

Herbal Medicines Used for the Treatment of Diabetes Mellitus in Paonta Sahib Tehsil of District Sirmour, Himachal Pradesh (India)

Abstract : Diabetes is a chronic condition that affects mankind throughout the world. In the present study, an ethnobotanical survey was carried out and 24 plant species belonging to 21 families were reported to treat diabetes in Paonta Sahib Tehsil of District Sirmour, Himachal Pradesh (India). Most of the plant species used were trees (41%), followed by herbs (33%), shrubs (13%) and climber (13%). The medicinal preparations include powder, decoction, juice, etc. The present study explores the traditional medicinal plants wealth used by the local inhabitants of the study area against diabetes.

Key words: Herbal Medicines, Diabetes Mellitus, Ethnobotany, Indigenous Societies, Paonta Sahib

Diabetes mellitus is a common and very prevalent disease affecting the citizens of both developed and developing countries. It occurs when the pancreas does not produce enough insulin (Type 1) or alternatively, when the body cannot effectively use the insulin it produces (Type 2). It is caused by the abnormality of carbohydrate metabolism which is linked to absolute deficiency of insulin. It is estimated that 25% of the world population is affected by this disease (Arumugam *et al.*, 2013)¹. The number of people with diabetes is increasing due to population growth, ageing, urbanization, and increasing prevalence of obesity and physical inactivity. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030 (Wild *et al.*, 2004)². According to 2016 data of WHO, it is estimated that 422 million people are presently suffering with diabetes mellitus worldwide (World Health Organization, Global Report on Diabetes, Geneva, 2016). According to International Diabetes Federation, the number of people suffering from Diabetes Mellitus was 381 million worldwide by the year 2013, and the figure will be almost double by the year 2030. There are lots of chemical components available to control and treat diabetic patients, but total recovery from diabetes may not be possible. Conventional drugs treat diabetes by improving insulin sensitivity, increasing insulin production and/or decreasing

the amount of glucose in blood. It has been predicted that by the year 2025, more than 75% of people with diabetes will reside in developing countries, as compared with 62% in 1995 (King *et al.*, 1998)³. A good number of synthetic commercial anti-diabetic drugs/agents like sulfonylureas, biguanides, glucosidase inhibitors and thiazolidiones are well known today which are not only expensive but also produce serious side effects. Most common side effect of drugs involves gastrointestinal system. Nearly any drug can cause nausea, upset stomach and trigger allergic reactions ranging from itching and rash all the way. Some drugs trigger side effects. Commonly used anti-allergic drug diphenhydramine (Benadryl) suppresses the activity of acetylcholine, that leads to drowsiness and dryness of mouth. When certain drugs are mixed with other things, their interaction causes side effects. For example, drinking alcohol with painkillers increases chances of accidental death. Generally, fever occurs in children after vaccination. In addition to adverse effects, drug treatments are not always satisfactory in maintaining normal level of blood glucose and avoiding late stage diabetic consequences.

Therefore, there has been a growing interest in the ethno-botanical approach to examine the anti-diabetic properties of plants traditionally used by the ethnic groups in different parts of the world (Mahbubur Rahman, 2015)⁴. Many medicinal plants have provided a potential source of anti-diabetic principles and are widely used for the treatment of diabetes in various traditional systems of medicine worldwide and many of them are known to be effective against diabetes.

Traditionally, indigenous societies worldwide are dependent largely on plants for their sustenance and livelihood. The harmony with nature is inherent in their culture and way of life of these societies. Considerable amount of knowledge on the traditional uses of plants is available with the indigenous people who are considered as the repository of accumulated experience and knowledge of indigenous flora and fauna (Jain, 2004)⁵. In fact, these societies are human conservatories which can't be duplicated by application of science and technology. "These groups of people are not to be pitied for primitive existence; they rather deserve to be honoured and respected for their richness of human existence in harmony with

