



### Review Article

## SOME LESS KNOWN ANTI-DIABETIC MEDICINAL PLANTS-AN EXPLORATION OF TRADITIONAL LORE AND EXPERIMENTS

Rinky Thakur<sup>1</sup>, Gopal C. Nanda<sup>2\*</sup>

<sup>1</sup>Research Officer, <sup>2</sup>Assistant Director and In-charge (Scientist-IV), Dr. AL Research Centre for Ayurveda (CCRAS), M/O AYUSH, GOI, Chennai, Tamil Nadu, India.

**KEYWORDS:** Anti-diabetic, plant drugs, Ayurveda, Traditional Lore.

### ABSTRACT

The fast growing Diabetes health problem is at risk to about 422 million estimated people in world scenario. As the people suffering from diabetes since ages and no definite medicine could be able to control the disease safely except insulin as a hope for sustaining life. Several herbal drugs are in practice for limited preventive and curative aspect. Ayurveda emphasize on the preventive aspects and provides managerial approach through lifestyle intervention since inception. Herbal products have always played vital role in drug research in every sphere. Several medicinal plants are being used in different way either by traditional healers or by practitioners in India and Abroad on the basis of known anti-diabetic activities but, so many other plants are there which are either used by traditional physicians which are not tested in the clinical laboratory and sometimes several medicinal plants have been tested as Anti-diabetic in R&D study but not known/less known to practitioners. In this paper attempts have been made to identify those medicinal plants with R&D experimental study but are less known to practitioners. Moreover such medicinal plants were also verified in classical references for anti-diabetic effect if any. The present paper deals with the comparison of classical references with modern R&D as far as possible. Review was focused on such limited number of medicinal plants which are commonly not known is having hypoglycemic effect. Observation was also noted through several experimental studies done by the scientists earlier which signifies the merit of study. Such herbal study models are attributed here to provide newer initiatives in future and it can also focus for better solution in the field of diabetes control.

### \*Address for correspondence

**Dr.G.C Nanda**

Assistant Director and In-charge [Scientist-IV], Regional Ayurveda Dr.AL Research Centre for Ayurveda (CCRAS), Chennai, Tamil Nadu, India.

Email: [vdgnanda@gmail.com](mailto:vdgnanda@gmail.com)

Mob: 09415001345

### INTRODUCTION

It was known to Ayurveda since three thousand years as a disease with some persons whose urine was sweet enough to attract ants and flies. WHO predicts that diabetes will be the 7<sup>th</sup> leading cause of death in 2030 [1] According to an estimate of the World Health Organization (WHO), about 80% of the world population still uses herbs and other traditional medicines for fulfilling their primary health care needs. [2] Diabetes refers to a group of diseases that affects major systemic damage. Glucose is vital to health because it's an important source of energy for the cells that make up muscles and tissues. It is also brain's main source of fuel. Traditionally *Madhumeha* is equated with diabetes mellitus, as many similarities in causative factors, pathogenesis, signs and symptoms, classification, complication and also in treatment as compared with modern.

### MATERIALS AND METHOD

Five medicinal plants were identified as per the traditional claim and were verified for their anti-diabetic effect and compared with the information available in

Ayurvedic texts and in practice also. Efforts were taken to verify as per the prevailing claims by the traditional healers of Assam and Orissa through extensive survey and documentation. It was an effort in this paper to bring those collected materials to the scientific forum for further research in the field. There were five such plants identified on which the claims are documented like *Helicteres isora*, *Clerodendrum Serratum*, *Carissa Carandas*, *Cicer Arientinum* and *Barleria Prionitis*. The information so collected are enumerated here.

*Helicteres Isora*<sup>[3]</sup> which is otherwise called as *Avartani*, *Avartaphala* in Ayurveda. A woody shrub 2-3 m tall, young shoots stellate hairy, bark thin and strong. Leaves simple and bifarious, Flowers bisexual, bright red seeds numerous, angular, wrinkled. It is very important drug in Ayurveda and is being used in several ailments. Different parts of the plants are being used for various disease conditions as expectorant, demulcent, astringent, hemostatic and also useful in diabetes as per evidence available in specific areas. Though the plant is used for various purposes but it was found on survey that few

tribal people of Assam use this drug as preventive by using its tender leaves in the form of vegetable. Moreover the drug has been stated is having certain qualities principally like *Pramehanashini*.<sup>[4]</sup> However the use is very limited and less known because there is no emphasis on diabetes has been given whereas the modern study reveals its hypolipidemic, insulin-sensitizing activity.

