

# A Review Of Diabetes Mellitus And Herbs In Ayurveda

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**Abstract** : Sedentary life style and stress in today's life is the reason for development of disorder like diabetes mellitus. Diabetes mellitus is described in Ayurveda as Madhumeha/Kshaudrameha, which literally means excessive urine with sweet taste like honey. Acharya Madhava described the term Prameha, which parallels to as a set of symptoms which includes obesity, prediabetes, diabetes mellitus, and metabolic syndrome in modern medicine.. Ayurveda medicine is oriented toward prevention, health maintenance and treatment of diseases. There are large number of drugs of herbal and mineral origin mentioned in ayurveda texts, regarding the treatment of Madhumeha and prameha. The present review article was undertaken to explore the antidiabetic effects of these herbal medication

## Introduction

Sedentary life style and stressful mental conditions nowadays have called for many distressing diseases, foremost amongst them being Diabetes Mellitus – a perfect example for a lifestyle disorder. Diabetes mellitus (DM) in Ayurveda is referred to as *Madhumeha* or *Kshaudrameha*, which literally means excessive urine with sweet taste like honey. The number of people suffering from diabetes all over the world is increasing progressively. Amongst the twenty types of *Pramehas* described in Ayurveda, *Madhumeha* caused by vitiation of *vata dosha* has many clinical similarities to the modern day Diabetes mellitus. *Madhumeha* consists of two words- 'madhu and meha' where 'madhu' denotes sweetness and 'meha' stands for urination. So, the disease in which the urine is having quality concordant with *madhu* (honey) in its colour, taste, smell and consistency called along with the pathognomonic features of *Prameha* (i.e. increased frequency and quantity of urine) is *Madhumeha*. On the other hand, the word "Diabetes mellitus" consists of two words - Diabetes and mellitus, diabetes word derived from Greek which means 'excessive discharge of urine' and word mellitus derived from Latin word *mellitus*, meaning 'mellite' (i.e.

sweetened with honey; honey-sweet). The Latin word comes from *mell*, which comes from *mel*, meaning "honey"; sweetness; pleasant thing. So, above descriptions shows that word *Madhumeha* and Diabetes mellitus have similar literal meanings. Thomas Willis (1675) added 'mellitus' to the word "diabetes" as a designation for the disease, when he observed that the urine of a diabetic had a sweet taste. The modern lifestyle trends over a few decades are heavily inclined towards a comfortable life style, with decreasing opportunities for physical exertion, prominence of processed foods in daily diet, irregular sleeping patterns, and a predominantly sedentary life, has lead to the emergence of various lifestyle disorders like obesity, diabetes mellitus, hypertension, cardiac diseases etc.

## Discussion

*Madhumeha* is discussed under twenty types of *Prameha* in Ayurvedic texts. The synonyms mentioned for diabetes in Ayurvedic texts are – *Madhumeha*, *Ojomeha*, *Kshaudrameha*. *Madhumeha* is one of the four types of *Vatika Prameha*. *Prameha roga* comprises of a number of diseases with various physical and chemical changes in urine. Acharya Madhava described term *Prameha* as "Prakarshena Prabhutam Prachuram Varam Varam Va Mehati Mutratyagam Karoti Yasmina Roge Sa Pramehah" (*Madhava Nidana*).<sup>(1)</sup> which means repeated (*Prakarsha*) excessive (*Prabhoota*) and turbid urination in terms of frequency, quantity etc. *Madhumeha* is included among the *astamaharoga* (eight major disorders) in *Charaka Samhita Indriyasthanas* which indicates the severity of the disease given by the *Acharyas*.<sup>(2)</sup> In the ancient times the disease was quite prevalent among the masses and was considered incurable. Then again, Diabetes mellitus, which is a syndrome of impaired carbohydrate, fat, and protein metabolism caused by either lack of insulin secretion or decreased sensitivity of the tissues to insulin. <sup>(3)</sup> It has been found to be the major cause for mortality and has been declared a pandemic by W.H.O. in the present day scenario. In the studies

