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Review Article

A Review On Paneer Phool

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ABSTRACT

Withania coagulans Dunal, also called Paneer Phool belongs to the family Solanaceae is a well-known plant in herbal medicinal systems for its great potential against various diseases. This plant particularly leaves, fruits, and roots are known to have biological as well as pharmacological activities including hypoglycaemic, hypolipidemic, free radical scavenging, cardiovascular, central nervous system depressant, anti-inflammatory, wound healing, antitumor, immune-suppressive, cytotoxic, antifungal, antibacterial, sedative, emetic, diuretic, antidiabetic, antimicrobial, antitumor and hepatoprotective properties. This abstract aims to highlight the plant's diverse medicinal application and its potential role in modern pharmacology. Further research is needed to fully understand its mechanism and optimize its use in therapeutic formulation.

INTRODUCTION

Herbal medicines have a growing demand in the world market and they are a valuable gift of nature. World Health Organization (WHO) estimated that more than 80% of the world's population uses plant-derived health care products for their daily regimes because of their good activity and comparatively fewer side effects as compared to synthetic drugs [16]. *Withania coagulans* Dunal belongs to the family Solanaceae is one of the important ayurvedic medicinal plants commonly known as vegetable rennet, Indian cheesemaker, Indian rennet, Paneer ke phool, Paneer band or Paneer dodiis widely used over 3,000 years in India[1,11]. *Withania Coagulans* Dunal has been

valued for its medicinal properties ,particular in the Ayurvedic and Unani systems of medicine ,where it is utilized for the its broad therapeutic effects It is found in the Eastern Mediterranean region and extends into South Asia. Across India, it grows in drier regions such as Punjab, Gujarat, and Rajasthan [16,46]. *Withania coagulans* is commonly known as paneer in Punjab because fruits and leaves have properties to coagulate milk. The milk coagulating properties of the fruit is attributed to the pulp and husk of berries which possess enzyme which has milk coagulating activity [27]. One ounce fruit and a quart of boiling water make a decoction, one tablespoonful of

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which coagulate a gallon of warm milk in about an hour. Buffalo or sheep milk is warmed to about 100°F and crushed berries of the plant, tied in a cloth, are dipped in it. The milk takes 30-40 minutes to curdle. In folk medicine, different parts of the plant, especially fruits are considered magic healers [27]. Fruits of *Withania coagulans* exhibit sedative, emetic as well as diuretic properties. They help treat diabetes, nervous exhaustion, disability, insomnia, wasting diseases, failure to thrive in children, impotence. chronic liver disease, dyspepsia, flatulent coli asthma, biliousness, and other gastrointestinal infections [21]. The berries are used to purify the blood. Chewing the twigs of the plant is used to clean teeth and inhaling the smoke relieves toothaches. [22,27]. This introduction aims to provide an overview of *Withania Coagulans*, exploring its traditional uses, pharmacological significance, and understanding the mechanism and new therapeutic approaches and the development of novel drugs based on this versatile plant.

BOTANICAL DESCRIPTION :-

Synonyms:- Paneer Phool

Indian Rennet

Withania Coagulata

Indian cheese Maker

Rishyagandha

Subfamily :- Solenoidal

Tribe :- Physaleae

Subtribe:- Withaninae

Taxonomical classification:

Kingdom :- Plantae, plants

Subkingdom :- Tracheobionta, vascular plants

Superdivision :- Spermatophyte, seeds plants

Division :- Angiosperma

Class :- Dicotyledons

Order :- Tubiflorae

Family :- Solanaceae

Genus :- *Withania*

Species :- *Coagulans*

Geographical description :-

It is found in the Eastern Mediterranean region and extends northern Africa to Southwest Asia. Across India, it grows in drier regions such as Punjab, Gujarat, Rajasthan, Shimla, Kumaon, and Garhwal [2].

Morphological Description :-

Withania coagulans Dunal is a rigid, grey undershrub, 60-120 cm high [53]. Seeds: Seeds of the paneer Dodi 2.5-3.0 mm diameter, dark brown, somewhat ear-shaped, glabrous. Natural regeneration occurs from the seed [1].

