

## Short Communication

# Antibacterial and antifungal activity of *Terminalia Arjuna* leaves extract with special reference to flavanoids

Rajeev Nema<sup>\*1</sup>, Parul jain<sup>1</sup>, Sarita Khare<sup>1</sup>, Alka Pradhan<sup>1</sup>, Abhishek Gupta<sup>1</sup>, Dharmendra Singh<sup>1</sup>

Sarojini Naidu Government Girls Post Graduate (Autonomous) College,  
Shivaji Nagar, Bhopal - 462016 (M.P.) Center for Microbiology and Bio-Technology Research and Training.

\*Corresponding author email: rrsht.nema@gmail.com

Accepted 05 December, 2012

**Arjuna (*Terminalia arjuna*) is a widespread medicinal plant used in the ayurvedic system of medicine to care for various ailments and is one of the active ingredients in numerous polyherbal hepatoprotective formulations now used in India. Its stem, bark, leaves possesses glycosides, large quantities of flavonoids, tannins and minerals. Flavonoids have been detected to exert antioxidant, anti-inflammatory and lipid lowering effects whereas glycosides are cardiogenic, therefore making *Terminalia arjuna* distinctive amongst currently used medicinal plants. *Terminalia arjuna* leaves, (Flavonoids) antimicrobial and antifungal activity study has been restricted that's why in the present study we have addressed and provides an overview of extraction, phytochemical analysis, flavonoid quantification and FTIR Spectroscopy (Fourier Transform Infrared) analysis of *Terminalia arjuna* leaves.**

**Keywords:** FTIR, *Arjuna*, Flavanoids, antibacterial and antifungal evaluation.

## INTRODUCTION

Medicinal plants are the oldest existing complete medical system in the world. And now green-chemistry move toward has demonstrated to be a skillful and early tool for natural drug development. Natural products are important sources for biologically active drugs (Saleh et al., 2009). There has been a growing interest in the study of medicinal plants as natural products in diverse parts of the world (Gazzaneo et al., 2005). Medicinal plants containing active chemical constituents with high antioxidant property play an important role in the prevention of various degenerative diseases (Lukmanul et al., 2008), and have possible benefits to the humanity. Phenolics are commonly found in medicinal plants and have been reported to have multiple biological effects, including antioxidant activity.

The Indian system of Medicine owes its origin (Shatvlekar and AtharvaVeda, 1943; Dwivedi and Chaturvedi, 2000). *T. arjuna* (Combretaceae) is a good hypocholesteremic, hypolipidemic, anticoagulant, antihypertensive, antithrombotic, antiviral, antifungal and antibacterial agent. Many useful phytoconstituents have been isolated from *T. arjuna* which includes, triterpenoids

for cardiovascular properties, tannins and flavonoids for its anticancer properties, and so on. The bark, leaves and fruits of *Terminalia arjuna* have been used in indigenous system of medicine for different ailments (Warrier et al., 1996). *Terminalia arjuna* bark contains a very high level of flavonoids compared to other commonly used plant item. Flavonoids detected from its bark are namely, arjunolone, flavones, bicalein, quercetin, kempferol and pelargonidin. The present study is aimed to investigate the antibacterial and antifungal activity of *Terminalia Arjuna* Leaves Extract.

## MATERIAL AND METHOD

### Plant material collection

*Terminalia arjuna* leaves of plants were collected from sanjivani ayurvedic nursery Bhopal during October month 2011. Than dried up under the shed dry for three week furthermore crush it.

### Soxhlet extraction: hydroalcoholic (1:1)

*Terminalia arjuna* leaves of plants were used for Soxhlet extraction with solvent system of hydroalcoholic (1:1). Soxhlet extraction is only required where the desired compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent. If the desired compound has a high solubility in a solvent then a simple filtration can be used to separate the compound from the insoluble substance. 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 thermo labile compounds as prolonged heating may lead to degradation of compounds.

### Phytochemical analysis

Phytochemical analysis is a major procedure for estimation of particular chemical compound so that following soxhlet extraction crude drug evaporated under steam bath tank, And Phytochemical analysis was proceed with the help of different specific method for each test. All phytochemical analysis (test) has been done by using the C.K.. Kokate (Practical Pharmacognocny) as a reference book.