available on diabetes care in Indian literature it is found that 50 to 60% of diabetic patients do not achieve the glycemic target of HbA1c below 7%.<sup>(4)</sup> According to Ayurveda like any other disease, the etiology of *madhumeha* is the result of *dosha* vitiation, particularly the *vata dosha*. The common etiology for all types of *Pramehas*, are all those factors which increase the quantity of *Kapha*. The responsible factors are the sedentary habits and increased consumption of sweets and fats in daily diet.<sup>(2)</sup> Thus, according to Ayurvedic texts, all *Pramehas* (urinary disorders including *madhumeha* or diabetes mellitus) initiate with the derangement of *Kapha dosha* that spreads throughout the body and mixes with *meda dhatu* (fat) that is similar in physical properties to *kapha dosha*. *Kapha* mixed with *meda* affects the urinary system, thereby interfering with normal urine excretion. Vitiating other *doshas* (e.g. *pitta*, *vata*), and other *sharirik dhatu* (body tissues) and fluids (*malas*) may also be involved in this blockade. *Acharya Charaka* while describing the prognosis of *Madhumeha*, described it to be a *kulaja vikara* (meaning a disease occurring due to some genetic defect and hence may be inherited) due to defect in the *beeja* (the sperm or the ovum).<sup>(2)</sup> *Sushruta* also mentioned the term “*sahaja*” in context of the genetic predisposition in the pathophysiology of the disease *Madhumeha*. The classical symptoms of untreated diabetes are loss of weight, polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger). Diabetes is a serious metabolic disorder with micro- and macrovascular complications that result in significant morbidity and mortality. Diabetes increases the risk of long-term complications. These typically develop after many years (10-20 years), but may be the first symptom in those who have otherwise not been diagnosed before that time. The major long-term complications of diabetes are diabetic retinopathy, nephropathy, neuropathy, cardiovascular disorders etc.

Throughout world various health systems have not been able to manage diabetes efficiently. In the management of diabetes, oral hypoglycaemic medications (e.g. metformin etc.), insulin and lifestyle management are followed. Lifestyle modifications are recommended to control diabetes which includes patient education, specific diet and controlled physical exercise with the goal of keeping both short-term and long-term blood glucose levels within controlled limits. The main emphasis in diabetes management lies on the use of medications for keeping blood sugar levels as close to normal (euglycemia) as possible, without causing hypoglycemia. The most common side effect of these includes weight gain, nausea, rash, or gas. Examples of more serious side effects are

micro and macroangiopathy, liver damage, or low blood sugar. In such a scenario, the ancient Ayurvedic principles of preventive (*Nidanparivarjan*) and purificative measures (*Shodhan Chikitsa*) with due consideration of appropriate single/polyherbal formulations (*aushadi*), diet (*pathya-apathya*) management have proved to be fruitful for better wellbeing in *Madhumeha* (Type-II diabetics) patients. With conventional (allopathy) therapies managing diabetes may not always be easy, but with Ayurveda management for *Madhumeha*, which is oriented toward prevention, health maintenance and treatment, one can stay healthy with benefits of a personalized treatment plan, diabetes-friendly diet, and lifestyle. In Ayurveda, plants are always an excellent source of drugs; in fact many of the presently available modern drugs were derived either directly or indirectly from them. There is large number of drugs made of herbal and mineral origin mentioned in ayurveda texts, which were advised for treatment of *Madhumeha*. Some plants preparations used as anti-diabetic medications show significant effect on lowering the blood sugar levels with minimal side effects. These drugs also improve general debility along with providing much needed antioxidant property in diabetics. The medicinal values of various plant parts have been studied by many scholars in the field of diabetic research in present era. Traditional antidiabetic plants may provide new oral hypoglycemic compounds for many rural populations in developing countries. A list of a few such medicinal plants with antidiabetic and related beneficial effects in *Madhumeha* is given below:

1. *Aegle marmelos*: The aqueous extract of *A. marmelos* leaves show significant reduction in blood glucose level and showed anti-oxidative activity on alloxan induced diabetic rats.<sup>(5, 6)</sup> Similar antidiabetic activity reports found in other trails where Fenugreek seeds (*Trigonella foenumgraceum* Linn.) and Bael leaves (*Aegle marmelos*, *Corr.*) individually and collectively used in non insulin dependent diabetes mellitus patients.<sup>(7)</sup>
2. *Allium cepa*: *Allium cepa* is also known to have antioxidant and hypolipidaemic activity. *A. cepa* aqueous extracts showed hypoglycaemic and hypolipidaemic activity in alloxan-induced diabetic experimental animals.<sup>(8, 9)</sup>
3. *Allium sativum*: Ethanolic extract of *Allium sativum* was investigated in normal and streptozotocin-induced diabetic rats and showed antidiabetic activity.<sup>(10, 11)</sup>
4. *Aloe vera*: The extracts of *Aloe vera* showed hypoglycaemic activity on

