenty wildlife sanctuaries, and twenty-three protected areas, respectively [19, 20]. The climatic condition and wide varieties of physical features witnessed in Assam have resulted in a diversity of ecological habitats which harbor and sustain a wide range of species. Furthermore, the prevalence of mild and highly humid weather coupled with heterogenic physiography make possible dense growth of several plant species in this part of the country and, therefore, phyto-geographically, imparting Assam a distinct identity in the world.

Ethnic People of Assam: The Assamese is a mixture of Mongolian-Tibetan, Aryan, and Barman ethnic origin. The people of Assam mostly speak Assamese, which is commonly known as ‘Asomiya’. The language is an Indo-Aryan language with Sanskrit roots. The people of Barak Valley speak the Bengali language. The primary official languages of Assam are Assamese, Bangali, and Bodo. Other languages often said in the state include Nepali, Karbi, Mising, Dimasa, *etc*. [18] The ethnic people of Assam can be divided into two groups, *viz*. tribal and non-tribal. Most of the tribal communities have their languages [21]. These tribes include Rabha, Bodo, Karbi, Tiwa, Mishing, Dimasa, Garo, Sonowal Kacharis, Deori, Hojai, Mech, *etc*. All these communities are an integral part of Assam. According to the 2011 census data, the total population is 31,169,272, out of which males comprise 15,954,927 and females comprise 15,954,927. It comprises people from various religions like Hindus, Muslims, Christians, Buddhists, Jain, and Sikhs. Most of the community lives in rural areas. The total literate population of the state is 73.18%, where the female literacy rate is lower (67.27%) as compared to males (78.81%) [21].

A Brief Description of Diabetes Mellitus: Diabetes mellitus can be classified into two major types, *i.e.*, Type I diabetes mellitus (T1DM) and Type II diabetes mellitus (T2DM) [22]. T2DM is very common and accounts for 90-95% of all diabetic cases, so it is regarded as the most critical health concern worldwide [23]. The distinction between the two types has historically been based on age onset, degree of loss of β cell function, degree of insulin resistance, presence of diabetes-associated auto-antibodies *etc*. The significant symptoms of diabetes mellitus are thirst, polyuria, polyphagia, blurring vision, and weight loss. The most severe clinical manifestation is ketoacidosis or a non-ketotic hyperosmolar state that may lead to dehydration, coma, and death in the absence of effective treatment [7]. The long-term specific effects of diabetes mellitus include mainly retinopathy, nephropathy, and neuropathy. People with diabetes are also at high risk of other diseases, including heart, cerebrovascular disease, obesity, cataracts, erectile dysfunction, and nonalcoholic fatty liver disease [7].

Antidiabetic Drugs and their Side Effects: There are several oral hypoglycemic classes of drugs that show antidiabetic effects by different cellular mechanisms. Among those sulfonylureas, biguanides, α-glucosidase inhibitors, DPP-4 inhibitors, GLP-1 receptor agonists, thiazolidinediones, meglitinides, SGLT-2 inhibitors are most commonly used. Oral sulphonylureas reduce the blood sugar level by elevating insulin release from islets of Langerhans. Similarly, biguanides reduce hepatic gluconeogenesis and replenish peripheral tissues' sensitivity to insulin. The α-glucosidase inhibitors such as acarbose, voglibose are responsible for the break-

down of carbohydrates. Another essential class thiazolidinedione such as pioglitazone, rosiglitazone primarily improves the muscle and adipose tissue sensitivity to insulin. Although synthetic oral hypoglycemic drugs mainly control diabetes, these drugs often come with prominent side effects [24, 25]. The different antidiabetic medicines and their side effects and mechanism of action are summarized in **Table 1**.

TABLE 1: SUMMARY OF SOME COMMONLY USED ANTIDIABETIC DRUGS, THEIR MECHANISM OF ACTION AND SIDE EFFECTS [24–26]

Class of drugs	Antidiabetic drugs	Mechanism of action	Side effects and contraindications
Biguanides	Metformin	Inhibit hepatic gluconeogenesis and increases skeletal muscle uptake of glucose	Lactic acidosis and contraindicated for patients with liver or heart failure
Sulphonylureas	Glimepiride Glibenclamide	Increases insulin secretion by activating β-cells of islets of langerhans	Risk of weight gain
α-glucosidase inhibitors	Acarbose Miglitol	Inhibit carbohydrates degradation in intestine	Gastrointestinal side effects. Negligible effects on cholesterol
Thiazolidinedione	Pioglitazone Rosiglitazone	It activates PPAR γ, increases insulin sensitivity in muscle	Risk of weight gain, edema, and heart failure
Meglitinides	Nateglinide Repaglinide	Increases insulin secretion by activating β-cells of islets of langerhans	Risk of weight gain, risk of hypoglycemia
DPP4 inhibitors	Sitagliptin Aloglaptin	Increases incretin concentration	Gastrointestinal side effects
SGLT- 2 inhibitors	Dapagliflozin Canagliflozin	Limits renal glucose reabsorption	Risk of urinary tract infections

