



**WITHANIA COAGULANCE DUNAL (PANIR DODA) AND ITS ANTIDIABETIC  
EFFECT: A REVIEW**

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**ABSTRACT**

Diabetes, a rising epidemic throughout the world, has no signs of abatement and remains one of the most challenging health problems. The development and progression of diabetes and associated vascular complications are largely precipitated by chronic hyperglycemia-induced oxidative stress. Though many Ayurvedic medicines have promising anti hyperglycemic effect, but researches are still going to find out cost effective, easily available safe medicine for diabetes, so that ailing society can get freedom from this disease, one among such new emerging drug for disease is *Withania Coagulans*. This drug may be a promising medicine for diabetes, due to the presence of free radical scavenging potential which might help to protect against oxidative damage of organs along with anti hyper glyceemic and hypolipidimic effect. An animal study demonstrates that *Withania coagulans* corrects hyperglycemia and maintained antioxidant status and reduced the proinflammatory markers in kidney which may subsequently reduce the development and progression of renal injury in diabetes, However the translation of therapeutic efficacy in humans require further studies. A pub med database search revealed 49 Articles on entering key word *Withania coagulans*, 40 related articles are found from Google scholar, whereas dhara online reveals no results on entering the key word *Withania coagulans*. 2 full papers are searched from Ayujournal.org. In this review paper the chemical constituents and pharmacological properties of *W. coagulans* along with morphology and its therapeutic effects on animal model and clinical trials are presented by using these articles. *Withania coagulans* can be successfully used in the diabetic patients.

**KEYWORDS:** *Withania Coagulans*, proinflammatory.

**INTRODUCTION**

Diabetes is a clinical syndrome of hyperglycemia with glycosuria due to lack of insulin characterized by polyuria, polydipsia, polyphagia, hyperglycemia and glucosuria which may be associated with generalized weakness or weight loss. This is the disease that affects every tissue and every organ of the body and is responsible for the morbidity, reduced life expectancy, and diminished quality of life. Diabetes accounts for a huge share of lifestyle diseases all over the world and India is no exception. In northern India traditional healers use dry fruits of *Withania coagulans* for the treatment of diabetic patients which is commonly known Indian rennet, Indian cheese maker, vegetable rennet (English), *Panir ke phool*, *Panir band*, *panir doda*, belongs to family Solanaceae, and is distributed in the drier parts of India<sup>[1]</sup> The plant is native of Asia-tropical (Indian Subcontinent: India, Nepal) regions. In India, two species of the genus *withania* are found, *W.somnifera* (*Ashwagandha*) and *W.coagulance*. Though

*withanolides* are the principle compound found in both species, there are some *withanolides* specific to each of them. *Withaferin A* is major compound found in *W.somnifera* whereas, *coagulin L* has been found in major amounts in *W.coagulans*. of which anti hyperglycemic leads have been identified, and it is still to be determined in *W.somnifera*. A large number of phytochemicals are isolated from *Withania coagulans* which are responsible for various pharmacological action of this plant including hypoglycemic, hypo-lipidemic, free radical scavenging, cardiovascular, wound healing, anti inflammatory<sup>[2]</sup> and hence can be successfully used for the management of diabetes mellitus. Various animal studies proved anti diabetic effect of the plant along with reduction of oxidative stress and inflammation of kidneys. Moreover, one clinical trial also proved significant decreased in the fasting and post prandial blood sugar. Looking into these fact, a detailed review of *Withania coagulans* regarding its morphology, chemical constituents, and pharmacological properties and anti

diabetic effects of the whole plant and its isolated withanolides was done. A pub med database search revealed 49 articles on entering the key words *Withania coagulans*, 2 articles are related to *Withania coagulans* DHARA online search showed no results on the above key words, 40 related articles are found Google Scholar out of which 16 Abstract and 29 full papers are found. 2 full papers are found in Ayujournal.org. The description of plant is found in Indian medicinal plants, Indian Materia Medica and The Wealth of India.