For this purpose a test was done to find out the antidiabetic activity of the compounds from the methanolic extract of fruits of *Helicteres isora*.<sup>[5]</sup> Sanguinarine, berberine chloride (BC) and muscimol were found to be major compounds in the methanolic fruits extract of *H. isora*. BC was isolated from methanolic fruit extract of *H. isora* by using HPLC and other compounds were commercially acquired. Diabetes was induced in rats by a single dose of intraperitoneal injection of streptozotocin (STZ). Sanguinarine (50mg/kg b. w), (BC) (500mg/kg b. w) and muscimol (50mg/kg b. w) were evaluated by Oral Glucose Tolerance Test in normal and STZ induced diabetic rats. Among the three compounds, BC possesses promising antidiabetic activity against STZ induced diabetic rats. Hence, this result clearly demonstrates that *H. isora* fruits showed antidiabetic activity due to the presence of BC in its fruits. Further it has been suggested that more extensive studies need to be carried out to identify the mechanism of action and the long term effects of BC, extracted from *H. isora* fruits, on mammalian diabetic models.

Similarly in a study it was found that the effect of administering different extract of *Helicteres isora* L. roots on blood glucose level in normal and alloxan-induced diabetic rats was evaluated. Among five fractions, the butane; fraction at a dose of 250mg/kg showed maximum antihyperglycemic activity.<sup>[6]</sup>

Also in an another study the hypoglycemic effect of aqueous extract of the bark of *Helicteres isora* L. was investigated in normal, glucose load conditions and streptozotocin induced diabetic rats. The results suggested that the aqueous extract of bark of *Helicteres isora* L. possesses a potential hypoglycaemic effect in diabetic rats.<sup>[7]</sup>

***Clerodendrum serratum***<sup>[8]</sup> is otherwise called as *Bharangi*, *Bhargi* in Ayurveda. It is perennial herbs or shrubs, 0.9-2.4m high. Leaves sessile or ternate, passing upwards into bracts. Flowers blue purple or white, arranged in dichotomous cymes. The drug is extensively used in Ayurveda for various medical purposes. Some of its uses are important due to its anti-inflammatory, digestive, carminative, stomachic, anthelmintic like properties and advocated in skin diseases, leucoderma, fever etc. Apart from these qualities it is also a medicinal plant used for diabetes, hypertension and rheumatic pain by the tribes on Meghalaya, Arunachal Pradesh and Assam but is a popular folk remedy throughout north east India.<sup>[9]</sup> In traditional use its unripe fruits are given in form of vegetable to cure the diabetes. Sometimes the tribes of Assam use the juice of leaves taken at early morning in polyuria also on verification no such

preparation is being used by the practitioners of that locality to sustain the claim.

So far the study report is concerned it was found that in normal glucose-loaded and streptozotocin [STZ]-induced diabetic rats along with glucose utilization potential in rat hemi-diaphragm. Methanolic extract demonstrated maximum blood glucose lowering potential as compared to other extracts. The leaf of *C. Serratum* L. moon is endowed with blood sugar lowering potential in both normal and diabetic rats.<sup>[10]</sup>

The qualitative and quantitative phytochemical analysis of methanolic extract of CSR showed presence of phenolics, flavonoids, saponins and carbohydrates.<sup>[11,12]</sup>

***Carissa carandas***<sup>[13]</sup> is also known as *Karamardaka*, having long history of use in traditional system of medicine. It is used by the tribal healers of Assam and Orissa as antihyperglycemic along with the some other elements is also being used in diabetic ulcer, pruritus, scabies, stomach disorder, intestinal worms etc. But no scientific data is available to validate such folk-lore claim. However a search has been made to find out any experimental/clinical/R&D study made so far on the plant. During survey it was observed that the unripe fruits are collected by the tribal practitioners and made into powder and given in the dose of half tsf to one tsf (2.5gms to 5gms) for diabetes.