DPP-4: Dipeptidyl peptidase-4; GLP-1: Glucagon-like peptide 1; PPARɤ: Peroxisome proliferator-activated receptor; SGLT2: Sodium dependent glucose co-transporter 2

Ethnomedicinal Approaches: Diabetes mellitus is a lifestyle-dependent metabolic disorder in which dieting and controlling the blood sugar level is essential. In the last 40 years, the prevalence of diabetes in India has increased significantly. A large investment is requiring in the development of effective and safe antidiabetic drugs. Researchers are working day and night to fulfill the high demand for new antidiabetic drugs with minimum side effects. In the classical system of medicine, especially in *Ayurvedic, Siddha* and *Unani* employed many medicinal plants to treat diabetes. Moreover, several natural products have been reported to possess good antidiabetic activity in the ethnomedicinal survey. In this review article, we have collected such information from various ethnomedicinal surveys of Assam and tried to find out the most cited plant species and family and their parts used. All traditional antidiabetic plants used by ethnic people of Assam along with their families are listed in **Table 2**. All the plants collected were grown either in the homestead or in the vicinity of the homestead. These are available throughout the year. **Table 2** also gives the ethnobotanical information of plant parts utilized and the preparation method of the dosage forms. In the review, 92 plant species belonging to 45 families were recognized for the treatment of diabetes mellitus. Among these plant species *Adhatoda vasica* Nees., *Aegle marmelos* Correa ex Roxb., *Aloe veratourn* ex Linn., *Allium sativum* Linn., *Bryophyllum pinnatum* (Lam.) Oken, *Centella asiatica* (L.) Urb., Coptisteeta Wall., *Murraya koenigii* (L.) Sprengel, *Ocimum sanctum* Linn, *etc*., are frequently utilized folk remedies among various communities **Fig. 2**.

TABLE 2: LIST OF THE ANTIDIABETIC TRADITIONAL MEDICINAL PLANTS SPECIES ALONG WITH THEIR LOCAL NAME, FAMILY, PARTS OF PLANT AND METHOD OF USES BY VARIOUS RURAL COMMUNITIES ASSAM

S. no.	Local name	English name	Family	Biological Source	Plant parts used	Method of uses
1	Vasakpata	Malabar nut tree	Acanthaceae	*Adhatoda vasica* Nees.	Roots, leaves & flower	Decoction [27-29]
2	Bel	Golden apple; Stone apple	Rutaceae	*Aegle marmelos* Correa ex Roxb.	Leaves, Fruits	Leaves powder is taken with cow's milk 30-33
3	Koroi, Kurha	White siris tree	Mimosaceae	*Albizia procera* (Roxb.) Benth.	Leaves, flower, bark	Decoction [27, 28]
4	Piyaz	Onion	Amaryllidaceae	*Allium cepa* Linn.	Rhizome	Rhizome paste is taken with honey