- hyperglycaemic rats.<sup>(12,13)</sup> *Aloe vera* gel and its isolated compounds showed hypoglycaemic activity on noninsulin dependent diabetes mellitus mice.<sup>(14)</sup>
5. *Andrographis paniculata*: Andrographolide, the primary active component of *A. paniculata* demonstrated both hypoglycaemic and beta cell protective effects in alloxan-induced diabetic mouse model.<sup>(15)</sup> Aqueous leaf extract of *Andrographis* reported antioxidant properties and also decreased the blood glucose levels in STZ-induced diabetic animals (rats).<sup>(16)</sup>
  6. *Annona squamosa*: *A. squamosa* aqueous extract supplementation during trail in experimental diabetic rats noticed useful in controlling the blood glucose level, improves the plasma insulin, lipid metabolism.<sup>(17)</sup>
  7. *Azadirachta indica*: Aqueous extract of neem leaf extract in streptozotocin induced models noticed good anti-hyperglycaemic potential in male albino rats of wistar strains.<sup>(18)</sup>
  8. *Boerhaavia diffusa*: The extract of *B.diffusa* leaves reported significant antidiabetic activity in streptozotocin-induced hyperglycemic model diabetic rats.<sup>(19, 20)</sup>
  9. *Brassica juncea*: The aqueous seed extract of *Brassica juncea* showed hypoglycemic activity in male albino rat.<sup>(21)</sup> The methanol extract of *Brassica juncea* leaves reported hypoglycemic activity in glucose-loaded mice.<sup>(22)</sup>
  10. *Calotropis gigantean*: The chloroform extract of *C.gigantea* flowers showed anti-hyperglycaemic potential in alloxan-induced hyperglycemia in rats.<sup>(23)</sup> Similarly, the chloroform extracts of *C.gigantea* leaves and flowers reported significant anti-diabetic activity in streptozotocin-induced diabetic rats.<sup>(24)</sup>
  11. *Calotropis procera*: The extracts of *C.procera* were investigated for anti-hyperglycemic effect on streptozotocin induced diabetic rats and results showed anti-hyperglycaemic potential.<sup>(25)</sup> The latex of *C.procera* significantly reduced blood glucose levels in alloxan-induced diabetic rats.<sup>(26)</sup>
  12. *Cassia fistula*: Ethyl acetate fraction of the bark of *Cassia fistula* exhibited significant anti-hyperglycaemic potential in alloxan induced diabetic rats as well as lowers lipid profile.<sup>(27)</sup> Similar results noticed in hexane extract of stem bark of *Cassia fistula* on streptozotocin diabetic rats.<sup>(28)</sup>
  13. *Cassia grandis*: The aqueous and ethanolic extracts of *C. grandis* showed significant antidiabetic activity in alloxan-induced diabetic rats.<sup>(29)</sup>
  14. *Cassia occidentalis*: The extract of *C. occidentalis* exhibited significant antidiabetic activity alloxan-induced diabetic rats.<sup>30</sup> Methanol fraction of *C.occidentalis* leaves also demonstrated antidiabetic activity against streptozotocin-induced diabetic rats.<sup>(31)</sup>
  15. *Cinnamomum tamala*: The extracts of *C.tamala* exhibited anti-hyperglycemic as well as antioxidant activities in streptozotocin-diabetic rats.<sup>(32)</sup>
  16. *Coccinia indica*: The ethanolic extract of *C. indica* leaves possessed significant hypoglycaemic, hypolipidemic and antioxidant effects in alloxan-induced model albino rats.<sup>(33)</sup>
  17. *Cynodon dactylon*: The aqueous extracts of *C.dactylon* demonstrated anti-diabetic activity against alloxan-induced diabetic rats.<sup>(34)</sup>
  18. *Dalbergia sissoo*: Ethanolic extract of *D.sissoo* bark possesses significant anti-diabetic activity in alloxan induced diabetic rats.<sup>(35)</sup>
  19. *Ferula asafoetida*: The extract of *Ferula asafoetida* noticed anti-diabetic activity in alloxan induced diabetic rats.<sup>(36)</sup>
  20. *Ficus bengalensis*: The aqueous extract of *Ficus bengalensis* exhibits significant antidiabetic activity in streptozotocin induced diabetic rats.<sup>(37)</sup> Hot water extract of *F.bengalensis* noticed beneficial effect in diabetes mellitus induced by alloxan in rabbits.<sup>(38)</sup>
  21. *Ficus glomerata*: The aqueous extract of *Ficus glomerata* stem bark possesses significant antidiabetic activity in streptozotocin induced diabetic rats.<sup>(39)</sup>
  22. *Ficus hispida*: The ethanol extract of *Ficus hispida* bark when studied in diabetic rats showed significant reduction of blood glucose level.<sup>(40)</sup>
  23. *Gymnema sylvestre*: The extract of leaves of *Gymnema sylvestre* noticed anti-diabetic activity in alloxan induced diabetic rats.<sup>(41, 42)</sup>
  24. *Hemidesmus indicus*: Aqueous extract of the roots of *Hemidesmus indicus* demonstrated anti-diabetic activity on streptozotocin induced diabetic rats.<sup>(43)</sup>
  25. *Madhuca longifolia*: The methanolic extract of *Madhuca longifolia* exhibited