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Leaves :-

The Paneer Dodi's leaves are 2.5-5.7 by 1-2.2 cm, lanceolate-oblong, entire, obtuse, clothed with a

persistent not easily detachable greyish tomentum, of uniform colour on each side, thick, small or more rugose with base acute [1]



Flowers :-

The flowers of the paneer Dodi are long, campanulate, clothed with fine stellate grey tomentum; teeth triangular, 2.5 mm long dioecious, in axillary clusters; pedicels 0.6 mm. long, deflexed, slender, Calyx 6 long. Corolla of the flower is 8 mm long, stellately mealy outside, divided about one-third the way down; lobes ovate-oblong and subacute [1]. Stamens about level with the very base of the corolla-tube; filaments 2 mm. long, glabrous; anthers 3- 4 mm. long. Ovary ovoid, without style or stigma. Male flowers stamens about level with the top of the

corolla tube; filament 2 mm long, glabrous; anthers 3-4 mm long. Female flowers: Stamens scarcely reaching $\frac{1}{2}$ high the corolla-tube; filaments about 0.85 mm. long; anthers are small within the male flowers, sterile. Within flowers the Ovary ovoid, glabrous; style glabrous; stigma mushroom-shaped, 2-lamellat. The plant flowers from November to April and the berries ripen from January to May [10]

Fruits:-

Berry 6-8 mm. globose, smooth, closely girt by the enlarged membranous calyx which is scurfy-pubescent outside [53]



Chemical Constituents :-

With chemical and spectroscopic methods, $3\beta,14\alpha,20\alpha F,27$ - tetrahydroxy-1-oxo-20R,22R-with-5,24-dienolide were identified. The structure correlates with comparative studies of closely related withanolides. The *Withania coagulans* is rich in steroidal lactone, known as withanolides, which are naturally occurring polyhydroxy C28

steroidal lactones [14,48,50]. The structure of withanolides is characterized by a six or five-membered lactone or lactol ring attached to an intact or rearranged ergostane skeleton. The berries contain the milk-coagulating enzyme, two esterases, free aminoalkanoic acid, fatty oil, essential oil, and alkaloids [51]. There are five amino acids present in the protein are proline,

hydroxyproline, valine, tyrosine, aspartic acid, glycine, asparagine, cysteine, and glutamic acid. Fourteen alkaloidal fractions have been isolated from the alcoholic extracts of the fruits, coagulans, including ergosta-5,25-diene-3 β -D-glucoside and withanolide. From the roots of the plant, five withanolides have been isolated. There have been

two types of side chains found in withanolides both 17- α -oriented and 17- β -oriented. The essential oil shows antimicrobial and antihelminthic properties against *Micrococcus pyogenes* var. *aureus* [33]. Withanolide A Correlation between traditional use and modern pharmacological property

Table No. 1: Medicinal use of different parts of *Withania coagulans*

| Sr No | Pharmacological Activity | Part of Plant | Description | Reference |
|-------|--------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------|
| 1 | Antihyperglycemic activity | Fruit and Flower | Pharmacological effect on blood glucose, lipid profile. Soak about 10-15 pods of paneer Dodi in glass of water overnight | [14] |
| 2 | Cardiovascular effect | Fruits | The Withanolides produces moderate fall in blood pressure | [26] |
| 3 | Immunosuppressive effect | The aerial part of the plant/root | Withaferin A has a specific immunosuppressive effect on human B and T-lymphocytes. | [43] |
| 4 | Anti-inflammatory activity | Fruit | Its external application prescribes for inflammatory conditions | [9] |
| 5 | Anti- fungal Activity | Whole plant | Used in a treatment of antifungal disease | [9] |
| 6 | Anti- bacterial and Anthelmintics | Fruit | It is protective against microbial infection. | [19] |
| 7 | Hepatoprotective activity | Fruit | It is help in protecting the liver and maintain it's general well being | [11] |
| 8 | Anti- tumor activity | Root | It shows the remarkable inhibitory activity of DMSO induced cytotoxicity and disease TNF α | [53] |
| 9 | Wound healing activity | Whole plant | Both topical and oral forms showed a big increase in the rate of wound contraction | [3] |
| 10 | Diuretics activity | Seeds | It works as a diuretic because they increase urinary k ⁺ level and alter Na ⁺ /K ⁺ output | [7] |
| 11 | Anti- microbial activity | Roots | It has inhibited the growth of various Gram +ve micro tumor activities. | [9] |
| 12 | CNS Depressants | Fruits | It is used in Alzheimer's disease | [19] |
| 13 | Anti-mutagenic and Anti-carcinogenic | Fruits | Ability to reduce the tumor size | [10] |
| 14 | Anti-hyperlipidemic activity | Fruits | Reduce the serum cholesterol ,Triglyceride ,lipoprotein and LPU level | [1] |

