

Phytochemical, Antioxidant And Antimicrobial Activity Of A Ethnoveterinary Important Plant (Terminalia Arjuna)

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Abstract: *In the present study phytochemical, antioxidant and antimicrobial activity of Terminalia arjuna was performed by using standard methodology. It is a rich source of secondary metabolites such as alkaloids, glycosides, tannins, saponins, Proteins, Steroids and carbohydrates. DPPH values exhibited by the methanol extract were 204.6. Terminalia arjuna at 100mg/ml showed maximum activity on Aspergillus fumigatus (20 mm) followed by Brucella abortus (17mm). Further work is needed to locate the active principle from the various extracts and their phyto pharmaceutical studies.*

Keywords: *Terminalia arjuna, Aspergillus fumigates, Brucella abortus*

1. INTRODUCTION

There are 536.76 million cattle and 851.81 million poultry birds in India [1]. The livestock industry accounts for 4.9 percent of the nation's GDP (gross domestic product) and almost 28.4 percent of agricultural GDP [2]. India is the world's greatest producer of milk (187.75 million MT), as well as 103 billion eggs and 8.1 million tonnes of meat in 2018-2019 [2]. India is the world's greatest producer of milk (187.75 million MT), as well as 103 billion eggs and 8.1 million tons of meat in 2018-2019 [2]. Despite strong development in the livestock business, animal illnesses constitute a stumbling barrier to efficient expansion in the livestock sector. Furthermore, zoonotic illnesses have a substantial impact on the sector's growth. The risk of zoonotic disease transmission to humans may be significant owing to intimate contact with animals as a result of conventional husbandry techniques with insufficient biosecurity and biosafety precautions.

Zoonotic illnesses are worldwide health concerns caused by the intricate interactions of humans, animals, and the environment. There are around 1415 pathogenic infectious agents to humans, with roughly 60% being zoonotic. It is particularly concerning since 75% of new infections are zoonotic in origin. [3],[4]. Furthermore, food-borne illnesses and antimicrobial resistance (AMR) have increased the strain on the nation's health-care system and economy. Given the resurgence of existing diseases as well as the advent of new diseases, a One Health strategy is essential [5]. Because some developing illnesses use animals as reservoirs, disease surveillance in animals has the extra benefit of safeguarding humans by detecting, preventing, and controlling zoonotic infections early. As a result, the current study focuses on the infrastructure, functioning mechanisms, and gaps in animal disease surveillance programmes in India. It also highlights the scope to integrate keeping the human disease surveillance system with the focus on zoonotic diseases.

With a history dating back over 5000 years, India boasts one of the most advanced medical civilizations. Since time immemorial, cattle owners in India have used traditional medicine based on plant mixtures. Traditional methods of categorizing, diagnosing, preventing, and treating common animal illnesses are used by livestock raisers and healers all throughout the world. Many of these "ethno veterinary" methods are effective alternatives or supplements to traditional, Western-style veterinary medicine, particularly when the latter is unavailable or unsuitable. The distinct benefit is that India is one of the world's 12 mega diversity countries, accounting for 8% of global plant genetic resources and a greater proportion of microorganisms.

Ethno-vet practices have grown recently because these practices are much less prone to drug resistance and have fewer damaging side-effects on the environment than conventional medicine. Traditional healing practices make use of three important elements:

1. Application of natural products
2. Appeal to spiritual forces
3. Manipulation and surgery

Natural products used are:

- a. Medicinal plants and by-products
- b. Edible earth and minerals
- c. Parts and products of animals
- d. Other ingredients

Advantages and disadvantages of Ethno Veterinary Medicine (EVM):

Advantages of EVM:

- It is freely available or at a cost in proportion to the value of the animal.
- It is easily administered, usually topically or orally.

Disadvantages and Limitations:

- Particular methods are often much localized and the scope for their further dissemination is limited.
- Cures are variable in their effectiveness according to season, method of preparation etc., and few have been validated in the same way in which synthetic drugs must be validated.
- From a technical standpoint some are totally ineffective.
- EVM has little or nothing to offer against the acute viral diseases of animals.

2. MATERIAL AND METHODS

Terminalia arjuna L. (Combretaceae) is a large evergreen deciduous tree (Commonly known as Arjuna) found throughout India growing to a height of 20-25 m. It commonly grows on banks of rivers, streams and dry watercourses and distributed throughout the greater part of Indian sub-continent, Himalayan tract of Uttar Pradesh, Chota Nagpur, Orissa, west Bengal, Punjab, Deccan and Konkan. The bark of *Terminalia arjuna* is soft and thick with grey in colour on outer surface and tinge easily flakes off in flat large pieces inside.

