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Antidiabetic plants used by Sikkim and Darjeeling Himalayan tribes, India

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Abstract

Sikkim and Darjeeling Himalayan region is characterized by a rich floral diversity and an equally rich ethnomedicinal tradition. Herbal medicine is the dominant system of medicine practiced by the local tribes of this region for the treatment of diabetes. During the course of the present studies it was found that 37 species of plants belonging to 28 families are used as antidiabetic agents in the folk medicinal practices in the region and 81% of these plants are hitherto unreported as hypoglycemic agents. This finding may lead to serious research towards developing new and efficient drugs for diabetes.

Keywords: Diabetes; Antidiabetic plants; Hypoglycemic agents; Traditional medicine

1. Introduction

Sikkim and Darjeeling Himalaya is situated between 87°59′ and 88°53′ East longitude and, 26°31′ and 28°10′ North latitude in India (Fig. 1). This region is rich in floral diversity, many endemic elements and a number of species, which have become rare, threatened or endangered. (Pandey, 1991; Bhujel, 1996). The major ethnic groups of the region are the Nepalese, Lepchas and Bhutias (Tibetans). The tribes of this Himalayan region also have rich ethnomedicinal traditions for which a few literatures are available (Biswas, 1956; Bennet, 1983; Yonzone et al., 1984; Srivastava et al., 1987; Venu et al., 1990; Pandey, 1991; Rai and Sharma, 1994; Rai et al., 1998; Rai and Bhujel, 1999, 2002; Das and Mandal, 2003).

Diabetes affects about 5% of the global population (Chakraborty and Rajagopalan, 2002) and management of diabetes without any side effects is still a challenge to the medical system (Kameswararao et al., 2003). To treat diabetes, the tribal people in these parts of the Himalayas are found to use herbal treatments either alone or in combination with other forms of treatments. Herbal drugs are prescribed widely because of their effectiveness, less side effects and relatively low cost (Venkatesh et al., 2003). Therefore, investigation on such agents from traditional medicinal plants has become more important (Suba et al., 2004). Here, we report 37 species of plants used as antidiabetic agents by the traditional healers of Sikkim and Darjeeling Himalayas.

2. Methodology

Regular field trips to different areas of Darjeeling and Sikkim hills were conducted between September 2001 and April 2003 to collect the ethnomedicinal information and herbarium specimens. The tribal people including local healers, Jhankris, Bijuwas and Fedangwas (Nepalese traditional healers), Bongthings and Mon-Bongthings (Lepcha medicine men and women, respectively) Lamas (Bhutia priest) and village elders were interviewed. The help of the socio-cultural

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Table 1
Antidiabetic medicinal plants from Sikkim and Darjeeling Himalayas