Withania coagulans possess the following activities

1. Antihyperglycemic activities:

Diabetes can be effectively managed with *Withania coagulans* since it exhibits hypoglycemic properties, which is a safe and effective alternative treatment option [32]. An aqueous extract of *Withania coagulans* berries (1gm/kg; P.O.) significantly lowers vital signs, serum glucose, and lipid peroxide. It promotes the correct amount of insulin secretion. *Withania coagulans* improve glucose utilization and carbohydrate metabolism, thereby depleting blood glucose. Hyperglycaemia is reduced due to it [35]. Treatment with coagulanolide alongside four known withanolides 1-3 and 5 isolated from four fruits of *W. coagulans*, shows significant inhibition on the postprandial rise in hyperglycemia post sucrose load in normoglycemic rats also as streptozotocin-induced diabetic rats [11]. Hence, *Withania coagulans* is considered an antihyperglycemic and antidyslipidemic agent [14]. *Withania coagulans* are commonly used in the management of type-2 diabetes mellitus [15].

2. Antihyperlipidemic activities:

In high-fat diet-induced hyperlipidemic rats, extracts of *Withania coagulans* fruits significantly reduced levels of elevated serum cholesterol, triglyceride, lipoprotein, and therefore LPO levels. Ayurvedic products containing *Commiphora Mukul* are analogous to the hypolipidemic effect of fruits of *Withania coagulans* [41].

3. Anti-inflammatory activities:

Withania coagulans alcoholic extract has a significant anti-inflammatory effect in acute inflammation induced by egg albumin [25,11]. Withanolides from *Withania coagulans* are effective in reducing inflammation in acute inflammation [4]. The hydroalcoholic extract of *Withania coagulans* berries exhibits significant anti-inflammatory activity in a carrageenin-induced rat paw edema model [38].

4. Antifungal and antibacterial effects:

Micrococcus pyrogenus var. *aureus* *vibrio cholera* is inhibited by the volatile oil produced by steam distillation of the petroleum ether extract of the fruits. Two new withanolides 14,15 β -epoxywithanolides I [(20S, 22R) 17 β ,20 β -dihydroxy-14 β ,15 β -epoxy-1-oxo-with a-3,5,24-trienolides] and 17 β -hydroxy withanolides K[(20S,22R)14 α ,17 β ,20 β -trihydroxy-1-oxo-with a-2,5,24-trien-olide], isolated from ethanolic extract of whole plant *Withania coagulans* found to move against a variety of potentially pathogenic fungi [38].

5. Cardiovascular Effects:

Withanolide, a steroidal lactone derived from the aqueous extract of Paneer Dodi fruits, has a cardiovascular effect [18,52]. This withanolide replacement, isolated from the fruits of *Withania coagulans*, has a similar chemical structure to the aglycones of cardiac glycosides [29]. Withanolide produced a moderate fall in blood pressure in dogs (34 \pm 2.1, mm Hg), which was blocked by atropine and not by mepyramine or propranolol at doses of 5 mg/kg body weight. It produces a myocardial depressant effect in rabbit Langendorff or preparation of ECG studies but produces mild positive inotropic and chronotropic effects in perfused dogs' hearts [1].

6. Immunosuppressive Effects:

Withanolide E and Ashwagandha possess specific immunosuppressive properties on human B and T lymphocytes as well as mice thymocytes [45]. Withanolides, such as coagulin-H, acts on several cellular functions involved in immune responses, including lymphocyte proliferation and interleukin-2 (IL-2) cytokine expression [17]. It is comparable to the effects of prednisolone. The coagulin-H possesses a strong inhibitory effect on lymphocyte proliferation, and therefore, cytokine production by Th-1 cells. Coagulin-H inhibits phytohaemagglutinin (PHA)-induced T-cell motivation [7].