### Column chromatography

After phytochemical analysis bioactive compound present in extract was separate out by column chromatography in a proper solvent system. Column chromatography was performed on a classic 20 cm long × 2 cm diameter glass column packed with 50 g Silica gel of 60-120 mesh size as stationary phase and chloroform, methanol and water (2:2:1) solvent used as mobile phase to elute out the fractions of *Terminalia Arjuna* leaves extract<sup>9</sup>.

### FTIR analysis

FT-IR analysis of the extracts was done for the purpose of functional groups associated was determined; The FT-IR spectrum of the plants extracts recorded the number of peaks. FTIR analysis has been done by brukar FTIR Spectroscopy.

### Total flavonid estimation of Terminalia Arjuna leaves

Total flavonoid contents were measured by aluminum chloride colorimetric assay. Hydro-alcoholic extracts that has been adjusted to come under the linearity range and different dilution of standard solution of Quercetin (10-100µg/ml) were added to 3ml of water. To the above

mixture, 0.1ml of 5%  $C_4H_4O_6KNa.4H_2O$  (Potassium Sodium L-(+) - Tartrate Tetrahydrate) was added. After 5 minutes, 0.1ml of 10%  $AlCl_3$  was added and the total volume was made up to 3 ml with distill water. It was left at room temperature for 30 min after which the absorbance of the reaction mixture was measured at 430 nm with a single beam Visible spectrophotometer, Systronic (106).

### Antimicrobial analysis

This study was carried out with an objective to investigate the antibacterial and antifungal potentials of Hydro alcoholic *Terminalia arjuna* leaves extract. The aim of the study is to assess the antimicrobial activity and to determine the zone of inhibition of extracts on some bacterial and fungal strains.

The antimicrobial activity was determined in the *Terminalia arjuna* leaves extract using agar disc diffusion method. The antibacterial and antifungal activities of *Terminalia arjuna* leaves extract (40, 60, 80,100 %) were tested against two Gram-positive—*Staphylococcus aureus*, *Bacillus coagulans* and one Gram-negative—*Escherichia coli*, human pathogenic bacteria; and three fungal strains—*Aspergillus niger*, *trichoderma viride* and *Fusarium oxysporum*. Zone of inhibition of *Terminalia arjuna* leaves extract were compared with that of different standards like Streptomycin for antibacterial activity and Griseofulvin for antifungal activity. The results showed that the remarkable inhibition of the bacterial growth was shown against the tested organisms.

## RESULT AND DISCUSSION

### Phytochemical evaluation

#### Preliminary phytochemical tests

S.NO	NATURAL PRODUCT	TEST PERFORMED	RESULT
1	FLAVONOIDS	Ferric Chloride Test	+VE

### FT-IR spectral analysis

The FT-IR analysis of the *Terminalia arjuna* leaves was done and the functional groups associated were determined .The FT-IR spectrum of the sample was obtained effective peaks. the FT-IR spectrum of the *Terminalia arjuna* leaves samples recorded the number of peaks lying between  $3350.73\text{ cm}^{-1}$ ,  $2959.08\text{ cm}^{-1}$ ,  $2933.51\text{ cm}^{-1}$ ,  $2873.98\text{ cm}^{-1}$ ,  $1714.36\text{ cm}^{-1}$ ,  $1457.89\text{ cm}^{-1}$ ,  $1378.43\text{ cm}^{-1}$ ,  $1210.83\text{ cm}^{-1}$ ,  $1113.18\text{ cm}^{-1}$ ,  $1070.84\text{ cm}^{-1}$ ,  $1041.56\text{ cm}^{-1}$ ,  $1028.36\text{ cm}^{-1}$ ,  $1009.84\text{ cm}^{-1}$  respectively. This finding helps in further research in the investigation of other medicinal plant with different solvent fraction for their antioxidant activity and it also useful to utilize of

**Table 1.** Antibacterial activity of compounds

	Diameter of Zone of inhibition (mm) against											
	(+) <i>Bacillus coagulans</i>				(+) <i>Staphylococcus aureus</i>				(-) <i>Escherichia coli</i>			
	Concentration of compound				Concentration of compound				Concentration of compound			
	100%	80%	60%	40%	100%	80%	60%	40%	100%	80%	60%	40%
T.A	14.2	10.3	9.1	6.5	16.3	15.0	12.7	10.4	12.1	9.3	6.3	5.2
**Std.	21.2	20.0	19.5	18.0	20.0	19.1	18.3	17.9	18.3	17.0	15.6	14.0

\*The zone of inhibition (mm) taken as average of four determination in four different direction.