Botanical name family, voucher specimen no.	Habit	Local name: N-Nepali; L-Lepcha; T-Tibetan	Method of use and administration
1	2	3	4
Abroma augusta[a] (L.) L.f., Sterculiaceae, GCS 373	Shrub	Ulatkamal (N)	Stem bark and leaf decoction (10–20 ml) taken one time each alternate day in empty stomach for 4–6 week.
Abutilum indicum[b] (L.) Sw., Malvaceae, DRC 178	Shrub	Ghantiphool (N)	Decoction of stem bark (25–50 ml) given two times daily (after principal meals) for 3–4 weeks.
Aconitum palmatum[b] D. Don., Ranunculaceae, DRC 166	Herb	Seto bikhumma (N); Nyini (L); Bhongnanukpo (T)	Root decoction (10–15 ml) taken with a cup of milk one time daily (after lunch) for 7–10 days.
Aloe barbadensis[c] Mill, Liliaceae, DRC 161	Herb	Ghew kumari (N); Kumari (T)	Fresh leaf pulp (40–50 g) taken once a day in empty stomach for 10–12 weeks.
Asparagus racemosus[a] Willd., Liliaceae, DRC 102	Climbing shrub	Kurilo (N); Neusiri (T)	Decoction of tender shoots (25 ml) taken once a day for 6–8 weeks.
Berberis aristata[a] DC., Berberidaceae, DRC 111	Shrub	Sano Chutro (N); Sutangkung (L); Skyerba (T)	Root bark extract (5–10 ml) taken twice daily (after breakfast and dinner) for 1–2 weeks
Boenninghausenia albiflora[d] (Hook. f.) Reich ex Meissn., Rutaceae, DRC 180	Herb	Chirbirpatay (N)	The whole plant is crushed without water and the juice (5–10 ml) taken one to two times daily for 3–4 weeks.
Calamus rotang[a] (L.), Arecaceae, GCS 338	Climbing shrub	Bet (N)	Raw fruit (1–2) taken as masticatory two times daily (after breakfast and lunch) for 6–8 weeks.
Campylandra aurantiaca[d] Baker, Liliaceae, DRC 179	Herb	Nakima (N)	Flowers are made into curry and taken with staple food two times per week for 4–6 weeks
Cannabis sativa[b] (L.), Cannabaceae, GCS 329	Under shrub	Bhang (N)	Leaf extract (5–10 ml) taken two times daily for 3–4 weeks.
Catharanthus roseus[e] (L.) G. Don., Apocynaceae, DRC 161	Herb	Sada bahar (N)	Raw leaf (1–2) chewed daily for 2 weeks.
Cinnamomum tamala[d] (Buch.-Ham.) Nees and Eberm., Lauraceae, GCS 378	Tree	Sinkauli (N); Napsor (L); Mensing (T)	Decoction of stem bark taken three times daily for 3–4 weeks
Cissampelos pareira[a] (L.), var.*hirsuta* (Buch.-Ham ex DC) Forman, Menispermaceae, PPR 219	Climber	Batulpatay (N)	Root bark extract (5–10 ml) tken one to two times daily for 2–3 weeks
Coccinea grandis[a] (L.) Voigt., Cucurbitaceae, PPR 286	Climber	Tilkor (N)	Fresh root extract (5–10 ml.) taken two times daily (before principal meals) for 3–4 weeks
Costus speciosus[b] (Koening) Sm., Costaceae, PPR 249	Herb	Betlouri (N); Ruyang (L)	Decoction of rhizome (10–20 ml) taken two to three times daily for 2–4 weeks
Ficus racemosa[f] (L.), Moraceae, DRC 127	Tree	Dumri (N)	Fruit juice (20–25 ml) taken two times daily (before meals) for 4–8 weeks
Girardiana heterophylla[b] Decne., Urticaceae, PPR 228	Shrub	Bhangre sisnu (N)	Root decoction (25–50 ml) taken two times daily for 4–8 weeks
Gynocardia odorata[a] R. Br., Flacourtiaceae, DRC 150	Tree	Gantay (N); Tukkung (L)	Fruit juice (10–15 ml) taken one time daily for 2 weeks
Ipomoea batatus[g] (L.) Lamk., Convolvulaceae, PPR 238	Herb	Sagarkhanda (N)	The juice of the aerial part of the plant (25–30 ml) taken two times daily for 3–4 weeks
Litsea cubeba[g] Pers., Lauraceae, GCS 344	Tree	Siltimmur (N)	One raw fruit chewed as masticatory two times daily for 4–6 weeks
Momordica chrantia[a] (L.), Cucurbitaceae, GCS 368	Climber	Karela (N)	Fruit extract (25 ml) taken two times daily for 12–14 weeks
Nardostachys jatamansi[a] DC., Valerianaceae, DRC 154	Herb	Jatamansi (N), Spanpos (T)	Decoction of rootstock (30–50 ml) taken once daily for 2–3 weeks
Oroxylum indicum[c] (L.) Vent., Bignoniaceae, DRC 134	Tree	Totola (N), Phagorip (L), Sonaka (T)	Stem bark decoction (15–20 ml) or juice (5–10 ml) taken two to three times daily
Paederia foetida[a] (L.), Rubiaceae, DRC 138	Climber	Birilahara (N), Takpoedrik (L)	Leaf infusion (50–60 ml) taken one time in the morning for 2–3 weeks
Panax pseudoginseng[d] Wall., Araliaceae, DRC 123	Herb	Panch patay (N)	Dried rhizome powder (0.5–1 g) taken one time daily with warm milk
Picrorhiza kurrooa[d] Royle ex Benth., Scrophulariaceae, DRC 189	Herb	Kutki (N), Putse sel (T)	Dry rhizome powder (0.5 g) taken with two tablespoon of curd and a pinch of pepper power one time daily for 1–2 weeks