7. Antimutagenic and anticarcinogenic effects:

The genotoxicity of herbal drugs is determined by their phytoconstituents. *Withania coagulans* contain withanolides, which have antitumor properties, as well as flavonoids that exert antimutagenic and anticancer effects [27]. The antimutagenic properties of *Withania coagulans* remain unknown. *Withania coagulans* extract cyclophosphamide-induces micronucleus formation in mice bone marrow cells. The results show that a single i.p. injection of *Withania coagulans* fruits extracts at doses of 500,1000,1500 mg/kg weight before 24 hours effectively reduces micronucleus development in bone marrow cells of mice in a dose dependent manner as compared to the cyclophosphamide group [36]. The plant is ethnobotanically reported in cancer treatment [12]

8. Hepatoprotective Activity:

In adult albino rats, 3-hydroxy-2, 3-dihydro-withanolide F derived from a fruit of *Withania coagulans* has been shown to have hepatoprotective effects against CCl₄-induced hepatotoxicity. A weight-based comparison revealed that it is more active than hydrocortisone and exhibits a marked protective effect [14].

9. Antitumor properties:

Withaferin (3 β -hydroxy-2, 3-dihydro-withanolide F) exhibits antitumor effects. *Withania coagulans* aqueous extract has anticytotoxic properties. The extract shows the remarkable inhibitory activity of DMSO-induced cytotoxicity and decreases in TNF- α production in chicken Lymphocytes [53].

10. Wound healing activity:

A study suggests the wound healing activity of *Withania coagulans* in streptozotocin-induced diabetic rats. In both topical and oral forms, hydroalcoholic fractions of the methanolic extract (standardized by withaferin A) of *Withania coagulans* increase the rate of wound contraction. Withaferin-A enhances collagen, protein, DNA, SOD, and CAT levels, and decreases the levels of

hexosamine [6]. Hydroalcoholic fractions of *Withania coagulans* methanolic extract sort of 10 %w/w ointment were applied topically and orally at a dose of 500mg/kg weight to streptozotocin-induced diabetic rats [13]. In models of open and incised wounds, the aqueous-methanolic phase of the methanolic extract of *Withania coagulans* has shown significant wound healing activity. It accelerates collagen, mucopolysaccharides, DNA, and protein synthesis [35].

11. Anti-arteriosclerosis Activity:

The aqueous extract of *Withania coagulans* also exhibits radical scavenging activity in an in vitro system using DPPH and. Aqueous extract of fruits of *Withania coagulans* has antioxidant potential against several diseases like aging, atherosclerosis, etc[36].

12. Anthelmintic activity:

In the steam distillation of the petroleum ether extract of *Withania coagulans* fruits, essential oil appears to possess anthelmintic properties. The upper parts of *Withania coagulans* have anthelmintic activity in ruminants [31]

13. Diuretic activity:

Withania coagulans fruits exhibit diuretic potential in an aqueous extract when studied in rats. When compared with other *Withania* species, *Withania coagulans* have more polar Withanolides[19]. Using furosemide as a standard, the diuretic activity of the aqueous extract of paneer Dodi roots can be studied in the Lipschitz test model. The results showed significant increases in urine volume by 71.02% and 79.12% at 500mg/kg and 75mg/kg weight dosages, respectively, when compared to regulate. Urinary electrolyte excretion where increases in both the dosage compared to regulate. The diuretic effect is due to the presence of the active principles of polar nature, of which withanolides are the chemical protagonists. Research supports the use of *Withania coagulans* as a diuretic agent in folk medicine [34]. *Withania coagulans* extract has



hypotensive, respiratory stimulant, and muscle relaxing properties [11].

Toxicology:

When the body is exposed to medications or poisons, nephrotoxicity is a common adverse outcome. It leads to uremia due to a failure of the kidneys to filter excess urea, nitrogenous substances, and creatinine. There is no specific treatment for acute renal failure; only supportive care is required to restore renal function. This condition can only be avoided by avoiding nephrotoxic substances and maintaining adequate hydration and perfusion.

CONCLUSION:

The review article summarised the botanical name, taxonomical classification, morphology, phytochemistry, biosynthesis of withanolides, traditional uses, and pharmacological action of *Withania coagulans*. *Withania coagulans* was known by the name 'Paner Dodi' is the most important multipurpose ayurvedic medicinal plant, extensively used in herbal formulations. Paner Dodi, chemically rich in steroidal lactone, which is known as withanolides having significant pharmacological activity. In this study, we have reviewed literature about *Withania Coagulans* and their pharmacological activities such as antiinflammatory activity, antidiabetic activity, cardiovascular effect, antimicrobial, hepatoprotective activity, anthelmintic activity, antifungal activity, antioxidant activity, wound healing activity, antitumor properties, hypolipidemic activity. More clinical trials, however, are needed to support its therapeutic uses. Therefore, there remain sample scope for further scientific exploration of *Withania coagulans* to determine their therapeutic efficacy as well as commercial potential.

