A REVIEW ON WITHANIA SOMNIFERA (L.) DUNAL- AS AN IMPORTANT AYURVEDA PLANT

Dhruv Pandya*, Archana Mankad and Himanshu Pandya

Department of Botany, Bioinformatics & Climate Change Impacts Management, School of Science, Gujarat University, Navrangpura, Ahmedabad, Gujarat.

*E-mail: dhruvpandya1309@gmail.com

ABSTRACT

Withania somnifera (L.) Dunal is a well-known and important medicinal plant widely used in several indigenous systems of medicine for the treatment of various ailments, viz. asthma, bronchitis, inflammatory diseases, ulcer and stomach problems. Steroidal lactones have been reported as the major phytoconstituents of this species. Different pharmacological experiments in a number of in vitro and in vivo models have convincingly demonstrated the ability of W. somnifera to exhibit anti-inflammatory, anti-oxidative, antimicrobial, anti-anxiety, aphrodisiac, immunomodulation, anti-diabetic, anti-ulcer, anticancer, central nervous system depressant and hepatoprotective activities, lending support to the rationale behind several of its traditional uses. The species is also used to treat some neurological disorders like Parkinson’s and Alzheimer’s. The phytochemicals such as withaferin A, withanolide A and withanolide D isolated from this plant are potential bioactive molecules. Due to the remarkable biological activity of W. somnifera and its constituents, it will be appropriate to develop them as a medicine and make them more potent by chemical modifications and biotransformation. This review has covered botany, chemistry and pharmacology of the plant besides its traditional and folkloric uses.

Keywords: Withania somnifera; Steroidal lactones; Withanolides; Ayurveda.

INTRODUCTION

Plants play a dominant role in the discovery of new therapeutics and have been used in traditional medicine for centuries (Muthu et al., 2006). They have always been a rich source of large variety of lead compounds. Pharmacological screening of natural products has led to the discovery of a number of drugs. Among the worldwide list of twenty-six species, the genus Withania is represented in India by Withania somnifera and W. coagulans (Chadha, 1976). Recently we have reported a third species Withania ashwagandha from Indian germplasm using multidisciplinary approaches (Mir et al., 2010; Kumar et al., 2011). Within the family Solanaceae, Withania belong to subfamily Solanoideae, tribe Physaleae and sub-tribe Withaninae of which it is the type genus (Olmstead et al., 2008). The generic name Withania commemorates the celebrated English ‘Paleobotanist’, ‘Henry Thomas Maire Witham’ with an orthographic variation of the final ‘m’ into an ‘n’ to which the commemorative termination – ia has been added. The specific epithet somnifera is a compound of two Latin words ‘sommus’ meaning sleep and ‘fero’ (ferere) meaning to bear. Thus, the specific epithet alludes to sleep inducing properties of the plant.

Withania somnifera is an erect, branched, greyish, stellate-tomentose under-shrub, 30-150 cm high with long tuberous roots. Leaves are simple, petiolate with the leaf blade varying in shape from elliptic-ovate to broadly ovate, entire along margins, acute to obtuse at apex, cuneate or oblique at base, 4-10 cm long and 2-7 cm broad. Flowering is seen between March to July.
Classification of *Withania somnifera* L.:
Kingdom: Plantae Division: Angiosperms
Class: Dicotyledon
Sub-class: Gamopetalae Series: Bicarpellatae Order: Polymoniales
Family: Solanaceae
Genus: *Withania* Species: *somnifera*
(According to Bentham and Hooker).

Ethnobotany:
In Ayurveda, *Withania somnifera* is widely claimed to have aphrodisiac, sedative, rejuvenative and life-prolonging properties.

Pharmacological effects of *Withania somnifera* L.:
Anti-oxidant effects:
Free radical damage of nervous tissue may be responsible for neural loss in cerebral ischemia and may be involved in aging and neuro-degenerative diseases, e.g., epilepsy, schizophrenia, Parkinson’s, Alzheimer’s and other diseases (Sehgal *et al*, 2012). The active compounds of *Withania somnifera* L., sitoindosides and withaferin A, are reported to increase levels of endogenous superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPX), and ascorbic acid, with a concomitant decrease in lipid peroxidation (Mirjalali *et al*, 2009). A decrease in the activity of these enzymes is known to lead accumulation of free radicals and resulting in degenerative effects.

