



## A Review on Assessment of Antidiabetic Activity of *Arctium Minus* Leaves

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**ABSTRACT :** Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Diabetes mellitus is characterized by hyperglycemia that is induced by decreased cellular glucose uptake and metabolism. Hyperglycemia, or high blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves, kidney and blood vessels. Medicinal plants have shown to ameliorate diabetic conditions by acting as enteric carbohydrate hydrolyzing enzyme inhibitors, glucose uptake promoters, insulin sensitizers, insulin potentiating agents, anti-oxidants, gluconeogenesis inhibitors, anti-hypercholesteriomic agents etc. Medicinal plants and formulations comprising many medicinal plants are being promoted as anti-diabetic drugs in the drug market. Herbalism or "Herbal medicines" have a long history to cure several kinds of human diseases from the various parts of the plants such as leaf, stem, bark, root, etc. The World Health Organization (WHO) estimates that 80 percent of the population of some Asian and African countries presently uses herbal medicines for some aspect of primary health care. It was realized from the various reports that *Arctium minus*, belongs to the family Rubiaceae, have displayed plethoras of potential biological activities such as anticancer, hepatoprotective, anti-inflammatory, anti-fertility, anti-diabetic, anti-amoebic, antinociptive etc. from its various parts.

**Keywords:** Antidiabetic, Diabetes mellitus, Herbal medicines, *Arctium minus*

### Diabetes

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Diabetes mellitus is characterized by hyperglycemia that is induced by decreased cellular glucose uptake and metabolism. Hyperglycemia, or high blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves, kidney and blood vessels. Regulation of plasma glucose concentrations is essential to decrease the incidence and severity of long-term diabetic complications<sup>1</sup>. More than 100 million people worldwide (6% of the population) is affected by endocrine disorder. This number is likely to more than double by 2030. It is caused by deficiency or insufficient production of insulin by pancreas which results in both increase and decrease of glucose concentration in the blood. It is found to damage many of the body systems, especially the blood vessels and nerves<sup>2</sup>.

Medicinal plants have shown to ameliorate diabetic conditions by acting as enteric carbohydrate hydrolyzing enzyme inhibitors, glucose uptake promoters, insulin sensitizers, insulin potentiating agents, anti-oxidants, gluconeogenesis inhibitors, anti-hypercholesteriomic agents etc.<sup>3</sup>. Many medicinal plants with the promising potential are being

subjected to clinical studies for their complete validation as anti-diabetic agents or adjuncts<sup>4,5</sup>. Among the thousands of explored medicinal plants only a few are clinically validated in human subjects<sup>6</sup>. Medicinal plants such as *Gymnemasylvestre*, *Cinnamon cuminum*, *Allium sativum*, *Aloe vera*, *Artocarpusheterophyllus*, *MorusIndica*, *Asteracanthuslongifolia*, *Bauhinia forficata*, *Cocciniaindica*, *Ficuscarica*, *Ficusraecemosa*, *Panaxquinquefolius*, *Myrciauniflora*, *Ocimum sanctum*, *Opuntiastraptacantha*, *Trigonellafoenum*, *Asteracanthalongifolia* etc., have been tested for their anti-diabetic potency in human subjects<sup>7</sup>.

Medicinal plants and formulations comprising many medicinal plants are being promoted as anti-diabetic drugs in the drug market. Although there is an intense research on the development of herbal drugs, only a small fraction of medicinal plants have been explored and validated. In this context, there is scope for screening and development of unexplored medicinal plants as antidiabetic agents or as adjuvant. In-vitro and ex-vivo assays form a very crucial role in development of an anti-diabetic drug<sup>8</sup>. Enteric enzyme inhibition assays such as  $\alpha$ -amylase inhibition, sucrose inhibition and  $\alpha$ -glucosidase inhibition are widely used preliminary assays to screen the medicinal plants for anti-diabetic potential.

### Diabetes Mellitus (DM)

The Diabetes Mellitus is chronic metabolic disorder, which there are high blood sugar level over a prolonged period. The term "mellitus" or "from honey" was added by the Briton John Rolle in the late 1700s to separate the condition from diabetes insipidus, which is also associated with frequent urination<sup>9</sup>. It is a fast-growing global problem with huge social, health and economic consequences. It is estimated that in 2010 there were globally 285 million people (approximately 6.4% of the adult population) suffering from this disease. This number is estimated to increase to 430 million in the absence of better control or cure. An ageing population and obesity are two main reasons for the increase<sup>10</sup>. Furthermore it has been shown that almost 50% of the putative diabetics are not diagnosed until 10 years after onset of the disease, hence the real prevalence of global diabetes must be astronomically high.

This high blood sugar produces the symptoms of frequent urination, increased thirst, and increased hunger<sup>11</sup>. Untreated, diabetes can cause many complications. Acute complications include diabetic ketoacidosis and non ketotichyperosmolarcoma. Serious long-term complications include heart disease, stroke, kidney failure, foot ulcers and damage to the eyes.

