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Phytochemical Analysis and Study of Functional Groups by FTIR Analysis of *Withania Somnifera* L Dunal.

N. B. Mane*[1] and C. J. Khilare[2]

*[1]Botany Research Laboratory, Department of Botany, Yashavantrao Chavan Institute of Science Satara (Autonomous), nbmane123@gmail.com
[2]S. M. Joshi Mahavidyalaya, Hadapsar Pune, cjk_principal@redifmail

***Abstract*: *Withania somnifera* L. Dunal belongs to the family Solanaceae has been used as a medicinal weed all over India. It is commonly known as Ashwagandha. The medicinal weed has been used for to boost immunity. The Aswagandha (*Withania somnifera*) is one of the most powerful weeds in ayurvedic medicine. Medicine from Aswagandha relieves stress and keeps body rejuvenated to stay healthy. This study deals with the study of phytochemical analysis and protein estimation in *Withania somnifera*. Ethanol Aqueous and Acetone extract of roots, contains the presence of Alkaloids, Glycosides, phenol, Tannins, Flavens, Terpenoids, Cardioglycosides, Phytosterol Amino acids and Proteins, and Xanthoprotein.**

In ethanol (95%) extract of *Withania somnifera* showed the presence of Alkaloids, Glycosides, Phenols, Phytosterols, Flavonoids, Triterpenoides, cardioglycosides, Caumarins, Anthroquinones, Reducing sugar were present while, Carbohydrates, Saponine were absent. While FTIR analysis showed different functional groups in roots and leaves of *Withania somnifera.* The experiment carried out by using the plant part of the plant revealed the presence of different types of phytochemical constituents and analysis of different functional groups by FTIR method.

Keywords*: FTIR analysis, *Phytochemical* studies, *Withania somnifera.

I. INTRODUCTION

Withania somnifera (L. Dunal), known as Indian ginseng, is a dense pubescent shrub, which grows about 2 feet in height and belongs to the family of Solanaceae. It is a popularly known medicinal plant for its therapeutic use in Unani and Ayurvedic systems of traditional medicine of India and locally known as Ashwagandha.

Ashwagandha is also known as winter cherry. The roots are the main portions of the whole plant, as they possess wide number of therapeutic agents. The medicinal weed is termed as rasayana in Ayurvedic practice, which means it acts as a tonic for vitality and longevity. The plant grows in alkaline sand-soil in roadsides in Maharashtra, Madhya Pradesh, and semitropical region of India. Ashwagandha stimulates the immune system cells, such as lymphocytes and phagocytes, which also counteract the effects of stress and generally promote wellness. The present investigation helps to assess the status of phytochemical properties of roots of *Withania somnifera*, which could account for its varied medicinal properties.

The medicinal values of these plants lie in phytochemical constituents that produce definite physiological actions on the human body. These bioactive phytochemical constituents in medicinal weed plant parts include Alkaloids, Glycosides, phenol, Tannins, Amino acids and Proteins, Cardioglycosides, Terpenoides, Flavens and Phytosterol. Many pharmacological studies have been studied by Rajeev Nema et al., (2012) and highlighted properties of Aswagandha used as a multi- purpose medicinal agent. Plants can produce various kinds of secondary metabolites which are eliciting effects on other organisms Zwenger and Basu (2008). *W. somniferais* endemic to Ethiopia where its leaf and root traditionally used for the treatment of malaria. Sissay and Mekbib (2009). The main active constituents of *W. somnifera* root are steroidal alkaloids and steroidal lactones, which belong to a class of constituents called Withanolides. Phytosteroides, Withaferin 'A' is an active chemical constituent in Withanolides. Rajpal

(2008), Mishra (2000). Murugananthamet al., (2009) carried out the FTIR spectroscopic analysis in the powder sample of the root of medicinal plants. *W. somnifera* are best known for its rejuvenating properties (Sing and Kumar, 1998). The present investigation was undertaken to analyses

phytochemical screening, functional group analysis by FTIR method in medicinal weed plants.

FTIR spectroscopy is a rapid analytical method used for the detection of functional groups. Medicinal weeds are a promising source for herbal medicines over modern synthetic drugs. They show minimum or no side effects and are considered to be safe (Nivedittha Devi and Somasundram 2012). This plant is the weed of the arid region of Satara District. Therefore in present communication helps to assess the status of phytochemical properties of root of WS, taken for its varied medicinal properties, phytochemical screening, and FTIR analysis.