### Morphological Distribution

This shrub is common in East India, Nepal and Afghanistan, In India it occurs in Punjab, Rajasthan Shimla, Kumaun and Garhwal. It is a rigid grey tomentose undershrub 0.3-0.9 m. high, branches terete, clothed with dense grey or yellowish white tomentum. Leaves are 2.5 -5.7 long, lanceolate-oblong, obtuse, entire, clothed with a persistent not easily detachable grayish tomentum, of a uniform colour on both sides. Flowers are dioecious in axillary clusters: pedicels 0-6 mm. long, deflexed, cylinder. Calyx are 6 mm. long, campanulate, clothed with fine stellate grey tomentum, teeth triangular, 2.5 mm long Corolla 8 mm long. Berries are 6-8 mm in diameter globose, smooth, closely girt by the enlarged membranous calyx which is scurfy pubescent outside. Seeds are 2.5-3 mm. In diameter, dark brown, ear shaped glabrous and the flowering period is from January to April and berries ripen during January to May.<sup>[3]</sup>

### Chemical Constituents

The berries contain the milk-coagulating enzyme, two esterase, free amino acids, fatty oil, an essential oil and alkaloids. The amino acids present are proline, hydroxyproline, valine, tyrosine, aspartic acid, glycine asparagin, cysteine and glutamic acid. Fourteen alkaloidal fractions have been isolated from the alcoholic extract of fruits. The defatted meal from the seeds contains free sugar consisting of D- galactose and D-arabinose and traces of maltose. The leaves contain four steroidal lactones called withanolides<sup>[4]</sup> along with coagulin L responsible for antihyperglycemic activity. A hydrocarbon tricyclic and sterol dihydrostigmastrol are obtained from the unsaponifiable portion of the fruits. The oil was found to contain a high percentage of linoleic acid and  $\beta$  sitosterol i.e the factors which in combination are reported to be responsible for the hypocholesterolaemic effect of corn oil.<sup>[5]</sup>

### Experimental Studies

**Anti diabetic effect of *Withania coagulans* in experimental rats-** Dolly et al investigated antidiabetic effect of *Withania coagulans* in experimental rats. In this study, aqueous extract of dry fruits of *Withania coagulans* prepared at room temperature was administered in STZ induced diabetic rats divided into 3 groups normal, sub, mild and severely diabetic and were 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 reduces 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 37.85 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.<sup>[6]</sup>

**Hypoglycemic activity of *Withania coagulans* Dunal in streptozotocin induced diabetic rats-** Hemalatha et al. investigated Hypoglycemic activity of *Withania coagulans* Administration of aqueous extract of fruits of *Withania coagulans* significantly lowered the blood sugar, serum cholesterol, serum LPO (lipid peroxidase an oxidative stress marker), and hepatic LPO (levels at the highest concentration of 1g/kg; in streptozotocin induced diabetic rats in normal rats as well the blood sugar levels were significantly decreases following treatment with the above drug. *Withania coagulans* also exhibited free radical scavenging activity in an vitro system using DPPH.<sup>[7]</sup>

**Antiinflammatory activity of *Withania coagulans*-** *Withania coagulans* fruit extract reduces oxidative stress and inflammation in kidneys of streptozotocin induced diabetic Rats, In this study STZ injected rats show significant rise in plasma glucose level along with decrease in serum insulin and body weight and increase in kidney weight in comparison with non-diabetic control rats, indicating the development of diabetes as characterized by chronic and persistently elevated plasma glucose level. Decreased body weight in STZ-induced diabetic rats is believed to be due to dehydration, breakdown and proteins. Increased catabolic reactions after STZ administration leads muscle wasting and decrease body weight. STZ induces diabetes by selectively destroying insulin producing pancreatic endocrine cells and damages kidney similar to early stage diabetic nephropathy. The key markers of oxidative stress and inflammation cytokines (IL-1 $\beta$ , IL-6, and TNF $\alpha$ ) and immunoregulatory cytokines (IL-4 and IFN- $\gamma$ ) were increased in kidney along with significant hyperglycemia. However, treatment with *Withania coagulans* restored body weight, kidney weight, and reduced hyperglycemia, and proinflammatory markers as well as enhancing survival and general body growth of diabetic rats. Ratio of Kidney/body weight is an index of renal hypertrophy and a significant increase in kidney/body weight indicates renal injury in STZ administered rats. However, treatment with *Withania coagulans* restored body weight, kidney weight, and reduced hyperglycemia, and a significant increase in kidney/body weight is an index of renal hypertrophy and a significant increase in kidney/body weight indicates renal injury in STZ administered rats. However, treatment with *Withania coagulans* to the diabetic rats has markedly reduced renal hypertrophy as evidenced by

reduction of kidney /body weight when compared to the diabetic control. These results demonstrate that the extract of *Withania coagulans* exhibits antihyperglycemic as well as protective effect in other organs apart from kidney.<sup>[8]</sup>