Extraction

100 g of ground weighed material of fine coarse powder was successively extracted by different solvents of hexane, chloroform and methanol, in a specific sequence based on increasing polarity. The soxhlet hot extraction procedure for each of the above solvents was run for about 6 hours, until a colorless solvent was seen in the siphon tube, which indicated complete extraction. The solvents were removed under reduced pressure and controlled temperature by

rotary evaporator. The extracts were dried and stored in a clean glass bottle and kept at 4-6°C for further antimicrobial screenings at 4°C till further investigation.

Preparation of inoculums

Veterinary pathogens such as *Candida albicans*, *Clostridium septicum*, *Aspergillus fumigatus*, *Salmonella enterica* and *Brucella abortus* used as test organisms. Cultures of bacteria were grown for 12 h in nutrient broth at 37°C. Cultures of fungi were initially grown in potato dextrose broth at 25°C for 24 h.

Out of three extracts methanol extracts exhibited moderate to high activity in all the performed tests. Preliminary phytochemical analysis, antioxidant and antimicrobial activity was done based on the standard methods.

3. RESULTS

Yield was highest in Soxhlet Extraction method when compared with the Maceration. Yield was *Terminalia arjuna* (51%). It is a rich source of secondary metabolites such as alkaloids, glycosides, tannins, saponins, Proteins, Steroids and carbohydrates. Percentage of loss on drying was (9.92%). Ash content was observed with *Terminalia arjuna* was 4.8%. Total Flavonoids contents exhibited by the methanol extract were 129.86±0.07 mg RUE/g. Total phenolic contents exhibited by the methanol extract were 136.86 mg GAE/gm. FRAP values exhibited by the methanol extract were 119.17±0.07. [table 1]

The antioxidant activity of different plant extracts was determined using a methanol solution of DPPH reagent. The antioxidant activity was expressed in terms of percentage of inhibition (%). The effect of antioxidants on DPPH is thought to be due to their hydrogen donating ability. DPPH values exhibited by the methanol extract were 204.6. [fig 1]. *Terminalia arjuna* at 100mg/ml showed maximum activity on *Aspergillus fumigatus* (20 mm) followed by *Brucella abortus* (17mm), *Clostridium septicum* (16 mm), *Candida albicans* (15mm) and least activity was observed in *Salmonella enterica* (14 mm). [table 2]

4. DISCUSSION

Ethnoveterinary medicine, the scientific term for traditional animal health care, encompasses the knowledge, skills, methods, practices, and beliefs about animal health care found among the members of a community (6). The knowledge base differs not only from region to region but also among and within communities. It has been developed through trial and error and deliberate experimentation. Therefore, it is less systematic, less formalized, and not universally recognized as a valid method of disease control in animals. In many countries, there has been little documentation of traditional knowledge; rather, it has been transmitted across generations by an oral tradition and therefore is in danger of extinction. While traditional healers have less to offer in the treatment and control of epidemic and endemic infectious diseases like foot and mouth disease, rinderpest, septicemia, anthrax, and acute life-threatening bacterial diseases, they can cope with a reasonable spectrum of common diseases such as diarrhea, wounds, colds, worms, coccidiosis, and reproductive disorders.

Extraction is an important step in the recovery of phytochemicals from the plants. The extraction yield depends on solvent, time and temperature of extraction as well as chemical nature of the sample (7). The most commonly used solvents for the extraction of phytochemicals are methanol, ethanol and acetone either singly or in combination with water

(8and9). The polarities of the different organic solvents greatly influence extraction of a specific group of bioactive compounds. The yield in the present study varied from solvent to solvent and was in the order of methanol > water > ethyl acetate > hexane. The variation in the yield may be due to the polarity of the solvents used in the extraction process. Therefore, it is necessary to use the solvents of different polarity to separate out the polar and nonpolar components.

Leaves of *T. arjuna* are simple, borne opposite shortly acute or obtuse at the apex, glabrous 4-6 inch long and 2-3 inch wide, there are two glands near the base of the petiole. There is a morphological difference in leaf traits of this plant (10). It has pale yellow flowers with short auxiliary spikes or terminal panicle arrangement, which appear between March and June; its glabrous, 2.5-5cm fibrous woody fruit with smooth skinned divided into five hard wings, appears between September and November.

