

## Withania coagulans Dunal; A Promising Herb

Vidhi Bapna (Kumath)\*

Editor IJAPC

\* Department of Dravyaguna, J. S. Ayurved Mahavidhyalaya, Nadiad (Gujarat), India-387001

---

### Abstract

During last few years the graph of people suffering from diabetes is growing fast. The disease is very dangerous as it takes over the important vital organs of the body. All the medicinal systems globally are trying to fight the ailment. Role of medicinal plants in the treatment of diabetes can be very promising. Many medicinal plants have been scientifically proved to have hypoglycaemic effect. This paper discusses a lesser known medicinal plant 'Withania coagulans' which have anti diabetic potential.

### Keywords

Withania coagulans, Herb

---



**Greentree Group**

Received 10/1/15 Accepted 22/2/15 Published 10/3/15

## INTRODUCTION

*Withania coagulans* was a lesser known plant which has drawn attention in the recent times because of the presence of important phytoconstituents like Withanolides in it which have immense pharmacological activities. The plant has been used in Unani system of medicine since many years.

**Table 1: Various names of the plant<sup>1</sup>**

S.No.	Language	Name
1.	Arabian	Kaknaje hind
2.	Bengali	Ashvagandha
3.	English	Indian Rennet, Indian cheese maker
4.	Hindi	Akri ,Punir
5.	Kannada	Asvagandhi
6.	Latin	<i>Withania coagulans</i> Dunal
7.	Punjabi	Spin bajja, Panir, Panir band, akri
8.	Sanskrit	Hrshwa Ashvagandha <sup>2</sup>
9.	Tamil	Ammukkura
10	Telgu	Panneru-gadda

## HABIT

*Withania coagulans* Dunal belongs to family Solanaceae. *Withania* is a small genus of Shrubs. *Withania coagulans* is a rigid under shrub, 60-120 cm in height; ridge and furrows is present, slightly hairy

stem cylindrical, 0.5-0.16cm length, hair curved. Lamina oval to oblong, 1-6 cm length ,0.3-2.6 cm width, margin smooth, thick apex obtuse, more than one leaf arise from one point, base oblique, mid-rib wavy. Leaves have persistent greyish tomentum on both sides. Flowers in axillary cymose, having yellow colour 0.7-0.9 cm in length 0.4-0.5 cm width, oblong to lanceolate, pubescent ,sepals green, densely hairy ovate, completely adnate except tips. Petals 5, yellow margin serrulate, apex obtuse, 0.8-1.2 cm long, 0.3-0.4cm wide. Stamens 5, filament thin and straight, 0.4-0.5cm long. Ovary 2-loculed, anthers are elongated, 0.3-0.4 cm long, ribs prominent, rarely hairy. Berries globose , red or brownish, smooth, enclosed in leathery calyx. Seed glabrous, dark brown, oval to rounded, 41-59 in number, 0.1-0.3cm long, 0.2-0.3cm wide, dotted. Pulp brown in colour with fruity odour. Flowering occurs from November to April and fruiting from January to May.<sup>1</sup>

**HABITAT:** Common in Punjab, Sindh, Afganistan and Baluchistan<sup>3</sup>. Also been recorded from regions like Shimla, Garhwal and Kumaun.<sup>1</sup>

## CHEMICAL CONSTITUENTS

**Seed:** The seeds contain an enzyme or ferment which is similar to animal rennet.<sup>3</sup> Seeds on petroleum ether extraction yield fatty oil which contains oleic acid, linoleic acid, palmitic acid, stearic acid, and arachidic acid. The unsaponifiable matter consists of tricontaine, dihydrostigmasterol and  $\beta$ -sitosterol. The defatted meal from seeds contains free sugars- D-galactose, D-arabinose and maltose.<sup>1</sup>

**Fruits:** The Berries contain two esterases, free amino acids (proline, hydroxyproline, valine, tyrosine, aspartic acid, glycine, asparagines, cysteine and glutamic acid), essential oil and alkaloids.<sup>1</sup>