**Wound healing activity of *Withania coagulans* in streptozotocin induced diabetic rats-** In this study diabetes was induced in albino rats by single intraperitoneal injection of streptozotocin, animal with blood glucose level greater than 200mg/dl were used for further study. Circular wounds were produced on each rat by excising the skin for topical treatment a 10% w/w of ointment of hydroalcoholic fraction was prepared, Rate of wound contraction was estimated by measuring wound area, results showed that hydroalcoholic fraction in both forms i.e (topical 10% w/w ointment) and (500mg/kg) showed as significant increase in rate of wound contraction. when compared with diabetic control.<sup>[9]</sup>

#### Clinical Study

Upadhyay et al. conducted a study to evaluate the effect of (*Withania coagulans*) in the management of *Prameha* (Type 2 Diabetes), for this purpose fruit powder in the dose of 10 g daily in 2 divided doses was administered for 3 months. Registered patients were maintained into Groups: Patients of group A were taking no drug before initiation of therapy, were kept on trial drug, Group B: Patients were permitted the OHA(oral hypoglycemic agent) with unmodified dose which they were taking before initiation of therapy was treated as the control group. Group C: Patients were given a trial drug with the ongoing OHA in the same dose whatever they were taking before the initiation of the treatment. Results shows statistically significant reduction in fasting blood sugar in both the trial drug treated group and significant reduction in post prandial sugar in all the 3 groups, highly significant increased in serum HDL in group A (kept only on trial drug) but non significant effect on serum cholesterol, triglyceride was observed, significant improvement was found in subjective parameters in the patients kept on trial drug.<sup>[10]</sup>

#### CONCLUSION

Withanoloids are the principle compound of *Withania coagulans* and is an important medicinal herb as large numbers of phytochemicals (esterase, free aminoacids, fatty oil, essential oil, alkaloids and withanoloids.) have been isolated from it. Experimental studies have proved that it has hypoglycemic, Antidiabetic, lipid lowering effect on serum LPO and liver LPO (lipid peroxidase and oxidative stress marker), and it also corrects Hyperglycemia and maintained antioxidant status and reduced the proinflammatory markers in the kidneys, The results of the previous studies are encouraging for its potential use to delay the onset and progression of diabetic renal complication. However, the translation of therapeutic efficacy in humans requires further study. Clinical trial of *Withania coagulans* fruits powder

significantly reduced fasting blood sugar and highly significant reduction in post prandial sugar hence, the review reveals that *W.coagulans* is a promising medicine for the patients of diabetes and thus in the cases of type 2 diabetes its can be delay the onset and progression of diabetes.

#### REFERENCES

1. Kirtikar KR, Basu BD. Indian medicinal plants. Dehradun, India: International Book Distributors, 1995.
2. Indian Materia Medica Edited by KM nadkarni revised and enlarged by AK nadkarni ISBN-81-7154-143-7, Edited, 1982; 1291.
3. Kirtikar KR, Basu BD. Indian medicinal plants Text Vol.3 2nd Edition Dehradun, India: International Book Distributors, 1995.
4. Chadha YR -The Wealth of India, Raw Materials Vol-10, CSIR New Delhi, Reprinted-2009, page no 580.
5. Atkal CK Sethi PD.A preliminary chemical examination of *Withania coagulans*. Indian J Pharm 1963; 25: 163-164.
6. Dolly Jaiswal Prashant Kumar Rai Geeta Watal Antidiabetic effect of *Withania coagulans* in experimental rats Indian journal of clinical biochemistry, January 2009; 24(1): 88-93.
7. S Hemalatha, A.K Wahi, P.N Singh, J.P.N Chansouria Hypoglycemic activity of *Withania coagulans* Dunal in streptozotocin induced diabetic rats journal of Ethnopharmacology, August 2004; 93(2-3): 261-264.
8. Shreesh Ojha, Juma Alkaabi, Naheed Amir, Azimullah Seikh, Ahmad Agil, Mohamed Abdelmonem Fahim, Abdu Adem Withania coagulans Fruit Extract Reduces Oxidative Stress and Inflation in Kidneys of Streptizocin Induced Diabetic Rats. Hindawi Publishing Corporation Oxidative Medicine and cellular Longevity, 2014; Article ID 201436, 9.
9. S.K Prasad, R Kumar, D.K.Patel and S Hemlata. Pharmaceutical Biology, 2010; 48(12).
10. BN Upadhyay et al A clinical study on the effect of *Rishyagandha* (*withania coagulans*) in the management of *Prameha* (Type 2 diabetes mellitus) Ayu, 2011 Oct-Dec. 32(4): 507-511.