An effort was made to find out its antidiabetic effect. Out of the findings an observation was seen that a study was conducted by Gaurav Swami *et. al* 2010 in the dose 1000mg/kg of extract has shown both significant [ $p < 0.05$ ] hypoglycemic and anti-hyperglycemic effect in wistar rat.<sup>[14]</sup>

It is evident from an another experimental study indicating anti-diabetic activity of un-ripe fruit extract of *Carissa carandas* on alloxan induced diabetic rats done by Itankar. PR *et. al* in 2011.<sup>[15]</sup>

Moreover in an another study done by Ranbirsingh and Poonam Sharma in 2017 indicating the anti-diabetic effect of fruit extracts of *Carissa carandas* in healthy wister rats in which highest fall in fasting blood glucose was found.<sup>[16]</sup>

***Cicer arietinum***<sup>[17]</sup> is also known as *Chanaka* in Ayurveda. It has much branched annual herb, 30-60cm tall, branches spreading, hairy Leave pinnate 3-6cm long. Flowers axillary, solitary, pink, blue or white. It is also used in Ayurveda for various medicinal purposes apart from its medicinal effect on sprains, dislocated limbs, acid exudation, dyspepsia, constipation, leprosy, bronchitis, thirst and dysmenorrhea etc. Some traditional healers of Orissa especially phulbani of Orissa use it in diabetes and its raw fruits is also used frequently as appetizer, tonic and enhancing skin glow etc. The powder of dried *Chanaka* given empty stomach in morning for treating diabetes as a food supplement but practically no such preparation is found with information available by practitioners as a prescribed item. So far classical references are concerned it is also found evident from *Rajnighantu* having its role in *Prameha* which has been strongly recommended by the author, probably this

traditional system might have link with the classical books which are still in practice as per the observation done so. [18]

The same was also searched out in modern field to verify the anti-diabetic effect so far from available information. One such study reported that the seeds reduced postprandial plasma glucose and were useful in the treatment of diabetes. The antihyperglycaemic activity of petroleum ether extract of *Cicer arietinum* (PEECA) seeds was evaluated i. e. 100, 200 and 400 mg/kg po in alloxan (70 mg/kg iv) induced diabetic mice. Serum glucose level (SGL) was measured. During sub-acute study change in body weight was noticed. Oral glucose tolerance test (OGTT) was also performed in both diabetic and non-diabetic mice previously loaded with (2.5 g/kg po) glucose. Glyburide (10 mg/kg) was used as a standard drug. The maximum reduction in SGL was observed in PEECA (400mg/kg) group at 6h (137.17 mg/dl) in acute study and on 21st day (217.79mg/dl) in sub-acute study respectively. In glyburide treated mice the maximum reduction in SGL was observed at 6h (194.97 mg/dl) and on 21st day (267.40mg/dl) respectively. PEECA (400 mg/kg) and glyburide (10 mg/kg) prevented loss of body weight in diabetic mice. OGTT showed increase glucose threshold in non-diabetic and diabetic mice. Accordingly, PEECA showed anti-hyperglycemic activity comparable with glyburide. [19]

Modern research has found that the isoflavone fraction from chickpea has hypoglycemic activity demonstrating that the chickpea is a natural product with hypoglycemic activity. Further research has shown that although these components have hypoglycemic activity, their activity is not very high. In this study the series of derivatives were synthesized and their hypoglycemic activities were screened. The authors opine that this result may provide a basis for discovery of new hypoglycemic drugs and new drug delivery systems. Further biological evaluations and investigations into the mechanisms of action of generated active compounds are currently underway. [20]

***Barleria prionitis***<sup>[21]</sup> which is otherwise called as *Sahachara* in Ayurveda. Plant is a prickly under shrub, 60cm to 1.5m high. Leaves elliptic, acuminate at both ends, entire, spine tipped. Seeds compressed, ovate and clothed with silky adpressed hairs. Many medicinal uses are described in Ayurveda text some of important uses are whooping cough and wounds. The traditional healers use its leaves for treating diabetes in Assam. A search has been made to find out antidiabetic effect if any from the records of research carried out, it was found that the root and leaf possesses antidiabetic effect from the study done at L. B. S. College of pharmacy, Tilak Nagar, Jaipur, India.

