



# ANDROGRAPHIS PANICULATA Q FOR DIABETES MELLITUS IN HOMOEOPATHY

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## ABSTRACT :

Andrographis paniculata (A. paniculata) is an herbaceous plant has been effectively used in traditional Asian medicines for centuries. The demand for the herbal drug treatment of various ailments is increasing day by day and plant drugs from the Ayurvedic system are being explored more in India as well as globally.

The aerial part of the plant is used. It contains a large number of chemical components like diterpene, diterpenoid, glycosides, flavonoids as well as flavonoid glycosides. Andrographolide has been reported to have a wide range of biological activities, such as Anti-inflammatory, anti-allergic, anti-platelet aggregations, hepatoprotective and anti-HIV, Anti-diabetic.

A paniculata polysaccharides combined with andrographolide can be used in the recovery of diabetic nephropathy. In addition to these activities the ethanol and an aqueous extract of A. paniculata also decrease blood glucose levels .

Andrographolide, reacts with several inter and intracellular constituents like a bipolar compound hence ensuing in many biological responses. It Is also called Creat in English and is known as the “**king of bitters**”.

**Keywords:** Andrographis Paniculata, Medical uses, Chemical Compound, Constituents, Diabetes Mellitus, AGL, Phytochemistry, Pharmacology.



## ANDROGRAPHIS PANICULATA

**COMMON NAME :** Kalmegh

The creat (Eng) King of bitters

Hindi Name : Kalmegh

English Name: Kalmegh, creat

Latin Name : Andrographis Paniculata

Tamil Name : Siriyangai, Nilavembu<sup>[1]</sup>

**Origin :** Asia

**Alternative names**

**Indian Echinacea , Green Chireta**

**Part used :** Aerial plant

**First prover :** Dr P.P.Biswas **SCIENTIFIC CLASSIFICATION :**

**Kingdom:** Plantae      **Clade :** Eudicots      **Family :** Acanthaceae (Acanthus)

**Clade :** Tracheophytes      **Clade :** Asterids      **Genus :** Andrographis

**Clade:** Angiosperms      **Order :** Lamiales.      **Species :** Paniculata

## SYNONYMS :

- *Justicia paniculata*
- *Justicia latebrosa* Russell
- *Justicia paniculata*
- *Justicia stricta* <sup>[2]</sup>

**DESCRIPTION :**

The plant grows as an erect herb to a height of 30–110 cm (12–43 in) in moist, shady places. The slender stem is dark green, square in cross-section with longitudinal furrows and wings along the angles. The lance-shaped leaves have hairless blades measuring up to 8 cm long by 2.5 cm (0.98). The small flowers are pink, solitary, arranged in lax spreading racemes or panicles. The fruit is a capsule around 2 cm (0.79 in) long and a few millimeters wide.<sup>[3]</sup>

It contains many yellow-brown seeds. The seeds are subquadrate, rugose and glabrous. The flowering time is September to December.<sup>[4]</sup>

**MORPHOLOGICAL CHARACTERISTICS :**

It is an erect, annual herb and 30-90 cm tall with upper part of stem quadrangular while the lower part nearly rounded stem. Leaves are opposite sessile or subsessile, linear-lanceolate or lanceolate, 3-8 cm long, acute, glabrous or minutely puberulous beneath and base cuneate, margin slightly undulate.<sup>[5]</sup>

**CULTIVATION :**

The plant does best in a sunny location. The seeds are sown during May and Jun (northern hemisphere). The seedlings are transplanted at a distance of 60 cm (24 in) × 30 cm (12 in).<sup>[1]</sup>

**DISTRIBUTION :**

The species is distributed in tropical Asian countries, often in isolated patches. It can be found in a variety of habitats, such as plains, hillsides, coastlines, and disturbed and cultivated areas such as roadsides and farms. Native populations of *A. paniculata* are spread throughout south India and Sri Lanka which perhaps represent the center of origin and diversity of the species.

The herb is an introduced species in northern parts of India, Java, Malaysia, Indonesia, the West Indies, and elsewhere in the Americas. The species also occurs in the Philippines, Hong Kong, Thailand, Brunei, Singapore, and other parts of Asia where it may or may not be native. The plant is cultivated in many areas, as well.

Unlike other species of the genus, *A. paniculata* is of common occurrence in most places in India, including the plains and hilly areas up to 500 m (1,600 ft), which accounts for its wide use.