Table 1 (*Continued*)

Botanical name family, voucher specimen no.	Habit	Local name: N-Nepali; L-Lepcha; T-Tibetan	Method of use and administration
1	2	3	4
Potentilla fulgens[c] Wall., Rosaceae, DRC 171	Herb	Banmula (N)	Decoction of root (20–25 ml) taken two times daily for 4–8 weeks
Quercus lanata[d] Sm., Fagaceae, PPR 248	Tree	Banj (N)	Decoction of stem bark (20–25 ml) taken one or two times daily for 2–3 weeks
Saraca asoca[e] (Roxb.) De Wilde, Caesalpiniaceae, GCS 334	Tree	Asok (N)	Infusion of the dry flower (50–100 ml) taken two times daily (before principal meals) for 4–5 weeks
Stephania glabra[b] (Roxb.) Miers, Menispermaceae, PPR 212	Climber	Tamarkay (N), Kanthey (L)	Root decoction (20–25 ml) taken with milk two to three times daily for 1–2 weeks
Swertia angustifolia[d] Buch.-Ham.ex D. Don., Gentianaceae, DRC 121	Herb	Patlay Chireto (N)	Infusion of whole plant (40–50 ml) taken two times daily (before principal meals for 3–4 weeks
Swertia chirayita[b] (Roxb. ex Flem.) Karst., Gentianaceae, DRC 187	Herb	Chireto (N), Rungkyon (L), Tagota (T)	Infusion of the whole plant (50–60 ml) taken one time daily in empty stomach for 2 weeks
Swertia pedicellata[b] Banerji, Gentianaceae, DRC 151	Herb	Chireto (N)	Decoction of shoot (20–25 ml) taken two times daily (before meals) for 4–6 weeks
Syzygium cuminii[e] (L.) Skeels, Myrtaceae, PPR 209	Tree	Kyamuna (N), Dzambu (T)	Decoction of stem bark (25–30 ml) taken three times daily for 2–3 weeks
Trigonella foenum-graecum[a] (L.), Fabaceae, PPR 243	Herb	Methi (N)	Sprouted seeds mixed with chilly, salt and garlic and ground into a paste. 5–10 g of the paste taken with two principal meals daily
Urtica dioica[a] (L.), Urticaceae, DRC 163	Herb	Sisnu (N), Sarong (L)	Decoction of young leaves and shoots (50–100 ml) taken as curry one or two times daily with meals for 4–8 weeks
Zingiber officinale[a] Rosc., Zingiberaceae, DRC 162	Herb	Adua (N), Heng (L), Beasga (T)	Decoction of rhizome (25–50 ml) taken as herbal tea with a pinch of salt two to three times daily for 8–12 weeks

[a] Kirtikar and Basu (1998).
[b] Das and Mandal (2003).
[c] Kumar (2002).
[d] Polunin and Stainton (1984).
[e] Jain (1994).
[f] Chatterjee and Pakrashi (1991).
[g] Gurung (2002).

organizations of each group was taken for approaching and building up of rapport with the traditional healers of each community. Preliminary identification of collected plant materials, their local names and information regarding their mode of use were recorded with the help of these traditional medicine practitioners and village elders. Information obtained and cross checked with at least seven different informants only has been incorporated here. Subsequently, the collected plants were identified at the Panchavati Greentech Research Society, Darjeeling, and the voucher herbarium specimens were deposited in the herbarium of the Medicinal Plants Division, Panchavati Greentech Research Society, Darjeeling, India.