The study shows antidiabetic activity of alcoholic extract of leaf and roots of *B. prionitis*. For this purpose albino rats were divided into six groups of six animals each. In three groups, diabetes was induced using alloxan monohydrate (150mg/kg b.w., i.p.) and all the rats were given different treatments consisting of vehicle, alcoholic extract of leaves, and alcoholic extract

roots of *B. prionitis* (200mg/kg) for 14days. The same treatment was given to the other three groups, comprising non-diabetic (normal) animals. Blood glucose level, glycosylated hemoglobin, liver glycogen, serum insulin body weight were estimated in normal and alloxan-induced diabetic rats, before and after administration of drugs. The study reveals that the alcoholic extract of *Barleria prionitis* could be added in the list of herbal preparation beneficial in diabetes mellitus and considered as an important addition to therapeutic armamentarium. Further studies can be undertaken at cellular and molecular level. [22]

In another study anti-diabetic activity of *Barleria prionitis* was evaluated using alloxin induced hyperglycemic rats and was found that high degree of antidiabetic activity in the alcoholic and aqueous extract of leaf and root of *B. prionitis*. [23]

## OBSERVATION AND DISCUSSION

A lot of medicinal plants are there which are being used for various remedial purposes either in one or in multiple. According to the concept of Ayurveda drug action is not limited to any single disease, may be it might have been identified by the Ayurvedic ancestors comparing to its qualities that with the disease concern. But sometimes the multifarious action of the drug is only possible depending upon various reasonable resources and Acharya *Charaka* specially mentioned that "*Parikshyakarino hi kushalabhavanti.*" Similarly several medicinal plants are unknown in general which have potential quality for diabetes and are being used by the traditional healers of different places of India. Medicinal plants so described there have been collected from various places of Assam and Orissa looking to their practice skill specially plants with anti-diabetic effect. In this paper attention has been given to look at those plants which are though less known having anti-diabetic activities, which have been easier to compare those traditional practice skill with this experimental study so done.

## CONCLUSION

Though diabetes is dreaded disease but it has the solution for preventive control if specific attention given in advance or early, because diabetes is a long term processed disease in the body, which takes maximum tissue and system of body to control resulting complications, having no cure. In Ayurveda the disease though taken as *Achikitsaya* or incurable but having some specific conditions apart from chronicity. However looking to the aetiopathogenesis the disease is preventable at its early stage provided the patient is diagnosed and for this purpose several herbal preparations have been advocated to have a check point and interestingly, it is the matter for great pleasure that the research in modern medical science is on the way to find out solution /prevention and managerial skill for diabetes through herbs and at present it is also encouraging that herbs are being explored accordingly. Ethno botanical information indicates that more than 800 plants are used as traditional remedies for the

treatment of diabetes due to their effectiveness less side-effect and low cost.

The data presented based on finding from different reports clearly tells that only few plants have shown the clear mechanism in in-vivo condition and other plants have shown only in-vitro conditions. Hence more work has to be carried out to find solution from management of diabetes by using the plant extract. The use and role of plant extracts or phytochemicals in diabetes management by possessing different mechanisms.

The present study is nothing but a way to pave new researchers for further study on humans to have a positive and better work out in future since diabetes is going to be epidemic in recent future as per the medical statistics is concerned, so the herbal research would come to the explorative condition, it can share to reduce the disease load of the society no doubt.