In India the major source of plant is procured from its wild habitat. The plant is categorised as Low Risk or of Least Concern by the IUCN. Under the trade name Kalmegh, on average 2,000–5,000 tonnes (2,200–5,500 tons) of the plant is traded in India.<sup>[7]</sup>

**CLIMATE AND SOIL :**

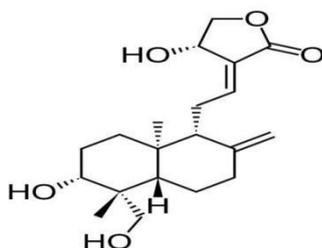
The plant comes up well in tropical and subtropical regions all over India. It is a hardy species, therefore, can be grown in medium fertile sandy loam to clay-loam soils, possibly with irrigation. It can withstand partial shade of trees, say few hours, but it is cultivated in open fields.<sup>[1]</sup>

**AGRO-TECHNIQUE :**

This crop is grown during cooler climate and it remains for 120 days in field; usually, ratoon crop is also taken all over north India. Cooler climate helps plants in synthesizing more bitter ingredients.<sup>[1]</sup>

**CONSTITUENTS :**

Andrographis paniculata contains: andrographolide, a diterpene lactone compound, is believed to be the principal active agent. Other possibly active constituents include neoandrographolide, andrographiside, 14-deoxy-11,12-didehydroandrographolide, deoxyandrographolide, and arabinoglycan proteins.<sup>[8]</sup>



**Figure : 1 CHEMICAL STRUCTURE OF ANDROGRAPHILIDE**

**TRADITIONAL USE:**

It is a beautiful herb that grows about a metre tall with purple and white flowers. The whole plant has a very bitter taste which is prized for its detoxifying effects. Earning it the nicknames, “King of Bitters” or “Bile of the Earth.” Both the fresh and dried leaves, and the fresh juice of the whole plant are used as medicine. <sup>(9)</sup>

Andrographis paniculata (Burn.f.) Nees plant originates from India, and has been used for several purposes, primarily preventing diabetes mellitus (DM).<sup>(10)</sup> Ethanolic extracts of this plant can decrease the blood glucose level in type 1 DM.<sup>(11)</sup>

The anti DM activity of Andrographis paniculata (Burn.f.) Nees has attracted many researchers to prove it scientifically and to investigate its mechanism of actions. Zhang and Tan have reported that the ethanolic extracts are potent to decrease the blood glucose levels in streptozotocin (STZ)-induced type 1 DM.<sup>(12)</sup>

In addition, the water-soluble extract shows antioxidant activity by increasing the activities of superoxide dismutase (SOD) and catalase in type 1 DM.<sup>(13)</sup> An in vitro study reported that the extract stimulates the release of insulin in Brin-BD11 cell culture.<sup>(14)</sup>

In phytochemical studies, Andrographis paniculata (Burm. F.) Nees (whole plant, leaf, and stem) contains diterpene lactones consisting of andrographolide, 14-deoxyandrographolide, neoandrographolide, andrographin, 14-acetylandrographolide, 14-deoxydidehydroandrographolide, and homoandrographolide, 19-o-acetylanhydrographolide. The plant also contains small amounts of flavonoids such as polymethoxyflavon, andrographins, panicholine, and apigenin.<sup>(15)</sup>

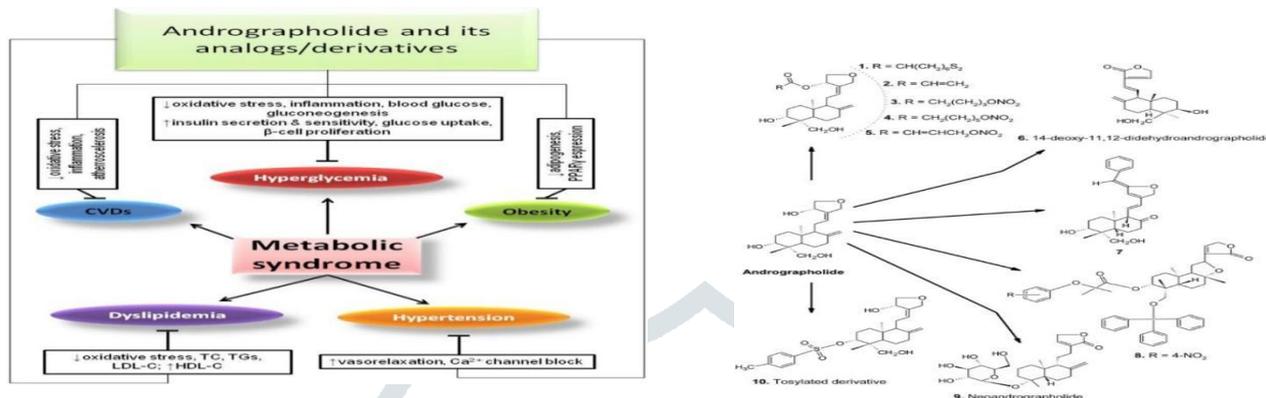
Among them, andrographolide is a major (>4%) and most active compound in a dried whole plant. Reportedly, andrographolide can decrease the blood glucose level in both normal and type 1 DM. The compound also increases the glucose utilization through the increase of mRNA and protein levels of GLUT-4, a transporter of glucose through the cell membrane.<sup>(16)</sup>