Indian physicians around the same time identified the disease and classified it as Madhumeha or "honey urine", noting but the urine would attract ants. This is possibly due to the diet and life-style of the ancient people, or because the clinical symptoms were observed during the advanced stage of the disease. Galen named the disease "Diarrhea of the urine" (diarrhea urinosa)<sup>12</sup>. The earliest surviving work with a detailed reference to diabetes is that of Aretaeus of Cappadocia (2nd or early 3rd century CE). Type 1 and type 2 diabetes were identified as separate conditions for the first time by the Indian physicians Sushruta and Charaka in 400-500 CE with type 1 associated with youth and type 2 with being overweight. Effective treatment was not developed until the early part of the 20th century, when Canadians Frederick Banting and Charles Herbert Best isolated and purified insulin in 1921 and 1922. This was followed by the development of the long-acting insulin NPH in the 1940s<sup>13</sup>.

### Overview of the most significant symptoms of diabetes

The classic symptoms of untreated diabetes are weight loss, polyuria (frequent urination), polydipsia (increased thirst), and polyphagia (increased hunger). Symptoms may develop rapidly (weeks or months) in type 1 diabetes, while they usually develop much more slowly and may be subtle or absent in type 2 diabetes<sup>14</sup>.

Several other signs and symptoms can mark the onset of diabetes, although they are not specific to the disease. In addition to the known ones above, they include blurry vision, headache, fatigue, slow healing of cuts, and itchy skin. Prolonged high blood glucose can cause glucose absorption in the lens of the eye, which leads to changes in its shape, resulting in vision changes. A number of skin rashes that can occur in diabetes are collectively known as diabetic dermadromes.

### Diagnosis

Diabetes mellitus is characterized by recurrent or persistent hyperglycemia, and is diagnosed by demonstrating any one of the following:

- Fasting plasma glucose level  $\geq 7.0$  Mmol/l (126 mg/dl)
- Plasma glucose  $\geq 11.1$  Mmol/l (200 mg/dl) two hours after a 75 g oral glucose load as in a glucose tolerance test
- Symptoms of hyperglycemia and casual plasma glucose  $\geq 11.1$  Mmol/l (200 mg/dl)
- Glycated hemoglobin (Hb A1C)  $\geq 6.5\%$ .

A positive result, in the absence of unequivocal hyperglycemia, should be confirmed by a repeat of any of the above methods on a different day<sup>12</sup>. It is preferable to measure a fasting glucose level because of the ease of measurement and the considerable time commitment of formal glucose tolerance testing, which takes two hours to complete and offers no prognostic advantage over the fasting test. According to the current definition, two fasting glucose measurements above 126 mg/dl (7.0 Mmol/l) is considered diagnostic for diabetes mellitus<sup>16</sup>.

The World Health Organization people with fasting glucose levels from 6.1 to 6.9 Mmol/l (110 to 125 mg/dl) are considered to have impaired fasting glucose. People with plasma glucose at or above 7.8 Mmol/l (140 mg/dl), but not over 11.1 Mmol/l (200 mg/dl), two hours after a 75 g oral glucose load are considered to have impaired glucose tolerance. Of these two prediabetic states, the latter in particular is a major risk factor for progression to full-blown diabetes mellitus, as well as cardiovascular disease<sup>17</sup>. The American Diabetes Association since 2003 uses a slightly different range for impaired fasting glucose of 5.6 to 6.9 Mmol/l (100 to 125 mg/dl).

Glycated hemoglobin is better than fasting glucose for determining risks of cardiovascular disease and death from any cause.

The rare disease diabetes insipidus has similar symptoms to diabetes mellitus, but without disturbances in the sugar metabolism

(insipidus means "without taste" in Latin) and does not involve the same disease mechanisms.

WHO DIABETES DIAGNOSTIC CRITERIA			
Condition	2 hour glucose	Fasting glucose	HbA <sub>1c</sub>
Unit	Mmol/l(mg/dl)	Mmol/l(mg/dl)	%
Normal	<7.8 (<140)	<6.1 (<110)	<6.0
Impaired fasting glycaemia	<7.8 (<140)	$\geq 6.1(\geq 110)$ & <7.0(<126)	6.0–6.4
Impaired glucose tolerance	$\geq 7.8(\geq 140)$	<7.0 (<126)	6.0–6.4
Diabetes mellitus	$\geq 11.1(\geq 200)$	$\geq 7.0(\geq 126)$	$\geq 6.5$

### Prevention and Treatment

There is no known preventive measure for type 1 diabetes. Type 2 diabetes can often be prevented by a person being a normal body weight, physical exercise, and following a healthy diet<sup>29</sup>. Dietary changes known to be effective in helping to prevent diabetes include a diet rich in wholegrains and fiber, and choosing good fats, such as polyunsaturated fats found in nuts, vegetable oils, and fish. Limiting sugary beverages and eating less red meat and other sources of saturated fat can also help in the prevention of diabetes<sup>30</sup>. Active smoking is also associated with an increased risk of diabetes, so smoking cessation can be an important preventive measure as well.