REFERENCE

1. Gupta V, Keshari BB. *Withaniacoagulans*Dunal. (Paner Doda): A

- Review. *International Journal of Ayurvedic and Herbal Medicine*. 2013;3(5):1330-6
2. Sharma N, Sachdeva P, Dhiman M, Koshy EP. Comparative evaluation of in vitro regeneration potential of seeds of *W. somnifera* and *W. coagulans*. *Biotechnology International*. 2015;8(1):21-33.
3. Sudhanshu MS, Rao NI, Menghani EK. Phytochemical and antimicrobial activity of *Withaniacoagulans* (Stocks) Dunal (Fruit). *International Journal of Pharmacy and Pharmaceutical Sciences*. 2012; 4:387-9.
4. Khodaei M, Jafari M, Noori M. Remedial use of withanolides from *Withaniacoagolans* (Stocks) Dunal. *Adv Life Sci*. 2012;2(1):6-19.
5. 5 Maurya R, Singh AB, Srivastava AK. Coagulanolide, a withanolide from *Withaniacoagulans* fruits and antihyperglycemic activity. *Bioorganic & medicinal chemistry letters*. 2008 Dec 15;18(24):6534-7.
6. Hemalatha S, Prasad SK, Kumar M, Dubey S. *Withaniacoagulans*Dunal : An overview on its up to dateantidiabetic investigation. *Diabetes Mellitus and Human Health Care: A Holistic Approach to Diagnosis and Treatment*. 2014 Feb 6:131.
7. Jain R, Kachhwaha S, Kothari SL. Phytochemistry, pharmacology, and biotechnology of *Withaniasomnifera* and *Withaniacoagulans*: A review. *Journal of Medicinal Plants Research*. 2012 Oct 25;6(41):5388-99.
8. Hasan M, Zafar A, Shahzadi I, Luo F, Hassan SG, Tariq T, Zehra S, Munawar T, Iqbal F, Shu X. Fractionation of biomolecules in *Withaniacoagulans* extract for bioreductive nanoparticle synthesis, antifungal and biofilm activity. *Molecules*. 2020 Jan;25(15):3478.
9. Pandey I, Nama KS. *Withaniacoagulans* (Stocks) Dunal A rare ethnomedicinal plant of