						[32-36]
5	Naharu	Garlic	Liliaceae	*Allium sativum* Linn.	Bulb	Bulb is fried with mustard oil and consumed with normal diet [28, 34-36]
6	Mankach, Mankanda	Giant taro	Araceae	*Alocasia indica* (Lour.) Spach	Rhizome	Juice, shade dry powder [27]
7	Salkowari	Indian Aloe	Liliaceae	*Aloe vera* tourn ex Linn.	Leaves	Decoction, Juice [28, 33-35]
8	Bogi-tora; Tora-bhaghini	Blue ginger, Siamese ginger	Zingiberaceae	*Alpinia galanga* (L.) Willd.	Tuber, rhizome	Raw [37]
9	Karpur		Zingiberaceae	*Amomum linguiforme* (Roxb.) Baker	Rhizome	Decoction is taken once a day [30, 38]
10	Nekhontenga; Abu-tenga	Rohitaka	Euphorbiaceae	*Antides maacidum* Retz.	Leaves	Decoction [39]
11	Mati kothal	Pineapple	Bromeliaceae	*Ananas comosus* (L.) Merr.	Whole plant, leaves, Fruits	Fresh juice fruit pulp, decoction of leaves [27, 28]
12	Kalmegh	Green chiretta	Acanthaceae	*Andrographis paniculata* (Burm. f.) Nees	Whole plant	Boiled with water [27, 28, 33]
13	Atloch	Sugar apple; Custard apple	Annonaceae	*Annona squamosa* Linn.	Bark	Bark decoction is taken before meal [28, 30]
14	Tamol-goch	Betel nut plam	Arecaceae	*Areca catechu* Linn.	Nuts	Dried and soaked with water [27, 28, 34]
15	Kothal	Jack-fruit	Moraceae	*Artocarpus heterophyllus* Lam.	Leaves	Juice is used orally [27, 28]
16	Neem	Mahaneem; Neem	Meliaceae	*Azadirachta indica*A. Juss.	Leaves, seed	Decoction of leaves, seed powder [27, 40]
17	Kausidarya		Linderniaceae	*Bonnayareptans* (Roxb.) Spreng.	Leaves	Roasted leaves powder [41]
18	Beet	Beetroot	Chenopodiaceae	*Beta vulgaris* Linn.	Root	Root juice taken orally [28, 32]
19	Simolu	Red cotton tree; Red silk cotton tree	Bombacaceae	*Bombax ceiba* Linn.	Flower, root and bark	Decoction [27, 28]
20	Dupor-tenga	Air plant	Crassulaceae	*Bryophyllum pinnatum* (Lam.) Oken	Leaves	Juice of boiled leaves to be taken orally twice a day [30]
21	Lataguti	Fever nut	Fabaceae	*Caesalpinia crista* Linn.	Seed	Decoction [28, 39]
22	Arahar-mah	Pigeon pea; Red gram	Fabaceae	*Cajanus cajan* (L.) Millsp.	Leaves	Decoction is taken orally on empty stomach [28, 30]
23	Akon	Crown flower	Apocynaceae	*Calotropis gigantea* (L.) Dryand.	Leaves	Decoction [28, 37]
24	Bhang	Marijuana; Hemp	Cannabinaceae	*Cannabis sativa* Linn.	Seed	Smoked seed powder [27, 28]
25	Amita	Papaya	Cariaceae	*Carica papaya* Linn.	Seed, fruit	Fruit pulp, shade dried seed powder [27]
26	Khorpat	Winged Senna;Carrion Crow Bush	Fabaceae	*Senna alata (*L.) Roxb.	Tender leaves	Leaves powder [28, 42]
27	Senna	Indian Senna	Fabaceae	*Cassia angustifolia* Vahl.	Leaves	Extract [28, 39]
28	Sonaru	Pudding-pipe tree	Fabaceae	*Cassia fistula* Linn.	Flower, seed, stem bark	Decoction of seed powder, flower & stem bark [27, 28]
29	Bor-madeluwa	Senna Sophera	Fabaceae	*Senna sophera (*L.) Roxb.	Seeds & stem bark	Decoction [27, 28]
30	Noyontora	Periwinkle; Vinca	Apocyanaceae	*Catharanthus roseus* (L.) G.Don	Leaves	Juice [27, 33, 34, 42, 43]
31	Bar manimuni	Indian pennywort	Apiaceae	*Centella asiatica* (L.) Urb.	Whole plant	Juice of whole plant is taken orally [27, 28, 34]
32	Poraamlokhi;	Star gooseberry	Phyllanthaceae	*Phyllanthus acidus* (L.) Skeels	Leaves	Decoction [27]