Diabetes mellitus is a chronic disease, for which there is no known cure except in very specific situations. Management concentrates on keeping blood sugar levels as close to normal ("euglycemia") as possible, without causing hypoglycemia<sup>16</sup>. This can usually be accomplished with diet, exercise, and use of appropriate medications (insulin in the case of type 1 diabetes; oral medications, as well as possibly insulin, in type 2 diabetes).

Learning about the disease and actively participating in the treatment is vital for people with diabetes, since the complications of diabetes are far less common and less severe in people who have well-managed blood sugar levels<sup>17</sup>. The goal of treatment is an HbA1C level of 6.5%, but should not be lower than that, and may be set higher. Attention is also paid to other health problems that may accelerate the deleterious effects of diabetes. These include smoking, elevated cholesterol levels, obesity, high blood pressure, and lack of regular exercise. Specialized footwear is widely used to reduce the risk of ulceration, or re-ulceration, in at-risk diabetic feet.

### Lifestyle

People with diabetes can benefit from education about the disease and treatment, good nutrition to achieve a normal body weight, and sensible exercise, with the goal of keeping both short-term and long-term blood glucose levels within acceptable bounds. In addition, given the associated higher risks of cardiovascular disease, lifestyle modifications are recommended to control blood pressure<sup>18</sup>.

### Medications

Metformin is generally recommended as a first line treatment for type 2 diabetes, as there is good evidence that it decreases mortality. Routine use of aspirin, however, has not been found to improve outcomes in uncomplicated diabetes. Angiotensin converting enzyme inhibitors (ACEIs) improve outcomes in those with DM while the similar medications angiotensin receptor blockers (ARBs) do not.

Type 1 diabetes is typically treated with a combinations of regular and NPH insulin, or synthetic insulin analogs. When insulin is used in type 2 diabetes, a long-acting formulation is usually added initially, while continuing oral medications. Doses of insulin are then increased to effect<sup>29</sup>.

In those with diabetes some recommend blood pressure levels below 120/80 mmHg; however, evidence only supports less than or equal to somewhere between 140/90 mmHg to 160/100 mmHg.

### Pancreatic transplantation

A pancreas transplant is occasionally considered for people with type 1 diabetes who have severe complications of their disease, including end stage renal disease requiring kidney transplantation.

### Herbal drugs

Allopathic medicines are very costly. In contrast, herbal medicines are very cheap. This cost effectiveness makes them all the more alluring. Herbal medicines can be brought without prescription and they are available in all most all health stores. Some herbs can even be grown at home<sup>16</sup>. For certain ailments, herbal medicines are considered to be more effective than allopathic medicines.

Herbal medicines do not have any side effects, as they are free from chemicals. They are also milder than allopathic medicines. The natural detoxification process of the body is effectively enhanced by herbal medicines. They can be used to cleanse the colon, improve digestion and food absorption. Herbal medicines are also very good in boosting the immune system<sup>17</sup>.

Herbal medicines are very effective in curing various digestive disorders like colitis, indigestion, peptic ulcers, and irregular bowel movements. These types of medicines are best for people who are allergic to various types of drugs<sup>19</sup>. Herbal medicines are also effective in boosting the mental health. Most of the ailments related to blood circulation like high blood pressure, varicose ulcers, and many others can be controlled through herbal medicine. Some herbal medicines are very good in reducing the cholesterol level in the blood stream. They are also used to treat coronary artery diseases. Herbal medicine can be used to reduce weight by regulating appetite<sup>10</sup>.



**Whole plant of Arctium minus**

### **Arctium minus**

Herbalism or "Herbal medicines" have a long history to cure several kinds of human diseases from the various parts of the plants such as leaf, stem, bark, root, etc. The World Health Organization (WHO) estimates that 80 percent of the population of some Asian and African countries presently uses herbal medicines for some aspect of primary health care. It was realized from the various reports that Arctium minus, belongs to the family Rubiaceae, have displayed plethoras of potential biological activities such as anticancer, hepatoprotective, anti-inflammatory, anti-fertility, anti-diabetic, anti-amoebic, antinociptive etc. from its various parts

### **DISCUSSION AND CONCLUSION**

Arctium minus one of most traditionally using hypoglycemic drug among tribes in and scientifically reported but Arctium minus is not scientifically validated. This review reveals that the plant extract having better activity and less side effects, which will be work multifactorial anti diabetic mechanism. Allopathic medicines are very costly In contrast, herbal medicines are very cheap. This cost effectiveness makes them all the more alluring. The review provides scientific validation for the use of leaf against diabetes by revealing the chemical compounds may be present in the plant.

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