II MATERIAL METHODS:

A. Collection and Identification of the Plant Material:

The medicinal weed plant *Withania somanifera* was collected in the arid region of Satara District (M.S.) India and taxonomically identified and authentically was confirmed in the Department of Botany, Shivaji University, Kolhapur (M. S.), India. A voucher specimen was deposited in the herbarium of the recognized Research Lab, Department of Botany. Dahiwadi College Dahiwadi Dist- Satara for further reference in the research laboratory.

B. sample collection of plant material and preparation of extract:

The whole plant of *Withania somanifera* and their fresh root, which are free from diseases, were collected from fields of the grown area of Satara District (M.S.) India. The root washed thoroughly two-three times with running tap water.

The collected plant part root was dried under shade and then coarsely powdered with a mechanical grinder. The soxhlet extraction method was used for the phytochemical analysis of roots of test plants.

C. Soxhlet extraction: acetone water (1:1):

Soxhlet extraction used only for the desired compound has limited solubility in a solvent and the impurity is insoluble in that solvent. The advantage of this system is that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled. This method cannot be used for thermolabile compounds as prolonged heating may lead to degradation of compounds (Nikhal S.B., et al 2010).

D. Phytochemical analysis:

The present study was aimed to analyze phytochemicals in ethanol Aqueous, Ethanol, and Acetone solvent of the root of *Withania somnifera*. The analysis revealed the presence of Alkaloids, Glycosides, phenol, Tannins, Flavens, Terpenoids, Cardioglycosides, Phytosterol Amino acids and Proteins, in *W. somnifera*.. Carbohydrate, Coumarin, Anthraquinones, Reducing Sugar and saponins, Quinones was found to be absent in test plant.

The presence of Alkaloids, Glycosides, phenol, Tannins, Flavens, Terpenoids, Cardioglycosides, Phytosterol Amino acids, and Proteins, in the plants, is evident in the present study may be due to the geographical, physiological, and ecological status of the plants. The content of Tannins in test plants could be act as antioxidants and antimicrobial agents. Kolekar et al., (2008), reported higher content of Tannins in medicinal plants acts as an antioxidant, antiviral and antibacterial agent. Flavonoids appeared in the plants and other compounds of plant origin may be useful in pharmaceutical industries. Senthil Kumar et al., (2011) recorded flavonoids in medicinal plants and reported them as a pharmaceutical effect of flavonoids.

E. Fourier transform infrared spectrophotometer (FTIR) :

The root, of *Withania somanifera* was ground into fine powder by using an electric grinder. Dried powdered samples of the root of W. somanifera were used for FTIR analysis in the range of 400-4000cm-1 by employing the standard kb pellet technique. Fourier Transform Infrared Spectrophotometer (FTIR) is the most powerful tool for identifying the types of chemical bonds (Functional groups) present in compounds.

Fig1. FTIR Spectra of roots of *Withania somanifera* L. Dunal

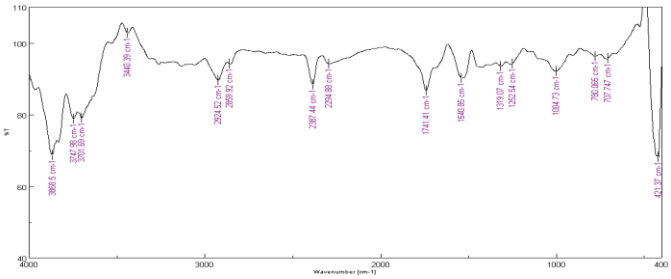

Table: 1. Phytochemical analysis of the root of *Withania somnifera*

Sr. No.	Tests Performed	*Withania somnifera* L. Dunal		
		ROOT		
		AQ	EE	AC
1	Alkaloids	+++ +++	++ ++	++ ++
2	Carbohydrates	-- --	-- --	-- --
3	Glycocides	+++ +++	-	+ +

4	Phenol	-- --	+++ +++	+++ +++
5	Tannins	-- --	+++ +++	+++ +++
6	Coumarins	-- +++	-- --	-- --
7	Anthraquinones	-- --	-- --	-- --
8	Phytosteroids	+++ +++	-- --	-- --
9	Flavones	+++ +++	-- --	-- --
10	Terpenoids	+++ +++	-- --	+ +
11	Cardioglycosides	+++ +++	- +	-- --
12	Reducing sugar	-- --	-- --	-- --
13	Amino Acid & Proteins	+++ +++	++ ++	-- --
14	Saponins	-- --	-- --	-- --
15	Quinons	++ +	-- --	-- --