- the Western Rajasthan Desert. *Int. J. Pharmaceut. Biomed. Res.* 2015; 2:34-40.
10. Raut KS, Bhongale SV, Chavan R. PDEAS International Journal of Research in Ayurved& Allied Sciences.
11. Maurya R. Chemistry and pharmacology of Withaniacoagulans: an Ayurvedic remedy. *Journal of pharmacy and pharmacology.* 2010 Feb;62(2):153-60
12. Maqsood M, Qureshi R, Ikram M, Ahmad MS, Jabeen B, Asi MR, Khan JA, Ali S, Lilge L. In vitro anticancer activities of Withaniacoagulans against HeLa, MCF-7, RD, RG2, and INS-1 cancer cells and phytochemical analysis. *Integrative medicine research.* 2018 Jun 1;7(2):184-91.
13. Sampathkumar K, Riyajan S, Tan CK, Demokritou P, Chudapongse N, Loo SC. Small-intestine-specific delivery of antidiabetic extracts from withaniacoagulans using polysaccharide-based enteric-coated nanoparticles. *ACS omega.* 2019 Jul 11;4(7):12049-57.
14. Maurya R, Akanksha, Jayendra, Singh AB, Srivastava AK. Coagulanolide, a withanolide from Withaniacoagulans fruits and antihyperglycemic activity. *Bioorg Med Chem Lett.* 2008 Dec 15;18(24):6534-7. doi: 10.1016/j.bmcl.2008.10.050. Epub 2008 Oct 14. PMID: 18952419.
15. Pande KH, Salve PS, Rai RK, Bali NR, Wankhede HS. Investigation and In vivo Demonstration of Synergistic Antidiabetic activity of Aqueous Extract of Aegle marmelos and Withaniacoagulans. *Research journal of Pharmacology and Pharmacodynamics.* 2014;6(2):101-7.
16. Pramanick DD, Srivastava SK. Pharmacognostic evaluation of WithaniacoagulansDunal (Solanaceae)-an important ethnomedicinal plant. *Bioscience Discovery.* 2015;6(1):6-13.
17. Shukla K, Dikshit P, Tyagi MK, Shukla R, Gambhir JK. Ameliorative effect of Withaniacoagulans on dyslipidemia and oxidative stress in nicotinamide–streptozotocin induced diabetes mellitus. *Food and Chemical Toxicology.* 2012 Oct 1;50(10):3595-9.
18. Datta A, Bagchi C, Das S, Mitra A, De Pati A, Tripathi SK. Antidiabetic and antihyperlipidemic activity of hydroalcoholic extract of WithaniacoagulansDunal dried fruit in experimental rat models. *Journal of Ayurveda and integrative medicine.* 2013 Apr;4(2):99.
19. Gupta A, Mittal A, Jha KK, Kumar A. Nature's treasurer: plants acting on colon cancer. *Journal of Stress Physiology & Biochemistry.* 2011;7(4):217-31
20. Budhiraja RD, Sudhir S, Garg KN. Cardiovascular effects of a withanolide from Withaniacoagulans, dunal fruits. *Indian journal of physiology and pharmacology.* 1983 Apr 1;27(2):129-34.
21. Mir SR, Ali M, Waris M, Sultana S. Chemical constituents from the fruits of Withaniacoagulans (Stocks) Dunal. *Trends in Phytochemical Research.* 2020 Jun 1;4(2):45-58.
22. Neelam-Bare B, Pratima-Jadhav S. Pharmaceutical importance of Withaniacoagulans in health and diseases. *International Journal of Advances in Science Engineering and Technology.* 2017;5(3).
23. Mirjalili HM, Fakhr-Tabatabaei SM, Bonfill M, Alizadeh H, Cusido RM, Ghassempour A, Palazon J. Morphology and withanolide production of Withaniacoagulans hairy root cultures. *Engineering in Life Sciences.* 2009 Jun;9(3):197-204.
24. Gupta S, Sidhu MC, Ahluwalia AS. Plant-based remedies for the management of

- diabetes. *Current Botany*. 2017 Mar 21; 8:34-40.
25. Budhiraja RD, Bala S, Garg KN. Pharmacological investigations on fruits of *Withaniacoagulans*, Dunal. *Planta medica*. 1977 Sep;32(06):154-7.
26. Ramaiah PA, Lavie D, Budhiraja RD, Sudhir S, Garg KN. Spectroscopic studies on a withanolide from *Withaniacoagulans*. *Phytochemistry*. 1984 Jan 1;23(1):143-9.
27. Gupta PC. *Withaniacoagulans*Dunal-an overview. *International Journal of Pharmaceutical Sciences Review and Research*. 2012;12(2):68-71.
28. Liu Q, Meng X, Li Y, Zhao CN, Tang GY, Li HB. Antibacterial and antifungal activities of spices. *International journal of molecular sciences*. 2017 Jun;18(6):1283
29. Sudhir S, Budhiraja RD, Miglani GP, Arora B, Gupta LC, Garg KN. Pharmacological studies on leaves of *Withaniasomnifera*. *Planta medica*. 1986 Feb;52(01):61-3
30. Budhiraja RD, Sudhir S. Review of biological activity of withanolides. *Journal of Scientific and Industrial research*. 1987
31. Mughal T, Shahid S, Qureshi S. Antifungal studies of *Withaniacoagulans* and *Tamarixaphylla*. *J. Appl. Pharm*. 2011;3(3):289-94.
32. Jaiswal D, Rai PK, Watal G. Antidiabetic effect of *Withaniacoagulans* in experimental rats. *Indian Journal of Clinical Biochemistry*. 2009 Jan 1;24(1):88-93.
33. Salwaan C, Singh A, Mittal A, Singh P. Investigation of the pharmacognostical, phytochemical and antioxidant studies of plant *Withaniacoagulans*dunal. *Journal of Pharmacognosy and Phytochemistry*. 2012 Sep 1;1(3):32-9.
34. Mathur D, Agrawal RC, Shrivastava V. Phytochemical screening and determination of antioxidant potential of fruits extracts of *Withaniacoagulans*. *Rec Res SciTech*. 2011 Jun 2; 3:26-9.
35. Ojha S, Alkaabi J, Amir N, Sheikh A, Agil A, Fahim MA, Adem A. *Withaniacoagulans* fruit extract reduces oxidative stress and inflammation in kidneys of streptozotocin-induced diabetic rats. *Oxidative medicine and cellular longevity*. 2014 Sep 14;2014.
36. Sharma S, Joshi A, Hemalatha S. Protective effect of *Withaniacoagulans* fruit extract on cisplatin-induced nephrotoxicity in rats. *Pharmacognosy research*. 2017 Oct;9(4):354.
37. Mathur D, Agrawal RC. Evaluation of in vivo antimutagenic potential of fruits extracts of *Withaniacoagulans*. *Der Pharma Chemica*. 2011;3(4):373-6.
38. Maher S, Choudhary MI, Saleem F, Rasheed S, Waheed I, Halim SA, Azeem M, Abdullah IB, Froeyen M, Mirza MU, Ahmad S. Isolation of antidiabetic withanolides from *Withaniacoagulans*Dunal and their in vitro and in silico validation. *Biology*. 2020 Aug;9(8):197.
39. Ahmad R, Fatima A, Srivastava AN, Khan MA. Evaluation of apoptotic activity of *Withaniacoagulans* methanolic extract against human breast cancer and Vero cell lines. *Journal of Ayurveda and integrative medicine*. 2017 Jul 1;8(3):177-83.
40. Ahmadi S, Salehi M, Ausi S. Kinetic and thermodynamic study of aspartic protease extracted from *Withaniacoagulans*. *International Dairy Journal*. 2021 May 1; 116:104960.
41. Hemalatha S, Wahi AK, Singh PN, Chansouria JP. Hypolipidemic activity of aqueous extract of *Withaniacoagulans*Dunal in albino rats. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*. 2006 Jul;20(7):614-7.