\*\*Streptomycin used as standard antibacterial agent.

## Antifungal activity

**Table 2.** Antifungal activity of compounds

	Diameter of Zone of inhibition (mm) against											
	<i>Aspergillus niger</i>				<i>Tricoderma viride</i>				<i>Fusarium oxysporum</i>			
	Concentration of compound				Concentration of compound				Concentration of compound			
	100%	80%	60%	40%	100%	80%	60%	40%	100%	80%	60%	40%
T.A	10.6	8.8	6.2	4.0	12.5	9.0	6.2	3.5	10.4	7.3	4.1	2.0
**Std.	16.8	15.2	14.0	12.8	23.4	22.0	20.9	10.5	20.1	18.7	17.0	15.3

\*The zone of inhibition (mm) taken as average of four determination in four different direction.

\*\*Griseofulvin used as standard antifungal agent.

*Terminalia arjuna* Plant as a source medicine.

## Quantification

Current study revealed the flavonoid contents of the leaves, and stem of *Terminalia arjuna* leaves. (Quercetin standard plot:  $y = 0.0966x$ ,  $R^2 = 0.9878$ )<sup>8</sup>. on the basis that calibration curve was plotted by preparing the Quercetin solutions at concentrations 12.5 mg/ml-1. Total flavonoid content of the extracts was expressed as percentage of flavonoid in plant extract 4.35  $\mu\text{g./ml}$  equivalents per dry weight of sample and take notice of  $y = 0.002x + 0.0148$ ,  $R^2 = 0.993$ .

## Antibacterial activity

## CONCLUSION

In the present time herbal products are considered to be symbols of protection in contrast to the synthetic product that are regarded as risky to human life and environment. Some Medicinal plants have therapeutic potential due to the occurrence of natural antioxidants. Now everyday phytochemical and pharmacological studies are conducted on different parts of *Terminalia arjuna* plant. The present literature supports the antimicrobial potential of *Terminalia arjuna* leaves. More research can be done to investigate the unknown and unexplored potential of this plant. Further structural analysis of *Terminalia arjuna* leaves (flavonoid compounds) can be carried out by way

of making use of different analytical methods such as NMR and Mass spectrophotometer analysis.

## ACKNOWLEDGEMENT

The authors express gratitude SIRT pharmacy department Bhopal for FTIR analysis facility and kind support.

## REFERENCES

- Dwivedi S, Chaturvedi A (2000). Cardiology in ancient India. J. Indian College Cardiol. 1: 8-15.
- Elija K, Vaishali BA, Manik MK, Deshpande NR, Kashalkar RV (2010). Spectroscopic determination of total phenol and flavonoid contents of Ipomoea carnea. Intern. J. Chem.Tech. Res. 2(3)-1701.
- Gazzaneo Ir, De lucena PRF, Paulino de Albu QU (2005). In vitro antioxidant activities of ocimum species: ocimum basilicum and ocimum sanctum, J. Ethnobiol. Ethnomed. Pp1: 9.
- Lukmanul HF. Girija A, Boopathy R (2008). Antioxidant property of selected Ocimum species and their secondary metabolite content. J. Med. Plants Res. 2(9): 250-257
- Saleh AI, Al-Dosari M, Abdul MS, Alsheikh M, Abdel-kader MS (2009). Evaluation of the Hepatoprotective Effect of *Fumaria parviflora* and *Momordica balsamina* from Saudi Folk Medicine Against Experimentally Induced Liver Injury in Rats. Res. J. Med. Plants, 3(1): 9-15.
- Sharma PN, Shoeb PN, Kapil RS, Popli SP (1982). Arjunolone—a new flavone from stem bark of *Terminalia arjuna*. Indian J. Chem. 21B, 263-264
- Shatvarekar S, AtharvaVeda S (1943). 1st ed. Balsad, Maharashtra, India: Suyadhyay Mandal Kila Pardee publication. p. 25.
- Waksmundzka-Hajnos M, Wawrzynowicz T (1992). Preparative Layer Chromatography. J. Planar Chromatogr., 5, 169
- Warrier PK, Nambiar VPK, Ramankutty C (1996). Indian medicinal plants: a compendium of 500 species. Orient Blackswan, Pp 592.