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nature” (Chandra, 1990)⁶. Their number has been estimated to be around 250 million all over the globe. They constitute about 7.7 per cent of India’s population (Sinha, 1996)⁷, mostly located in Central and Peninsular region and in the northeast, with sporadic pockets in the northwestern plains, the Himalayas in the north and in the Andaman and Nicobar Islands in the extreme south. Indigenous knowledge is the main resource of the all ethnobotanical investigations and is generally called as Traditional Ethnobotanical Knowledge (TEK). The value and importance of TEK are now being increasingly acknowledged all over the world (Verma & Chauhan, 2007)⁸. As such, there exists no record of this knowledge, and its continuation is endangered due to the advent of modern civilization in tribal pockets and the tendency among younger generation to discard their traditional lifestyle. Therefore, documentation of the TEK through ethnobotanical studies among the diverse ethnic communities is important for the conservation and utilization of biological resources (Muthu *et al.*, 2006)⁹ and should be carried out before such rich heritages are lost for ever due to various anthropogenic and other natural causes (Kumbi, 2007)¹⁰; (Rao, 1996)¹¹.

Materials and Methods : Study Area : Paonta Sahib, a land adorned by lofty mountains, deep gorges, treacherous ravines, lush valleys and meadows, lies in Sirmour district of Himachal Pradesh (India) in outer Himalayas commonly known as Shivalik. The district shares its boundaries with Shimla in north-east, Solan in north-west, Haryana to its west and south-west, Uttar Pradesh to its south-east and Uttarakhand to its east. Tehsil Paonta Sahib is located between 30.43°N to 77.62° E at an altitude of 400 - 1,300 m at a distance of 45 km from its headquarter at Nahan. Yamuna river flows below the Yamuna bridge at Paonta Sahib. Giri and Bata are also the other rivers flowing through the Tehsil. The population is largely rural with 90% of it living in villages. On account of the traditional lifestyle

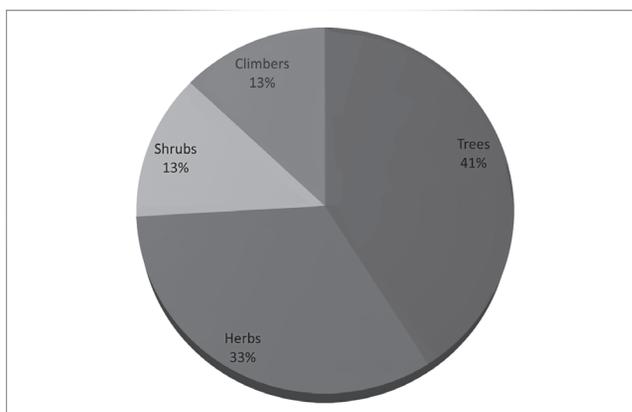


Fig. 1: Habit-wise distribution of plant species used for the treatment of Diabetes in study area

of the people, the region has a rich heritage of ethnobotanical, floral and cultural diversity.

Methodology : For documenting first hand information pertaining to ethnobotany of Tehsil Paonta Sahib, intensive and extensive ethnobotanical field surveys were undertaken in its various rural pockets in different seasons during the years 2013-2015. A questionnaire format was prepared in which local name of the plant, area from where it was collected, folk use and dosage of the plant against diabetes etc. are mentioned (Table 1). The field surveys were planned in such a way so as to collect the ethnobotanically interesting species either in flowering or fruiting stage. The desired information on ethnobotanical aspects was collected through interviews from knowledgeable people (traditional practitioners, old experienced farmers, family heads, housewives, eminent elderly persons of the community, etc.). The data thus collected were verified in different villages among the interviewers after showing the same plant sample and even with the same informants on different occasions. Ethnobotanical lore was considered valid if at least three informants made similar comments about the uses. The specimens were identified consulting with the experts, by comparing herbarium specimens and available literature from Himachal Pradesh University, Shimla and Forest Research Institute, Dehradun. The voucher specimens were deposited in the herbarium section of Botany Department at Ethnobotany and Biodiversity lab, Himachal Pradesh University, Shimla (H.P).

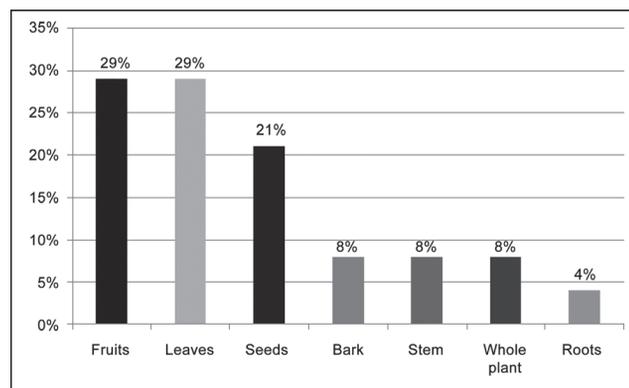


Fig. 2: Analysis of different plant parts used for curing Diabetes by the inhabitants of Tehsil Paonta Sahib, District Sirmour, H.P.