42. Budhiraja RD, Sudhir S. Review of biological activity of withanolides. *Journal of Scientific and Industrial research*. 1987.
43. Shohat B, Kirson I, Lavie D. Immunosuppressive activity of two plant steroidal lactones withaferin A and withanolide E. *Biomedicine*. 1978 Jan-Feb;28(1):18-24. PMID: 27256.
44. Kazemipour N, Salehi Inchebron M, Valizadeh J, Sepehrimanesh M. Clotting characteristics of milk by Withaniacoagulans: Proteomic and biochemical study. *International Journal of Food Properties*. 2017 Jun 3;20(6):1290-301.
45. Atta-ur-Rahman A, Choudhary MI, Qureshi S, Gul W, Yousaf M. Two new ergostane-type steroidal lactones from Withaniacoagulans. *J Nat Prod*. 1998 Jun 26;61(6):812-4. doi: 10.1021/np970478p. PMID: 9644072.
46. Barad R, Soni P, Upadhyay S, Upadhyay U. Withaniacoagulans and Psidium guajava-an overview. *International Research Journal of Pharmaceutical and Applied Sciences*. 2013 Jun 30;3(3):42-7.
47. Abbas S, Jamal SA, Choudhary MI. New Withanolides from Withania sp. *Journal of Natural Products*. 1993 Jul;56(7):1000-6.
48. Valizadeh J, Valizadeh M. Development of efficient micropropagation protocol for Withaniacoagulans (Stocks) Dunal. *African Journal of Biotechnology*. 2011;10(39):7611-6.
49. Chouhan S, Sharma K, Guleria S. Antimicrobial activity of some essential oils—present status and future perspectives. *Medicines*. 2017 Sep;4(3):58.
50. Neogi P, Kawai M, Butsugan Y, Mori Y, Suzuki M. Withacoagin, a new withanolide from Withaniacoagulans roots. *Bulletin of the Chemical Society of Japan*. 1988 Dec;61(12):4479-81.
51. Mirjalili HM, Fakhr-Tabatabaei SM, Bonfill M, Alizadeh H, Cusido RM, Ghassempour A, Palazon J. Morphology and withanolide production of Withaniacoagulans hairy root cultures. *Engineering in Life Sciences*. 2009 Jun;9(3):197-204.
52. Ali N, Ahmad B, Bashir S, Azam S, Ahmad M. Calcium channel blocking activities of Withaniacoagulans. *African Journal of Pharmacy and Pharmacology*. 2009 Sep 30;3(9):439-5.
53. Hemalatha S, Kumar R, Kumar M. Withaniacoagulans Dunal: A review. *Pharmacognosy Reviews*. 2008 Jul 1;2(4):351.

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