Ayurvedic formulation

Terminalia arjuna is tremendous plant having enormous influence in ayurvedic system of medicines. In Rigveda, the word 'Arjuna' used either to indicate the white colour or one of taintless fame and glow like silver (11 and 12). It may be the first reference of Arjuna used as medicine stated in chief or principle sutra volume of Atharvaveda, Kaushiksutra (400300 B.C.). Further synonyms and properties of Arjuna are mentioned in Bhavprakash Nighantu. Later on Chakradatta, the great ancient physician, recommended uses of Arjuna bark in form of decoction with milk (Kshirpaka) or as a ghrita (a preparation with ghee) (13).

5. CONCLUSION

In conclusion, natural products discovered from medicinal plant *Terminalia arjuna* (and derivatives thereof) have provided numerous clinically used medicines. Even with all the challenges facing drug discovery from medicinal plants, natural products isolated from medicinal plants can be predicted to remain an essential component in the search for new medicines. Therefore, the world has been witnessing the growth of scientific and commercial interests in plant-based medicines mainly due to their immense economic potential and the widespread cultural acceptability. Further work is needed to locate the active principle from the various extracts and their phyto pharmaceutical studies. Research into the effects of local medicinal plants is expected to boost the use of these plants in the therapy against disease caused by the test bacterial species and other microorganisms.

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S.NO	Phytochemical test	<i>Terminalia arjuna</i>
1.	Alkaloids	++
2.	Flavanoids	-
3.	Glycosides	+++
4.	Cardiac glycosides	-
5.	Tanins	+++
6.	Phenols	+++
7.	Steroids	+++
8.	Quinones	-
9.	Proteins	+
10.	Carbohydrates	+
11.	Saponins	+++

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Table 1: Preliminary phytochemical analysis of *Terminalia arjuna*

Figure 1: DPPH activity of *Terminalia arjuna*

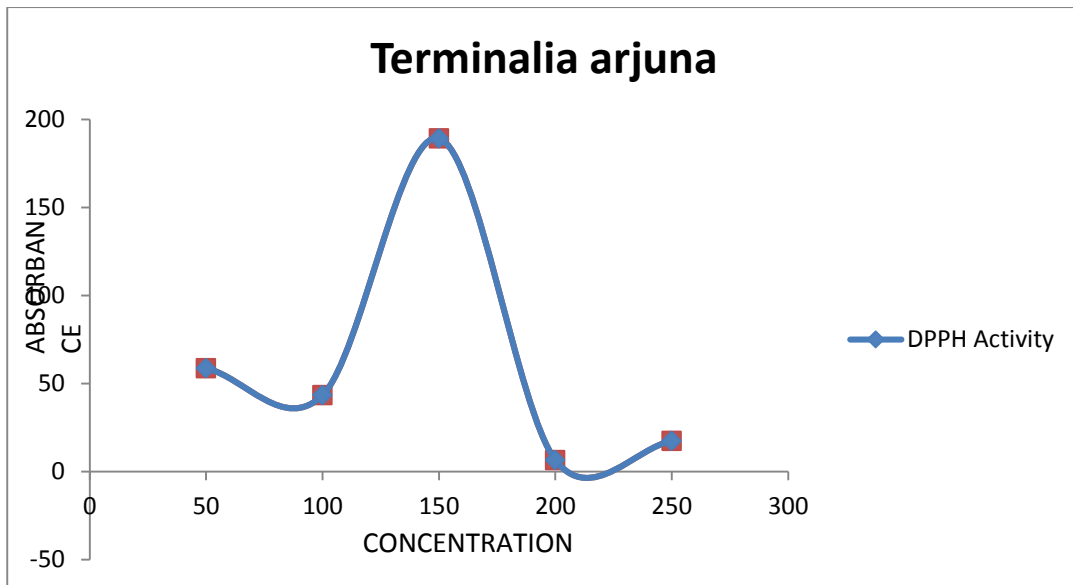


Table 2: Antimicrobial activities of methanol extract of *Terminalia arjuna*

S.No	Organism	Zone of inhibition (mm)					
		200mg/ml	150mg/ml	100mg/ml	MI C	Standar d	Contro l
1.	<i>Brucella abortus</i>	17	15	13	20	37	6
2.	<i>Clostridium septicum</i>	16	15	13	20	37	6
3.	<i>Salmonella enterica</i>	14	13	11	25	36	6
4.	<i>Aspergillus fumigatus</i>	20	17	16	15	36	6
5.	<i>Candida albicans</i>	15	13	12	20	34	6

Zone of inhibition in mm; 6mm borer size; 25µl per well; Standard: Ciprofloxacin/Fluconazole; Control: DMSO