	Dhupuri					
33	Holfoli		Euphorbiaceae	*Ciceracida* Linn.	Leaves	Decoction [39, 44]
34	Tezpat; Tejiya		Lauraceae	*Cinnamomum impressinervium* Meisn	leaves	Dry leaves powder [28, 30, 45]
35	KajiNemu	Key lime	Rutaceae	*Citrus aurantifolia* Linn.	Fruit	Decoction [28, 39]
36	JoraNemu	Sweet Orange	Rutaceae	*Citrus aurantium* Linn.	Fruit	Decoction [39]
37	Bharangi	Beetle Killer	Verbinaceae	*Clerodendrum serratum* (L.) Moon.	Whole plants	Juice, Infusion [46]
38	Kurula; Belipoka	Scarlet gourd; Ivy gourd	Cucurbitaceae	*Coccinia grandis* (L.) Voigt	Leaves, fruit	Decoction [27, 33]
39	Narikol	Coconut	Arecaceae	*Cocos nucifera* Linn.	Fruit	Juice, fresh fruit pulp [27, 28]
40	Kolakachu	Taro	Araceae	*Colocasia esculenta* (L.) Schott	Rhizome	Decoction, Infusion [30]
41	Dhonia	Coriander	Apiaceae	*Coriandrum sativum* Linn.	Leaves	Decoction [28, 30]
42	Mishmi tita	Canker root	Rununculacaeae	*Coptis teeta* Wall.	Root, leaves	Decoction [47]
43	Katri	Wild turmeric	Zingibenaceae	*Curcuma aromatica* Salisb.	Rhizome	Decoction [28, 39]
44	Halodhi	Turmeric	Zingiberaceae	*Curcuma longa* L.	Leaves, rhizome	Decoction [28, 39]
45	Dubori-bon	Bermuda grass	Poaceae	*Cynodon dactylon* (L.) Pers.	Whole plant	Fresh juice [27, 28]
46	Ou-tenga	Elephant apple	Dilleniaceae	*Dillenia indica* Linn.	Fruit, Flower	Fruit infusion, Flower extract [30, 48]
47	Okshi	Nepali elephant apple	Dilleniaceae	*Dillenia pentagyna* Roxb.	Ripe fruit	Juice [49]
48	Kath-aalu	Dioscoreaalata	Dioscoreaceae	*Dioscorea alata* Linn.	Rhizome	Decoction [27, 28]
49	Elaichi	Cardamomum	Zingiberaceae	*Elettaria cardamomum* (L.) Maton	Fruit, seed & leaf	Fruit & decoction, seed powder [27]
50	Amlokhi	Indian gooseberry; Amla	Euphorbiaceae	*Emblica officinalis* Gaertn.	Fruits, Whole plant	Decoction [28, 34, 40]
51	Modar	Indian Coral tree	Fabaceae	*Erythrina variegata* L.	Root	Decoction [28, 34]
52	Bot gos	Banyan	Moraceae	*Ficus benghalensis* Linn.	Stem, bark	Decoction [28, 36, 42]
53	Dimoru	Bonsai tree	Moraceae	*Ficus glomerata* Roxb.	Leaf, fruit, Root	Leaf extract & fruit juice [39, 50]
54	Ahot	Peepal tree	Moraceae	*Ficus religiosa* Linn.	Root and bark	Decoction [28, 39]
55	Dimoru	White fig or Pilkhan	Moraceae	*Ficusvirens*	leaf	Cold or hot infusion [51]
56	Borthekera	Mangosteen	Clusiaceae	*Garcinia pedanculata*	Fruit pulp	Fleshy fruit pulp is soaked overnight [28, 30]
57	Soyabean	Soyabean	Fabaceae	*Glycine max* Merr.	Seed	Decoction [28, 39]
58	Gomari	Beechwood	Lamiaceae	*Gmelina arborea* Roxb.	Leaf, fruit	Decoction [28, 39]
59	Anantamul	Indian Sarsaparilla	Apocynaceae	*Hemidesmus indicus* L.	root	Decoction [27]
60	Kurchi	Tellicherry bark	Apocynaceae	*Holarrhena antidysenterica*	Seed, bark	Seed powder, bark decoction [27]
61	Lamkandol	Black creeper	Apocynaceae	*Ichnocarpus frutescens* R. Bn.	root	Root extract [39]
62	Kahuwa bon	Cotton grass	Poaceae	*Imperata cylindrical* Beauv.	Root	Decoction [39]
63	Kalmou	Waterspinach	Convulaceae	*Ipomoea aquantica* Forssk.	leaves	Dried leaf powder taken orally with *Piper nigerium* [28, 32]
64	Doportenga	Air plant/ miracle leaf/ cathedral bells	Crassulaceae	*Kalanchoe piñata* Pers.	Whole plant	Fresh juice [34]
65	Aam	Mango	Anacardiaceae	*Mangifera indica* L.	Leaves and fruits	Decoction prepared from leaves is taken orally [28, 35]
66	Nilazibon	Touch-me-not/shameplant	Mimosaceae	*Mimosa pudica* Linn.	Whole plant	Decoction [28, 39]
67	Titakerela	Bitter gourd	Cucurbitaceae	*Momordica charantia*	Fruit juice	Decoction [28, 40, 52]
68	Nuni	Mulberry	Moraceae	*Morusindica* Linn.	Tender leaf	Decoction [28, 39]
69	Norosingha	Curry tree	Rutaceae	*Murraya koenigii*	Leaf extract	Decoction [28, 52]
70	Athiakol	Wild banana	Musaceae	*Musa balbisiana* Colla.	Aerial stem	Decoction [37]
71	Kashkol	Plantain	Musaceae	*Musa paradisiaca* L.	mucha	Juice, decoction [27, 28]
72	Sewali	Night jasmine	Oleaceae	*Nyctanthes arbor tristis* L.	Leaves, flower	Leaf juice, flower