**Leaves:** The leaves contain chlorogenic acid and four steroidal lactones called withanolides- withaferin A (5,20 $\alpha$ (R)-dihydroxy-6 $\alpha$ , 7 $\alpha$ -epoxy-1-oxo-(5 $\alpha$ )-witha-2,24-dienolide ) and two minor withanolides.<sup>1</sup> Withanolides are a group of steroidal lactones found among members of Solanaceae. Withanolides are named after the name of the source plant Withania species. They are generally defined as C-28 steroidal lactones. The presence of a lactones ring with C-22 and C-26 oxygen

functions to form a six or five membered lactones ring on an Ergostane skeleton, intact ergostane or rearranged, constitutes the basic structure of all Withanolides. The Withanolides skeleton may be defined as 22-hydroxyergostane-26-oic acid-26, 22-olide. Modifications of either the carboxylic skeleton or of the side chains result in many novel structural variants of Withanolides which are described as modified Withanolides or ergostane-type steroids related to Withanolides (Cardenas et al., 1998).

**Root:** Presence of withanolide A is confirmed in Root also.<sup>4</sup>

## USES

**General:** Berries are used for coagulating milk which occurs due to the presence of an enzyme in berries resembling animal rennet. This concentrated enzyme can coagulate 90,000 parts of milk in half an hour, the cheese thus obtained has a good texture, flavour but a mild bitter taste which can be reduced by prolonging period of Ripening.

### Classical clinical uses:

In Unani medicine warm leaves are tied over oedema to reduce odema. Its root paste is

filled in wounds for wound healing. Fruit is used as an emetic, anti-inflammatory, diuretic, tonic and hepatoprotective. Dried Berries are used in tymphanitis, abdominal pain and other abdominal ailments.<sup>2</sup> Fruit is used in Asthama, biliousness, stangury. The seeds are emmenagogue, diuretic, useful in lumbago and Ophthalmia, suppose to lessen the inflammation of piles and causes liver troubles (Unani).<sup>5</sup>

The ripe fruits are supposed to possess anodyne or sedative properties. They are alterative, diuretic and believed to be useful in chronic liver complaints. They are used as an emetic. The dried fruits are employed in dyspepsia and flatulent colic and other intestinal affections. They are prescribed in infusions either alone or conjoined with the leaves and twigs of *Rhazya stricta*, an excellent bitter tonic. In Bombay the berries have reputation of blood purifier. Honiberger says that the bitter leaves are given as febrifuge by the luhanees. In Las bela, the fruit is pounded and used as a cure for colic. The wood is used for cleaning the teeth. In the ormera hills the smoke is applied to aching teeth to destroy the worm.<sup>5</sup>

## PHARMACOLOGICAL ACTIVITIES

**Anhelmintic activity:** Oil obtained by steam distillation of Petroleum ether extract of fruit was active against *Micrococcus pyogens* var. aureus and *Vibrio cholera* and also showed anthelmintic activity.<sup>1</sup>

**Antibacterial activity:** Alcoholic extract of fruit was active against *Micrococcus pyogens* var. aureus and *Vibrio cholera* and *Escherichia Coli*<sup>1</sup> Ethanolic extract of leaves and stem showed antibacterial activity.<sup>6</sup>

**Hepatoprotective activity:** 3 $\beta$ -hydroxy-2,3 dihydrowithanolide F, isolated from fruits showed significant hepatoprotective activity and anti-inflammatory activity equal to hydrocortisone.<sup>6</sup>

**Antifungal activity:** Ethanolic extract of fruit Showed antifungal activity against *Aspergillus niger* and *Penicillium Citrinum*.<sup>6</sup>

**Diuretic activity:** Aqueous extract of *Withania coagulans* was found to possess a demonstrable and potent diuretic potential.<sup>7</sup>

**Antioxidant Activity:** One Study showed that there are several phytochemical

constituents present in the methanol and aqueous extracts of *Withania coagulans*. The results confirmed the presence of alkaloids, glycosides, steroids, saponin and oils in both the extracts of the fruit of the plant. These phytochemical constituents are responsible for antioxidant activity of the plant.<sup>8</sup>

