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'Comparative Anti-oxidative Potential of Barks Phenolics of Genus *Termanalia*'

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ABSTRACT

The herbal extracts of Genus *terminalia* have been used in traditional treatment of Alzheimer's disease, cancer, atherosclerosis, diabetes mellitus, and inflammatory diseases. Here we have evaluated the comparative antioxidant potential of phenolics and their amounts in barks of *Terminalia catappa, Terminalia chebula, Terminalia arjuna and Terminalia belerica*. The amount of phenolics was estimated by using a method of Folin-Ciocalteu reagent and the antioxidant activity examined by DPPH (2-diphenyl-1-picrylhydrazyl) reagent. The amount of phenolics were observed in order of *T. catappa* >*T. arjuna* >*T belerica* >*T. chebula*. The highest IC_{50} value 171.66 ± 7.637 was observed in *T. belerica* followed the IC_{50} value 93.16 ± 2.516 was observed in *T. catappa*. Similarly, the minimum IC_{50} value 38.33 ± 0.763 near about equivalent to IC_{50} value 34.16 ± 0.763 of ascorbic acid was observed in *T. arjuna*. In conclusion this studies useful in selection of *Terminalia* species for drug preparation against various disorders.

Key words : B*erminalia,* Phenolics, DPPH, Anti-oxidative property, Drug preparation.

INTRODUCTION

Several species of Genus *Terminalia* have been used as therapeutic drug against many disorders. Some species of *Terminalia* have been used in traditional treatment of cancer (1). Phytochemical analysis of *Terminalia species* shows the presence of gallic acid, ellagic acid, tannic acid, ethyl gallate, chebulic acid, chebulagic acid, corilagin, mannitol, ascorbic acid (vitamin C), and other compounds (2,3). These phenolics exhibit several biological effects such as anti oxidant, anti cancer, anti-inflammatory, anti ulcer, hepatoprotective, anti microbial, antitumour, astringent, anti-hemorrhagic, and anti-bacterial (4,5). *Terminalia arjuna* traditionally used as astringent**,** wound healing, cardiac stimulant, heamoptysis, lithontriptic and also useful in bilious infections, diarrhoea and in acne (6).

It is well known that the reactive oxygen species (ROS) such as super oxide anion, hydroxyl radical and hydrogen peroxide are highly reactive and potentially damaging transient chemical species. The tissue damage resulting from an imbalance between ROS-generating and scavenging systems inside the body. The decrease or damage scavenging systems leads to variety of disorders, including degenerative disorders of the CNS (central nervous system), such as Alzheimer's disease, cancer, atherosclerosis, diabetes mellitus, hypertension, AIDS and aging (7,8). The antioxidative potential in *T. catappa, T. chebula T. arjuna and T. belerica* have been reported earlier (9, 10, 11). Besides antioxidant activity *Terminalia* species exibit anti-HIV reverses transcriptase, anti-inflammatory, and antidiabetic effects (12).

The main objective of present study was to compare antioxidant potential and amount phenolic compounds in barks of *Terminalia* species. The comparative study will assess the selection of potent anti-oxidative potential producing species from selected *Terminalia* species for drug preparation.

MATERIALS AND METHODS

Collection of samples

The barks of *Terminalia catappa, Terminalia chebula, Terminalia arjuna and Terminalia belerica* were purchased from local market of Aurangabad. The samples were kept at room temperature until dried. The samples were crushed into fine powder by mixture grinder.

Preparation of Methanol extract

The fine powders were soaked into methanol (1; 10 w/v) and kept for overnight in stirring condition. Thereafter mixed samples were centrifuged at 6000 rpm for 15 min and the supernatants collected. The remaining solids were extracted twice with the same solvent and extracts combined and stored at -20°c for further experiment.

Estimation of total phenolics

The phenolics were estimated by using Folin-Ciocalteu method with slight modifications (13). The methanolic extracts and gallic acid (standard phenolic compound) were mixed with Folin-Ciocalteu reagent (0.5 ml) and incubate at room temperature for 3 min followed addition of 2% Na_2CO_3 and incubated for 1 min in boiling water bath. Cooled the samples under tap water and optical density recorded at 650 nm. The amount of phenolics was determined by plotting standard graph and concentration expressed in gallic acid equivalents (GAE mg/ml).

DPPH radical scavenging assay

DPPH radical scavenging activity of the methanolic extracts was estimated using a slight modification of the protocol reported earlier (14). For a typical reaction, 2ml of 100 µm DPPH solution in ethanol/acetone was mixed with increasing phenolics concentration of extract. The ascorbic acid was used as standard reference antioxidant. The reaction mixture was incubated in the dark for 15 min and thereafter the optical density was recorded at 517 nm against the blank. For the control, DPPH solution in ethanol/acetone was taken without plant extracts and the optical density was recorded after 15 min. The each assay was carried out in triplicate. The decrease in optical density of DPPH on addition of test samples in relation to the control was used to calculate the antioxidant activity, as percentage inhibition of DPPH radical scavenging calculated using the following equation:

Effect of scavenging (%) = [1-A sample (517 nm) /A control (517 nm)] ×100

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RESULTS AND DISCUSSIONS

The interest in the phenolics has increased outstandingly due to their prominent free radical scavenging activity. Phenolic compounds could be classified as simple phenols, a single aromatic ring bearing at least one hydroxyl group, and polyphenols with at least two phenol subunits like flavonoids or three and more phenol subunits called tannins (15).