- potential as anti-diabetic agent in streptozotocin induced diabetic rats. <sup>(44)</sup>
26. *Mimosa pudica*: The ethanolic extract of the leaves of *Mimosa pudica* showed significant anti-diabetic activity. <sup>(45)</sup>
27. *Mormodica charantia*: An aqueous extract of *M.charantia* showed in streptozotocin induced diabetic rats. <sup>(46)</sup> Similarly crude juice extract of *M.charantia* showed anti-diabetic activity in rats in other trail. <sup>(47)</sup>
28. *Nigella sativa*: The crude aqueous extract of *Nigella sativa* seeds on intestinal glucose absorption in vitro exhibited anti-diabetic activity. <sup>(48)</sup> The ethanol extract of *Nigella sativa* exhibited anti-diabetic activity in streptozotocin induced diabetic rats. <sup>(49)</sup>
29. *Ocimum sanctum*: *O.sanctum* leaves showed anti-diabetic activity in experimental models. <sup>(50,51)</sup>
30. *Oroxylum indicum*: The aqueous and ethanolic extract of roots of *O.indicum* was examined in alloxan and dexamethasone induced diabetic rats and showed significant decrease in plasma glucose levels. <sup>(52)</sup>
31. *Piper longum*: The ethanolic extract of dried fruits of *Piper longum* showed anti-hyperglycemic on alloxan induced diabetic rats. <sup>(53)</sup>
32. *Piper nigrum*: The aqueous extract of *Piper nigrum* seeds and *Vinca rosea* flowers evaluated in alloxan induced diabetic rats which showed antidiabetic activity. <sup>(54)</sup>
33. *Pongamia pinnata*: The ethanolic extract of *Pongamia pinnata* showed hypoglycemic activity on alloxan-induced animals. <sup>(55)</sup>
34. *Punica granatum*: Pomegranate aqueous extract when evaluated showed its antidiabetic potentials in alloxan induced diabetic rats. <sup>(56,57,58)</sup>
35. *Syzygium cumini*: Different extracts of *Syzygium cumini* possessed antidiabetic potentials against STZ-induced diabetic rats. <sup>(59,60)</sup>
36. *Tinospora cordifolia*: Various extracts of *Tinospora cordifolia* stem were noticed having potent anti-diabetic activity in streptozotocin induced diabetic rats. <sup>(61)</sup>
37. *Trigonella foenum-graecum*: Soluble dietary fibre fractions of *T. foenum-graecum* were evaluated which exhibited antidiabetic effects. <sup>(62)</sup> The aqueous extract of *Trigonella foenum-graecum* leaves possessed a hypoglycaemic effect in

normoglycaemic and alloxan induced hyperglycaemic rats. <sup>(63)</sup>

38. *Zingiber officinale*: Ginger (an underground rhizome of *Zingiber officinale*) produced a significant hypoglycemic effect in alloxan-induced diabetic rats. <sup>(64,65)</sup> Similarly ethanolic extract of *Zingiber officinale* showed anti-diabetic property in alloxan induced diabetic rats. <sup>(66)</sup> An aqueous extract of raw ginger was reported antidiabetic activities in streptozotocin induced diabetic rats. <sup>(67)</sup>

## Conclusion

Diabetes mellitus is a chronic metabolic disorder of impaired carbohydrates, fat and protein metabolism. Control of symptoms of DM without any side effects is a challenge still to the medical system. In recent years, Ayurveda herbs have become a subject of interest because of their beneficial effects on human health. Several plant extracts have been examined for their anti-diabetic properties in an attempt to recognize alternative treatment strategies that pose less of a hazard for diabetics. The present review article was undertaken to explore the anti-diabetic effects of various above mentioned herbs in experimental diabetes mellitus. There are many herbal remedies suggested for diabetes and diabetic complications.

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