### **Hypoglycemic and Hypolipidaemic activity:**

Administration of aqueous extract of fruits of *Withania coagulans* Dunal significantly lowered the blood sugar, serum cholesterol, serum LPO, and hepatic LPO levels at the highest concentration of 1g/kg; p.o. in streptozotocin induced diabetic rats. In normal rats as well the blood sugar levels were significantly decreased following treatment with the above drug. *Withania coagulans* also exhibited free radical scavenging activity in an in vitro system using DPPH.<sup>9</sup> Hypolipidemic activity of Aqueous extract of *W.coagulans* Dunal was confirmed in Swiss albino mice.<sup>10</sup>

A study was done on effect of ethanolic extract of *Withania coagulans* fruits on normal and streptozotocin-induced diabetic models which observed the maximum reduction of 39.2% in fasting blood glucose at 4 h and 39.9% during oral glucose tolerance test at 2 h with the dose of

750 mg/kg in normal rats, whereas the reduction observed was 47.1 and 42.7% in blood glucose levels of sub- and mild diabetic rats, respectively, at 2 h during oral glucose tolerance test with the same dose. Long-term study of severely diabetic rats showed reduction of 48.5 and 52.6% in fasting blood glucose and postprandial glucose levels, respectively, after 30 days of treatment. In addition 75% decrease in urine sugar and 13.08% increase in body weight of treated group was found at the end of the experiment.<sup>11</sup>

One study defines the systematic evaluation and the role of minerals in glycemic potential of aqueous extract of *Withania coagulans* fruits in order to develop an effective and safe alternative treatment for diabetes mellitus. Laser Induced Breakdown Spectroscopy was used for glycemic element detection. The study was based on the results of lowering in blood glucose levels of normal, sub, mild and severely diabetic rats assessed during fasting blood glucose, glucose tolerance test and post prandial glucose studies. The dose of 1000mg/kg was identified as the most effective dose, which reduced the Fasting Blood Glucose level maximum by 33.2% at

4h in normal rats during fasting blood glucose studies. Glucose tolerance test studies of normal, sub and mild diabetic rats showed the maximum reduction of 15.7, 28.9 and 37.8% at 3h respectively. Long-term study in case of severely diabetic rats showed reduction of 52.9 and 54.1% in Fasting Blood Glucose and Post Prandial Glucose levels respectively after 30 days of treatment. The study, besides confirming hypoglycemic and antidiabetic activities of aqueous extract of *W. coagulans*, helps in identifying the role of trace minerals like Mg & Ca responsible for antidiabetic potential of this potent indigenous shrub.<sup>12</sup>

The Drugs *Withania coagulans* and *trigonella foenum* showed hypoglycaemic activity and significant improvement in signs and symptoms of Diabetes type 2 patients. In the study 60 patients who fulfilled the criteria of diabetes type 2 as per WHO were taken. Control group of 20 patients were given 1800 kcal diet while 40 patients of study group were given 1800kcal food and decant 150 ml water of 10 seeds of *Withania coagulans* and 6 gm powder of *Trigonella foenum* twice a day for 90 days. There was a significant improvement in signs and symptoms and significant

( $p < 0.05$ ) reduction in blood glucose level of patients of test group.<sup>13</sup>

In one study *withania coagulans* is considered as *Rishyagandha* which is mentioned in *Brihaniya Mahakashaya* of Charak Samhita, a well known text of Ayurved. Clinical evaluation of Fruit powder done in patients of Prameha (Type II Diabetes mellitus) and statically significant results were observed in subjective and objective parameters.<sup>14</sup>

**Antimutagenic activity:** The Antimutagenic activity of *Withania coagulans* fruit extracts was investigated on cyclophosphamide induced micronucleus formation in mouse bone marrow cells. The results suggested that the fruit extracts of the plants in dose-dependent manner showed antimutagenic behavior when compared to standard drug, cyclophosphamide. It had been observed that with the increase in concentration of plant extract viz. 500, 1000 and 1500 mg/kg, the formation of micronucleus in bone marrow cells gets decreased thus showing the protective effect of *Withania coagulans* fruit extract<sup>15</sup>.