The total phenolics content in methanolic extracts prepared from barks of *T. catappa, T. arjuna T. belerica and T.chebula* were estimated by using a standard method of Folin-Ciocalteu. Methanol has been proven as effective solvent to extract phenolic compounds (16)**.** The maximum phenolics 44.26 ± 0.923 mg/ml GAE was estimated in *T. catappa* followed 12.4 ± 0.4 mg/ml GAE in *T. arjuna*. The presence of minimum phenolics among all four species 1.43 ± 0.621 mg/ml GAE was observed in *T.chebula*.(Table 1).The phenolics of *Terminalia* are very important because their role in various human diseases like atherosclerosis, stroke, diabetes, cancer and neurodegenerative diseases, such as Alzheimer's and Parkinsonism have been reported earlier (17).

The antioxidant potential determined by using DPPH (diphenyl picrylhydrazyl). The increasing concentrations of phenolics were treated with DPPH and their effects were observed like dose dependent antioxidative potential (Figure 1, 2, 3, and 4). The maximum IC_{50} value 171.66 ± 7.63µg/ml was observed in *T. belerica* and the minimum IC_{50} value 38.33 ± 0.763 was observed in *T. arjuna* (Table 1). The antioxidant potentials in *T. arjuna and T. chebula* were similar to standard antioxidant i. e. Ascorbic acid. The IC_{50} value of *T. arjuna* was minimum and hence it was confirmed that the phenolics in *T. arjuna* have a enormous anti-oxidative potential than three other species. The phenolics in *T. chebula* also have an excellent anti-oxidative potential. DPPH is a stable free radical. When antioxidant reacts with this stable radical, the electron becomes paired off and bleaching of the color stochiometrically depends on the number of electrons taken up (18).

Table 1: Total phenolics content and Anti-oxidative potential of *Terminalia* species.

Sr. No.	Name of the species	Total Phenolics content GAE in mg/ml (n= 3)	IC_{50} µg/ml (n=3)
1	*Terminalia catappa*	44.26 ± 0.923	93.16 ± 2.516
2	*Terminalia belerica*	1.60 ± 0.051	171.66± 7.637
3	*Terminalia chebula*	1.43 ± 0.621	52.66 ± 2.254
4	*Terminalia arjuna*	12.4 ± 0.4	38.33 ± 0.763
5	Ascorbic acid	————	34.16 ± 0.763

Figure 1: Evaluation of antioxidant potential in *Terminalia belerica*

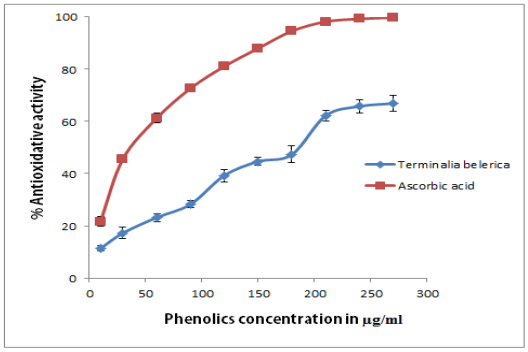

Figure 2: Evaluation of antioxidant potential in *Terminalia arjuna*

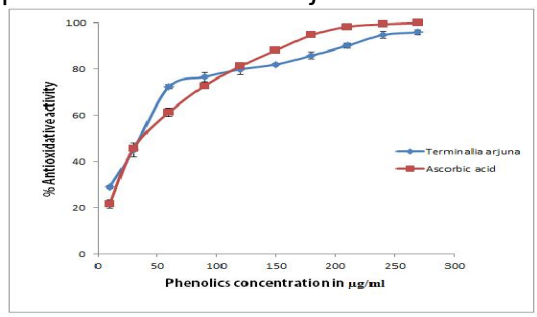

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Figure 3: Evaluation of antioxidant potential in *Terminalia chebula*

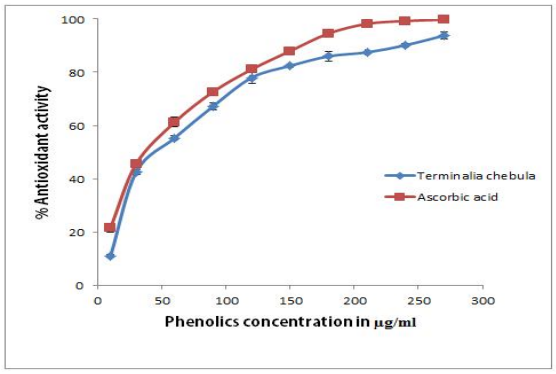
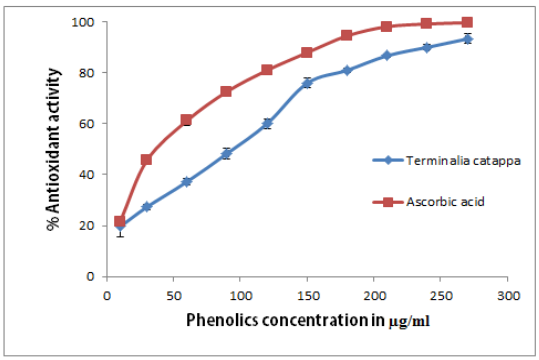


Figure 4: Evaluation of antioxidant potential in *Terminalia catappa*



CONCLUSION

In this study, it was demonstrated for the first time the phenolics extracts from barks of *T. chebula, T. catappa, T. arjuna and T. belerica* exhibited different antioxidant potential. The phenolics of *T. arjuna* was found most efficient antioxidants. This study will applicable in selection of *Terminalia* species for the preparation of potent drug against various disorders.

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