Results and Discussion : During present investigation, 24 species belonging to 21 families were recorded to be useful for the treatment of diabetes (Table 1). Among these, 12 species are growing wild whereas the remaining 12 are cultivated. Trees were dominating with 41% species as compared to herbs (33%), shrubs and climbers (13% each) (Figure 1). Various methods of preparation of these herbal

remedies have been recorded. Powder of 42% species (*Berberis asiatica*, *Madhuca indica*, *Platyclusus orientalis*, *Schleichera oleosa*, *Syzygium cumini*), followed by decoction of 21% species (*Abroma augusta*, *Asclepias curassavica*, *Lagerstroemia speciosa*, *Senna sulfurea*, *Tinospora cordifolia*), juice of 13% species (*Momordica charantia*, *Pyrus communis*) were practised by the inhabitants. Moreover, 13% species were chewed (*Aegle marmelos*, *Catharanthus roseus*, *Marsdenia sylvestris*), 8%

were consumed as such (*Cordia dichotoma*, *Psidium guajava*) and 4% used as leaf extract (*Stevia rebaudiana*) to manage the diabetes. Different plant parts such as Fruits (*Bixa orellana*, *Cordia dichotoma*, *Lagerstroemia speciosa*, *Momordica charantia*, *Psidium guajava*), Leaves (*Abroma augusta*, *Aegle marmelos*, *Aloe vera*, *Catharanthus roseus*, *Marsdenia sylvestris*, *Pyrus communis*), Seeds (*Linum usitatissimum*, *Platyclusus orientalis*, *Schleichera oleosa*, *Syzygium cumini*), Bark (*Madhuca indica*, *Senna sulfurea*),

TABLE I: Anti-diabetic Medicinal Plants of Tehsil Paonta Sahib, District Sirmour, H.P.