*Withania coagulans* reduced the occurrence of oxidative stress and inflammation and

improves hyperglycemia streptozotocin-induced diabetic rats kidneys and serum<sup>16</sup>.

**CONCLUSION:** Withania coagulans Dunal is a promising herb with vivid pharmacological actions especially its hypoglycaemic activity is worth noting which should be further investigated through long term studies to formulate new drug for the deadly disease Diabetes.

## References

1. The Wealth of India; National Institute of Science Communication and Information Resources; CSIR, New Delhi; 1976; volume X, 580-81
2. Singh D.; Unani Dravyaguna; Ayurvedic and Unani Academy; 1<sup>st</sup> edition; 1974; part-2, 46
3. Nadkarni K.M.; Indian Materia Medica; Bombay Popular Prakashak; 3<sup>rd</sup> edition; 1982; volume 1, 1291
4. Phytochemical reference standards of selected medicinal plants volume 2: ICMR, 2012.
5. Kirtikar K. R. and Basu B.D.: Indian Medicinal Plants: Periodical Expert Book Agency; 2nd edition 1993; volume 1, 1777-78.
6. The Wealth of India First supplementary series; National Institute of Science Communication and Information Resources; CSIR; 2004; volume 5, 361-62.
7. Dabheliyaa Janak, Khan Shoeb ali, Joshipura Manan, Vasoya Manoj, Patel Sanjay, S. Vijaya; Diuretic potential of aqueous extract of fruits of Withania coagulans Dunal in experimental rats; International Journal of Pharmacy and Pharmaceutical Sciences; Vol 2, Issue 4, 51-53
8. Mathur Deepika, Agrawal R.C. and Shrivastava Vinoy; Phytochemical Screening and Determination of Antioxidant Potential of Fruits Extracts of Withania coagulans; Recent Research in Science and Technology 2011, 3(11), 26-29
9. Hemlatha S., Wahi A.K., Singh P.N. and Chaurasia, J.P.N.; Hypoglycemic activity of Withania coagulans Dunal in Streptozotocin induced diabetic rats; J. Ethnopharmacol, 2004; 93(2-3), 261-264
10. Hemlatha S., Wahi A.K., Singh P.N. and Chaurasia, J.P.N.; Hypolipidemic activity of

aqueous extract of *Withania coagulans* Dunal in albino rats, *Phytother Res*; 2006; 20(7), 614

11. Jaiswal Dolly, Rai prashant kumar, Watal Geeta ; Hypoglycemic and Antidiabetic effects of *withania coagulans* fruit ethanolic extract in normal and streptozotocin-induced diabetic rats; *Journal of food biochemistry*; 2010; 34(4) ,764–778.

12. JaiswaDolly I, Rai Prashant Kumar and Watal Geeta; Antidiabetic Effect Of *Withania Coagulans* in Experimental Rats; *Indian Journal of Clinical Biochemistry*; 2009 ; 24 (1) 88-93

13. Alam A., Siddiqui M.Y. and Hakim M.H; Clinical efficacy of *Withania coagulans* Dunal and *Trigonella foenum graecum* Linn in Type 2 Diabetes mellitus; *Indian Journal of Traditional know ledge*; 2009; 8 (3), 405-409.

14. Upadyaya B.N., Gupta Vandana; A clinical study on the effect of *Rishyagandha* (*Withania coagulans*) in the management of Prameha (Type II Diabetes mellitus); *AYU* ; 2011; 32(4), 507-511.

15. Mathur Deepika and Agrawal R. C.; Evaluation of in vivo antimutagenic

potential of fruits extracts of *Withania coagulans*; *Der Pharma Chemica*; 2011; 3 (4), 373-376.

16. Ojha S., Alkaabi J. Naheed Amir, Azimullah Sheikh, Ahmad Agil, Mohamed Abdelmonem Fahim, and Abdu Adem; *Withania coagulans* Fruit Extract Reduces Oxidative Stress and Inflammation in Kidneys of Streptozotocin-Induced Diabetic Rats; *Oxidative Medicine and Cellular Longevity*; 2014(2014), Article ID201436