The compound can also stimulate insulin release and inhibit the absorption of glucose through inhibition of the enzyme alpha-glucosidase and alpha-amylase.<sup>(17)</sup>

Andrographolide can be isolated from the purified extract of Andrographis paniculata (Burm.f.) Nees using gradual extraction with petroleum ether, chloroform, and methanol, respectively, and then purified by

recrystallization. High dietary intake of fructose in combination with high fat aimed to stimulate insulin resistance and hyperlipidemia.<sup>(18)(19)</sup>

**Figure : 2** ( Chemical structures of AGL and its important derivatives acting against metabolic syndrome. )<sup>[20]</sup>



## DEFINITION

As per WHO, diabetes mellitus (DM) is defined as a heterogeneous metabolic disorder characterized by common feature of chronic hyperglycemia with disturbance of carbohydrate, fat and protein metabolism.<sup>[21]</sup>

## INCIDENCE:

It accounts for 88 to 95 percentages of all patients with diabetes mellitus. Usually beings as insulin resistance in the last decade, it has increasingly begun to affect children and adolescents, likely in connection with the increased prevalence of childhood obesity.

## CLASSIFICATION

According to WHO classification of Diabetes 2019, diabetes is classified into six types as

- Type 1 Diabetes Mellitus
- Type 2 Diabetes Mellitus
- Hybrid form of Diabetes Mellitus

### Other specific types

- Unclassified diabetes

## CLINICAL FEATURES

Common presenting symptoms of DM include

- POLYURIA
- POLYDIPSIA
- Weight loss
- Fatigue

- Weakness, blurred vision, frequent infection.

Only half of patients present with the classic symptoms of thirst, polydipsia, polyuria and tiredness, hyperglycemia.<sup>[23]</sup>

### DIAGNOSTIC CRITERIA FOR DIABETES:

Widespread use of the Fasting Plasma Glucose or the A1C as a screening test for type 2 DM is recommended. [24]

Diagnosis of DM is based on values of plasma glucose or glycated haemoglobin (HbA1c). [25]

MEASUREMENT	DIAGNOSTIC CUT-OFF VALUE
Fasting venous or capillary Plasma glucose ( Overnight fast of 8-14 hours).	≥7.0 mmol/L (126 mg/dL)
2-hour Post meal venous plasma glucose	≥11.1 mmol/L (200 mg/dL)
Random plasma glucose	≥11.1 mmol/L (200 mg/dL)
HbA1c	6.5% (48 mmol/mol)

### COMPLICATIONS :

#### ACUTE COMPLICATIONS:

- Diabetic ketoacidosis
- DKA may be the initial symptom complex that leads to the diagnosis of type.
- Hyperglycemic hyperosmolar state (HHS).

The prototypical patient with HHS is an elderly individual with type 2 DM, With a Several-week history of polyuria, weight loss, and diminished oral intake that culminates in mental confusion, lethargy and coma.<sup>(26)</sup>

#### CHRONIC COMPLICATIONS:

- Micro vascular complications
- Vascular complications

**OTHER COMPLICATIONS:**

- Gastrointestinal
- Genitourinary
- Dermatologic
- Infection
- Cataract
- Glaucoma
- Periodontal disease
- Hearing loss.<sup>[27]</sup>
  - Hyperglycemia first detected during pregnancy<sup>[22]</sup>

**CONCLUSION :**

This has resulted in many research studies with varied results and hence there is a need to summarize them together. This review acts as a ready reference for biological activities of Indian medicinal plants *Andrographis Paniculata* to the scientific community, in specific to researchers and students looking for sources of knowledge of medicinal plants and leads for new bioactive compounds. It is to be kept in mind that the reported activity may be shown by either the whole plant or a part of the plant or a particular extract or isolated compounds. Andrographolide which exhibits notable pharmacological activities has attracted the interest of numerous researchers. Because of its rational activity, numerous andrographolide derivatives have been synthesized for the development of biological activities. Significant anti-hyperglycemic activity in diabetic has been observed with both water and alcohol extracts. Highly significantly and better than metformin treatment (an extensively used antidiabetic drug). Both extracts increased activities of antioxidant. Better glucose utilization via up-regulation of GLUT483 and increased Insulin release has also been proposed as mechanisms for the anti-hyperglycemic effect.

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