#### REFERENCES

- Mathers CD, Loncar, D. PLoS. Projections of global mortality and burden of disease from 2002 to 2030. PLOS/medicine. 2006, journal. pmed. 0030442.
- World Health Organization. WHO global report. Preventing chronic diseases. Avital investment. Geneva: World Health Organization. Available: [http://www.who.int/chp/chronic\\_disease\\_report/en/](http://www.who.int/chp/chronic_disease_report/en/). Accessed 30 August 2006.
- K. Billore, M. B. Yelne, T. J. Dennis, B. G. Chaudhari. Data base on medicinal plants in Ayurveda. Vol. -6. New Delhi. CCRAS;2004. p. 29-31.
- Indian medicinal plants Vol. -3. Hyderabad India;1995. p. 131.
- S. N. Belhekar, P. D. Chaudhari, J. S. Saryawanshi, K. K. Mali, R. B. Pandhare. Determination of antidiabetic compounds from *Helicteres isora* fruits by oral glucose tolerance. Journal of Applied Pharmaceutical Science. 2016; 6 [02]:p. 172-174.
- Sama Venkatesh, G. Dayanand Reddy, B. Madhava Reddy. Antihyperglycemic activity of *Helicteres isora* roots in Alloxan-Induced diabetic rats. Journal of pharmaceutical biology. 2008; 41[5]: p. 347-350.
- G. kumar, G. Sharmila Banu, A. G. Murugesan, M. Rajasekara Pandian. Hypoglycemic effect of *Helicteres isora* bark extract in rats. Journal of ethanopharmacology. 2006;Vol. 107[2]:p. 304-307.
- P. C. Sharma, M. B. Yelne, T. J. Dennis. Data base on medicinal plants in Ayurveda. Vol. -1. New Delhi CCRAS; 2000. p. 73-75.
- SinghJ, Bhuya TC, Ahmed A Ethan botanical studies on the mishing tribes of Assam with special reference to food and medicinal plant-1. JEcon-Taxon Bot. 12[1]:350-356.
- Mihir K Kar, Trupti R Swain, Sagar K Mishra. Antidiabetic activity of *clerodendrum serratum* (L.) moon leaves in streptozotocin-induced diabetic rats. Asian Journal of pharmaceutical and clinical research. 2014; 7[5].
- Vaishali D. Murade, Dinesh P. Hase, RupaliD. Murade, Sonali Dichayal, K. Deshmukh. Phytochemistry of *clerodendrum serratum* (L.) moon. International journal of phytopharmacology. 2015; 6[3].
- Niyati Sanjeev Acharya. Quality assessment and phytochemical analysis of *clerodendrum serratum* roots. International journal of phytopharmacy. 2016;6[3].
- P. C. Sharma, M. BYelne, T. J. Dennis. Data base on medicinal plants in Ayurveda. Vol. -3. New Delhi CCRAS; 2001. p. 369-371.
- Gaurav Sawmi, Navneet Nagpal, Sandeep Rahar, Singh Preeti, Amitporwal. Effect of aqueous leaves extract of *Carissa carandas* linn. on blood glucose levels of normoglycemic & alloxan induced. International Journal of Current Pharmaceutical Research. 2010; 2[3]:
- Itankar PR, Lokhande SJ, Verma PR, Arora SK, Sahu RA, Patil AT. Antidiabetic potential of unripe *Carissa carandas* Linn. fruitextract. Journal of Ethanopharmacology. 2011; 135[2]:430-3.
- Rambir Singh, Poonam Sharma. Antidiabetic effect of *Carissa carandas* in rats and the mechanism of its insulin secretagogues activity in isolated pancreatic islets. Journal of clinical and experimental pharmacology. 2017.
- P. C. Sharma, M. BYelne, T. J. Dennis. Database on medicinal plants in Ayurveda. Vol. -4. New Delhi CCRAS; 2002. p. 60-62.
- Indian medicinal plants. Vol. -2. Hyderabad India;1994. p. 72.
- AliEsmail Al-Snafi. The medical importance of *Cicerarietinum*. IOSR Journal Of Pharmacy. 2016; 6[3]:29-40.
- Ying Wei, Pengshou, Bo Li, JiaqiGao. Study of the hypoglycemic activity of derivative of isoflavones from *Cicerarietinum* L. Evidence based complementary and alternative medicine. 2017.
- P. C. Sharma, M. B. Yelne, T. J. Denni. Data base on medicinal plants in Ayurveda. Vol. -1. New Delhi CCRAS;2000. p. 378-380.
- Reemadheer and Pradeepbhatnagar. A study of the antidiabetic activity of *Barleriaprionitis* Linn. Indian J Pharmacol. 2010;42(2):70-73.
- M. Geetha, A. K Wahi. Antidiabetic activity of *Barleriaprionitis* Linn. Journal of natural remedies. 2001; 1[1]:64-66.

#### Cite this article as:

Rinky Thakur, Gopal C. Nanda. Some Less Known Anti-Diabetic Medicinal Plants-An Exploration of Traditional Lore and Experiments. AYUSHDHARA, 2016;3(5):868-871.

**Source of support: Nil, Conflict of interest: None Declared**