'+++' - High concentration, '
++' – Moderate concentration,
'+'- Low concentration and '-'absent,
AE: Aqueous extract, EE: Ethanol extract,
AC: Acetone extract,+++ Before AM treatement.
+++ After Treatement

III. RESULT AND DISCUSSION:

The phytochemical screening of the aqueous, acetone and ethanol extract of the root of *W. somnifera* L. Dunal were qualitatively analyzed and depicted in Table no.1. In the screening process alkaloids, carbohydrates, glycosides, saponins, phytosterols, phenol, tannins, coumarins, anthraquinones, flavonoids, terpenoids, cardio glycosides, reducing sugars, amino acids and proteins, resin, and quinones showed different types of results in different solvents. However, all these bioactive molecules were not extractable in one solvent.

Phytochemical screening of different solvents revealed the presence of alkaloids, carbohydrates, glycosides, saponins, phytosterols, phenol, tannins, coumarins, anthraquinones, flavonoids, and terpenoids. Cardioglycosides, reducing sugars, amino acids and proteins, resin, and quinones.

Data on phytochemical screening of AMF treated and nonrelated test plant extracts showed the presence of Alkaloids, Glycosides, Tannins, Terpenoids, Cardioglycosides, Aminoacids and protein, Saponins, quinones, Flavens, carbohydrates, Phenol, Coumarine, Anthraquinones, Phytosterol, and Reducing sugars.

Various chemical tests were performed on ethanol, acetone, and aqueous extracts of *W. somnifera* for detection of phytochemical constituents present in them.

In the present study, the qualitative analysis indicated the presence of various phytochemicals in *W. somnifera* of drought-prone origin.

Different qualitative tests were carried out to confirm the presence of different phytochemicals like alkaloids, phenol, Tannins, carbohydrates, Glycosides, Saponins, Phytosteroids, Coumarines,

Anthraquinones, Flavonoids, Terpenoids Cardioglycocides, Reducing sugars, Amino acids, and proteins, Resin, Quinones, etc.

DISCUSSION:

The results of the phytochemical analysis are in confirmation with Bhalsing (2011), Yadav and Aggarwal 2011, Starlin and Mustak et al., (2012), from Tamilnadu, India studied screening and functional group analysis in *Tylophora* and reported, *Tylophora passiflora* having phytochemicals with the presence of Tannins, Phenols, Flavonoids, and Terpenoid. Mustak et al., (2012) from Hydrabad (A. P.), India studied a comparative study of Tephrosia purpura and recorded Flavonoids in the extract of the plant. Yadav and Agarwal (2011) reported phytochemical analysis of some medicinal plants. Carbohydrates, Phenols, and Tannins, Flavonoids and Saponins from medicinal plants. Sentil Kumar et al, (2011) screened Phytochemical constituents of Withania somanifera and reported nitrogen, hydrocarbon component,s, and other compounds. Phenolic compounds were detected from *Withania somanifera*.

The FTIR spectrum of root powder of *Withania somanifera*. is given in Fig.1. The data obtained on the peak values and probable functional groups generated on the FTIR

spectrum profile in the root powder of both the test plants are presented in Table No. 2.

The FTIR spectral analysis of root powder of *Withania somanifera* exhibited a characteristic absorption band at 3440 and 2924cm-1 indicating the presence of phenol and Carboxylic acids respectively with (O-H) group and at 1540 and 1004cm-1 for N-O group of Nitro and ethers respectively. The results are in agreement with Lethika *et al* 2013. Ragavendrum (2011) studied FTIR spectroscopy analysis of few medicinal plants. They identify the chemical constituents in medicinal plants and understand the

significance of functional groups as bioactive constituents for treatment of various diseases. Ragavendum (2011) carried out functional groups analysis of various extracts of *Aerva lanata* (L.), by FTIR spectrum and reported functional groups amines, amides, Carboxylic acids; organic hydrocarbons are responsible for various medicinal properties of *Aerva lanata*. In the present research work was undertaken in the view to identify the functional groups present in roots of *Withania somanifera* with the help of FTIR analysis.

It is concluded that the bioactive compounds in roots of and *Withania somanifera* may be useful for pharmaceutical compounds and will also be beneficial for designing of drugs after their standardization

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