Botanical Name/ Common Name/ Family	Part Used : Method of Use
<i>Abroma augusta</i> (L.) L.f. / Ulatkambal / Sterculiaceae	Leaves (stalks) : 10-20 ml decoction of 2-3 stalks of fresh leaves taken in the morning for three months.
<i>Aegle marmelos</i> (L.) Correa ex Roxb. / Bael / Rutaceae	Leaves : Fresh leaves chewed.
<i>Aloe vera</i> L. / Gwarpatha / Aloaceae	Leaves (pulp) : 10-15 ml of leaf pulp consumed once daily for three months.
<i>Asclepias curassavica</i> L. / Kaktundi / Asclepiadaceae	Whole plant : 20 ml decoction of the plant Prescribed twice a day for three months.
<i>Berberis asiatica</i> Roxb. ex DC. / Kashmal / Berberidaceae	Stem, Root : 1 tsp of powdered lower portion of stem and root taken with lukewarm water in the morning for 40 days.
<i>Bixa orellana</i> L. / Sindoori / Bixaceae	Fruits : 1 tsp of fruit powder recommended with milk or water twice a day for three months.
<i>Catharanthus roseus</i> G. Don / Sadabahar / Apocynaceae	Leaves : 4-5 leaves of white variety chewed on empty stomach daily in the morning for 2-3 months
<i>Cordia dichotoma</i> G.Forst. / Lasura / Boraginaceae	Fruits : 4-5 of its ripe fruits consumed daily for 10-15 days.
<i>Dicliptera paniculata</i> (Forssk.) I.Darbysh / Kakjangha / Acanthaceae	Whole Plant : 1 tsp powdered plant consumed on empty stomach in morning with warm water for 2-3 months.
<i>Lagerstroemia speciosa</i> (L.) Pers. / Jarool / Lythraceae	Fruits, Leaves : 25-30 ml decoction of dried fruits and/or leaves taken in morning.
<i>Linum usitatissimum</i> (L.) / Alsi / Linaceae	Seeds : Chapattis prepared by mixing its grounded seeds with wheat flour.
<i>Madhuca indica</i> J.F.Macbr. / Mahua / Sapotaceae	Bark : ½ tsp powdered bark given with milk once daily for 3 months.
<i>Momordica charantia</i> L. / Karela / Cucurbitaceae	Fruits : 3-4 tsp of fruit juice taken on empty stomach.
<i>Platyclusus orientalis</i> (L.) Franco / Saru, Morpankhi / Cupressaceae	Seeds : ½ tsp powdered seeds prescribed twice a day with water for two months.
<i>Pyrus communis</i> L. / Nashpati / Rosaceae	Fruits : Consumed as such or crushed to produce juice or canned; considered astringent and laxative in nature.
<i>Schleichera oleosa</i> Merr. / Kusam / Sapindaceae	Seeds : 5g powder given once a day for three months.
<i>Senna sulfurea</i> (DC. ex Collad.) H.S. Irwin & Barneby / Cassia / Fabaceae	Bark : 20-30 ml decoction of bark prescribed on empty stomach.
<i>Sorghum bicolor</i> (L.) Moench / Jowar / Poaceae	Grains : Powdered grains eaten like wheat flour.
<i>Stevia rebaudiana</i> (Bertoni) Bertoni / Madhupatri / Asteraceae	Leaves : Extract used as tea sweetener.
<i>Syzygium cumini</i> (L.) Skeels / Jamun / Myrtaceae	Seeds : 1 tsp of powdered seeds taken on empty stomach in the morning with lukewarm water for three months .
<i>Psidium guajava</i> (L.) Skeels / Amrud / Myrtaceae	Fruits : Consumed as such.
<i>Trigonella foenum-graecum</i> L. , / Methi / Fabaceae	Seeds : 1 tsp powder taken on empty stomach with lukewarm water.
<i>Tinospora cordifolia</i> Miers. / Giloy / Menispermaceae	Stem : 20-30 ml decoction prescribed on empty stomach for 3-4 months.

Stem (*Berberis asiatica*, *Tinospora cordifolia*), Whole plant (*Asclepias curassavica*) and Roots (*Berberis asiatica*) were used for the preparation of traditional medicines.

Of course, Combination of herbal drugs are used by traditional practitioners for curing various diseases. For example, 2-3g powdered bark of *Syzygium cumini* in combination with a pinch of ginger powder and pinch of black pepper powder consumed with milk for throat disorders, fever and allaying thirst. Bark and tender twigs of *Syzygium cumini* are also chewed for curing mouth ulcers. On the other hand, a single plant is also used for curing different diseases such as *Aegle marmelos* (2-3 spoons pulp of fruits prescribed to check dysentery), *Aloe vera* (leaf pulp is also applied for allergies), *Berberis asiatica* (decoction of the plant is used as eye drops for allergy), *Catharanthus roseus* (chewing two leaves of pink variety daily in the morning on empty stomach for 40 days is useful against high blood pressure), *Cordia dichotoma* (4-5 of its ripe fruits consumed daily for 10-15 days useful for arthritic pain), *Madhuca longifolia* (½ tsp powdered bark given with milk once daily for 3 months to check diabetes and high blood pressure), *Scleichera oleosa* (paste of the plant applied against headache) and *Trigonella foenum-graecum* (1tsp powder of seeds taken on empty stomach with lukewarm water also good for flatulence, stomach pain and rheumatism).

Conclusion : Traditionally used medicinal plants have been a source of relief in controlling different types of diseases throughout the globe. It is evident from the present investigation that the inhabitants of the study area have a self-sufficient and self-reliant subsistence system which is agro-forestry based and offers the most significant evidence that how wonderfully they maintain a balanced ecological rhythm in the region. The use of ethnic medicinal plants by the local communities of Tehsil Paonta Sahib plays a very important role for the cure of diabetes in the region. The potential value of their traditional herbal practices for curing this disease needs to be popularized in the local, national and international markets. Moreover, due to the prevalence of diabetes and the number of people affected by this disease, a global effort is necessary for effective planning and allocation of resources to discover the

traditional knowledge based antidiabetic drugs with low costs and less side effects. □

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