Anti-microbial activity:
The anti-bacterial properties of this plant were reported first time by Kurup (1956) against *Salmonella aurens*.

Anti-inflammatory property:
Ashwagantha act as an anti-inflammatory agent through inhibition of complement, lymphocyte proliferation and delayed type hypersensitivity (Rasool and Varalakshmi, 2006). The extracts of the plant have shown anti-inflammatory effects in a variety of rheumatological conditions (Al- Hindavi *et al*, 1992).

Anti-stress activity:
Anti-stress activity is associated with glycosides (Sitoindosides) present in the plant was reported by Bhattacharya (2000 and 2003). The studies conducted by (Singh *et al*, 2001) lent...
support to the usefulness of Ashwagandha as an anti-stress adaptogen.

Aphrodisiac activity:
Ashwagandha is also used as a tonic in the treatment of spermatopathia, impotence and seminal depletion (Nadkarni, 2002) and the man who used the herb enjoyed higher vigour performance (Boone, 1998). The higher concentrations of inorganic elements like Fe, Mg, K and Ni in the roots of this plant plays significant role in the diuretic and aphrodisiac activity of the drug (Lohar et al, 1992).

Anti-arthritic activity:
Ashwagandha powder has been found useful in acute rheumatoid arthritis and reduces the discomfort associated with arthritis (Bector et al, 1968). This property has been attributed to the active principle withaferin A.

Anti-neoplastic activity:
Ashwagandha is reported to have anti-carcinogenic effects. Research on animal cell cultures has shown that the herb decreases the level of the nuclear factor kappaB, suppresses the intracellular tumour necrosis factor, and potentiates apoptotic signalling in cancerous cell lines. It works to reduce tumour size.

Different plant part with uses and system of medicine:

<table>
<thead>
<tr>
<th>Plant Part</th>
<th>System of medicine</th>
<th>Uses</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unani</td>
<td>Asthma, Bronchitis, Leukoderma, Arthritis.</td>
<td>Stewart (1869), Mathani (1973).</td>
</tr>
<tr>
<td>Seeds</td>
<td>Ayurveda</td>
<td>Diuretic, Narcotic and Hypontic.</td>
<td>Dalzell and Gibson (1861).</td>
</tr>
</tbody>
</table>
CONCLUSION
The use of herbal drug is increasing worldwide as they have fewer or no side effects as compared with synthetic drugs. Ayurveda claims therapeutic potentials of various plants. A lot of work has been done on this multipurpose drug yielding plant till now. But all this information is fragmented therefore; the present review has been an attempt to compile this available information in a comprehensive manner. An extensive research has been done on this plant in past three decades but still there is an urgent need to carry out investigations on the biological activities, efficacies and modes of action of this traditional drug. In India, three species of the genus *Withania* are found, *Withania somnifera*, *Withania ashwagandha* and *Withania coagulans*. Withanolides are the principal compounds found in all the three species, there are some withanolides specific to each of them. Withaferin A is an important phytochemical found in *W. somnifera* and *Withania ashwagandha*, whereas, coagulin L has been found in major amounts in *Withania coagulans*. A unique thio-dimer of withanolide named Ashwagandhanolide has been found in *Withania somnifera*. The plant has been used as an antioxidant, adaptogen, aphrodisiac, liver tonic, anti-inflammatory agent, anticancer, central nervous system depressant, hepatoprotective and astringent and more recently as an antibacterial, anti-hyperglycaemic, hypolipidemic and antitumoral, as well as to treat ulcers, senile dementia, Parkinson’s and Alzheimer’s. It had the greater therapeutic value overall. The variety of activities reported for the extracts, fractions and withanolides isolated from this wonder medicinal plant provide promising evidence for future research. Withanolides could achieve an important place in the world of modern drugs. Isolation on a large scale, chemical transformations and synthesis of the active compounds will definitely enhance their pharmacological value. The pharmacophores of various pharmacologically active withanolides have not yet been identified. All these advantages prove the significance of *W. somnifera* in natural product research. Despite having immense medicinal properties a multipronged strategy is required for making Ashwagandha varieties more competitive. There is aneed to augment the pharmacological properties by selecting and improving chemotypes producing prodigious amounts of the desired withanolide.

REFERENCES


72) https://www.tradeindia.com/fp2076129/Ashwagandha-Withania-somnifera-.html