						paste [28]
73	Vet phul	Water lily	Nymphacaceae	*Nymphaea rubra* L.	Leaf, stem & flower	Flower extract, stem, & decoction [27]
74	Tulsi	Holy Basil	Lamiaceae	*Ocimum sanctum* L.	Leaf, stem, flower twing & root	Decoction [27, 28, 34, 36]
75	Koya bon	Panama crown grass	Poaceae	*Paspalum fimbriatum* kunth	Whole plant	Decoction [37, 42]
76	Titaphul	Nongmankha	Acanthaceae	*Phlogacanthus thrysiflorus* Nees.	Flower, leaf	Fresh juice [27]
77	Amlokhi	Indian gooseberry	Euphorbiaceae	*Phyllanthus emblica* L.	seeds	Roasted seed powder [27]
78	Champa	Temple tree	Apocyanaceae	*Plumeria acuminata*	bark	Bark extract [28, 39]
79	Madhuri aam	Guava	Myrtaceae	*Psidium guajava* Linn.	Fruit, leaf	Decoction [28, 36, 39]
80	Helash	Devil-pepper	Apocynaceae	*Rauwolfia tetraphylla* L.	root	Decoction [37]
81	Golapphul	Rose	Rosaceae	*Rosa alba* L.	Flower	Infusion [37]
82	Ashok	Sorrowless tree	Caesalpiniaceae	*Saracaindica* Linn.	Fruit	Decoction [39]
83	Jayanti	Sesban	Fabaceae	*Sesbania sesban*	leaf	Decoction [27]
84	Vekuritita	Yellow-berried nightshade	Solanaceae	*Solanum xanthocarpum*	Juice extract	Decoction [28, 52]
85	Chirata	Bitter Stick	Gentianaceae	*Swertica chirata* L.	Whole plant	Whole plant extract is consumed [28]
86	long	Clove	Myrtaceae	*Syzygium aromaticum*	Flower bud	Decoction [37]
87	Kola jamu	Java plum	Myrtaceae	*Syzygium cumini* L.	Bark	Bark powder taken with cow's milk [14, 40, 42, 53-55]
88	Kothonda-phool	Pinwheel flower/crape jasmine	Apocynaceae	*Tabernaemontana divaricata* L.	leaf	Decoction [30]
89	Arjun	Rangoon creeper	Combretaceae	*Terminalia arjuna* Linn.	Bark	Infusion [37]
90	Badam(desi)	Indian almond	Combretaceae	*Terminalia catapa* Kinn.	Fruit, seed	Decoction [39]
91	Silikha	Myrobalan	Combretaceae	*Terminalia chebula* Retz.	Fruits	Decoction & powder [42, 54]
92	Korobi	Mexican oleander	Apocyanaceae	*Theventia peruviana* (pers) Meril	bark	Bark extract [39]

FIG. 2: SOME FREQUENTLY UTILIZED MEDICINAL PLANTS BY RURAL COMMUNITIES OF ASSAM

CONCLUSION: Current scenarios of the management of diabetics, for the most part, focus on the potentiation of the of β-cell function, minimize insulin resistance. Phytoconstituents extracted from plants have been utilized to treat human sicknesses since the beginning of medication. The plant drugs and herbal formulations are considered less toxic and free from side effects compared with synthetic medications. In the last few years, researchers are mainly focusing on unexposed medicinal plants that are used by traditional healers in the treatment of diabetes. The indigenous population still relies greatly on traditional medicinal plants to meet their healthcare needs because of the perceived effectiveness, presumed safety with minimal side effects, and affordability.

However, such ethnobotanical information and local plant traditional knowledge need to be substantiated by pharmacological experiments for scientific validation.

In this way, Ayurveda's information upheld by present-day science is essential to separate, portray, and institutionalize the active constituents from natural sources for antidiabetic activity. Combining traditional folk remedies and modern health care therapy can create better medications to prevent and treat people with diabetes with fewer post diabetic complications. Thus, pharmacologists need to take progressively dynamic enthusiasm for assessing traditional folk medications for potential antidiabetic movement and institutionalizing such natural medications as clinically successful and universally focused.

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