In the enumeration, data on the plants used as hypoglycemic agents are presented which consist of the botanical name, family, voucher specimen number, habit, local name in Nepali (N), Lepcha (L) and Tibetan (T) (wherever available) followed by the method of use and administration (Table 1). References used for identification have been mentioned as superscript letters against the name of each plant. The present study reports the use of medicinal plants in the form of infusion or decoction (by soaking in hot water or boiling), extract or juice (by crushing the fresh plant parts with or without water) and paste or powder (by grinding the fresh or dried plant parts).

3. Results and discussion

In the present study, it was found that a total of 37 species of plant belonging to 28 different families are utilized as antidiabetic agents by the tribal people Sikkim and Darjeeling Himalayan region. Of these, 30 species of plants (81%) have not been reported as hypoglycemic agents in the Dictionary of Indian Folk Medicine and Ethnobotany (Jain, 1991). This emboldens us to conclude that herbal medicine is still the dominant medicine for diabetes in this area.

The efficacy of these ethnomedicinal plants needs to be subjected to pharmacological validation. Some antidiabetic plants may exert their action by stimulating the function or number of β-cells and thus increasing insulin release (Persaud et al., 1999). In some other plants, the effect is due to decreased blood glucose synthesis due to the decrease of the activity of enzymes like glucose-6-phosphatase, fructose

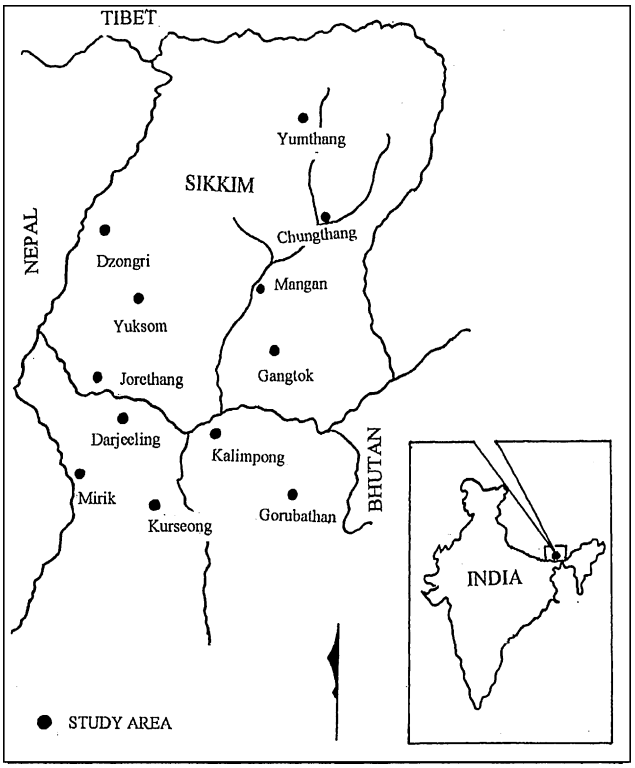

Fig. 1. Map of Sikkim and Darjeeling Himalayas showing the study area.

1,6-bisphosphatase, etc. In still other plants, the activity is due to slow absorption of carbohydrate and inhibition of glucose transport (Madar, 1984). However, these products may interact with the conventional diabetes medicines (Shane-McWhorter, 2001). Therefore, a cautious approach should be adopted before administering these drugs. Of course, this primary information is important in view that it may lead to serious pharmacological research and can provide great value in selecting plant material for drug discovery (Lewis et al., 2004).

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