

IN VITRO ANTIOXIDANT ACTIVITY OF SOME MEDICINAL PLANTS WITH COMPARATIVE ANALYSIS

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ABSTRACT

Natural products have played crucial role in drug discovery and development. They are capable of combating free radicals mediated diseases. The most important of these bioactive constituents of natural products or plants are phenols, flavonoids, alkaloids, terpenoids, tannins, glycoside and saponins. Phenols, flavonoids are known to possess wide range of biological activities like antimicrobial, antioxidant and anti-inflammatory properties. The present study was performed to evaluate the *in vitro* antioxidant capacity of *Ficus religiosa*, *Aegle marmelos* and *Butea monosperma* against free radical damage using different standard methods such as DPPH (1,1-diphenyl-2-picrylhydrazyl), hydrogen peroxide scavenging assay and reducing power assay. Results of present study showed that *F. religiosa* extract had higher DPPH radical scavenging activity (IC₅₀: 36.48 µg/ml) followed with *A. marmelos* (IC₅₀: 40.41 µg/ml) and *B. monosperma* (IC₅₀: 55.45 µg/ml) respectively. Similarly, in case of H₂O₂ radical scavenging assay, highest antioxidant activity was found in *F. religiosa*. The total phenolic content of extract was found to be higher in *Ficus religiosa* (213.0±0.721 mg/gm GAE) then *Aegle marmelos* and *Butea monosperma* (191.6±1.058 and 174.7±1.007). The results support local claims of their therapeutic uses in folklore medicine. In conclusion, all three i.e. *F. religiosa*, *A. marmelos* and *B. monosperma* plant extracts could serve as free radical scavengers, can be considered as potent antioxidants. Their activity may be attributed to high phenolic and flavonoid contents.

Keywords: - Antioxidant, *Ficus religiosa*, *Aegle marmelos* and *Butea monosperma*.

INTRODUCTION

Most of the drugs affect these tissues in a dose dependent manner; though, there are differences in susceptibility to individual members. Chemotherapy in cancer possess several adverse effects in recipient like use of alkylating agents (cyclophosphamide, chlorambucil, carmustine, lomustine, cisplatin etc.) causes

bone marrow depression, gastrointestinal disturbances such as nausea and vomiting; anthracyclines (doxorubicin, epirubicin, mitoxantrone, bleomycin etc) causes myelosuppression (bone marrow suppression), increased risk of infection and bleeding, cardiac toxicity/arrhythmias, tissue necrosis/extravasation, secondary malignancies, radiation recall (the recurrence of skin damage from previous radiotherapy), alopecia (hair loss), nausea and vomiting, oral ulceration; taxanes (paclitaxel, docetaxal, estramustine) causes nausea and vomiting, diarrhoea, mouth sores, joint and muscle aches, alopecia (hair loss), paraesthesia (abnormal sensation), mild allergic reactions (flushing, shortness of breath, urticaria (hives), rash), anaphylactic reactions, injection site reactions. Vinca alkaloids (vinblastine, vincristine, vindesine, vinorelbine etc.) cause nausea and vomiting, alopecia (hair loss), mouth sores, headache, constipation. Various reports showed that plant parts of *F. religiosa* has been used as folk medicine like leaf juice has been used for the cough, asthma, diarrhoea, sexual diseases, haematuria, tooth-ache, migraine, eye disorders, GIT problems earache and scabies. Decoction of leaf is useful in toothache, as an analgesic. Fruits are useful in asthma and other tracheal disorders and scabies treatment. Stem bark is useful in the management of gonorrhoea, diabetes, diarrhoea, bleeding, astringent, paralysis, bone-fracture and as anti-septic & anti-dote (Kunwar *et al.*, 2006). The root bark is aphrodisiac. Fruits are digestive and laxative at high dose. The powder of fruit is also used to improve fertility and in dysentery. In blood diseases, it is used to treat ulcers, uterine troubles, biliousness, and used as bitter tonic. Whole plant part is acrid and used in the treatment of blood disorders, UTIs, given in leucorrhoea, burning sensation, ulcers and biliousness. In vedic literature, *A. marmelos* is indicated for the treatment of jaundice, inflammations, constipation, asthma, chronic diarrhea, dysentery, stomach ache, stomachic, fever, febrile elirium, acute-bronchitis, snake-bite, abdominal distress, acidity, burning impression, epilepsy, in-digestion, leporsy, myalgia, small-pox, spermatorrhoea, leuco-derma, ophthalmic-disorders, upper respiratory tract infections, ulcer, mental-illnesses, nausea, thirsts, sores, thyroid-disorder, tumor and ulcer (Sekar *et al.*, 2011). *B. monosperma* is widely used in all the medicinal systems viz. Ayurveda, Unani, Homeopathic and Modern medicine. Genus butea is famous for colouring materials; plant parts are used as tonic, astringent, aphrodisiac and diuretics. Various parts of *B. monosperma* are used for various purpose, some are: Roots are used in filariasis, night-blindness, helminthiasis, piles, ulcer, tumors; flowers are used in dermatological disorders, diarrhoea, astringent, gout; stem bark is used for dysentery, peptic-ulcer, throat-sore and snake-bite; leaves are used for making plates, cups and bowls; bark fibers are used for making cordage; wood is used for well curbs & water scoop; wood pulp is used for newsprint manufacturing (Kirtikar, 1935; Ambasta, 1994)

MATERIALS AND METHODS

Reagents and laboratory wares

All reagents used were analytical grade were purchased from Hi-Media and Merck.

Collection of Plant Material

Leaves of *Ficus religiosa*, *Aegle marmelos* and *Butea monosperma* were collected in August-October locally from Meerut (U.P.). Special precautions were taken to collect healthy plants avoiding foreign materials. Herbarium of both the plants were prepared and submitted for authentication to GBPATU PantNagar (Department of Horticulture), UltraKhand, India. Authentication was done by Dr. Anju Pal Associate Professor (Department of Horticulture). Authentication voucher numbers were 5027/Horticulture/GBPATU/13,4047/ Horticulture/GBPATU /13 and 4048/ Horticulture/GBPATU /13 for *F. religiosa*, *A.marmelos* and *B. monosperma* respectively.

***In vitro* antioxidant assay**

DPPH Assay[17,18]

A solution of 0.1mM DPPH (4mg/100ml) in methanol was prepared. Different concentration of test sample with methanol was prepared. 2ml of test sample and 1ml of DPPH solution was added to 2ml of different dilution of test samples and allowed to react at room temperature for 10 min. The absorbance values are measured at 515 nm against blank (methanol). % Inhibition was calculated using following formulae:-

% Inhibition = [(AC 515 nm- AS 515 nm/ AC 515 nm) x 100].

Hydrogen peroxide Scavenging Assay [19]

A solution of hydrogen peroxide (20mM) was prepared in phosphate buffered saline (PBS, pH 7.4). Various concentrations of 1ml of the extracts and standards was prepared in methanol were added to 2 ml of hydrogen peroxide solutions in PBS. The absorbance was measured at 230 nm, after 10 min against a blank solution that contained extracts in PBS without hydrogen peroxide.

% Inhibition was calculated using following formulae:-

% Inhibition = [(AC 230 nm- AS 230 nm/ AC 230 nm) x 100].

RESULTS AND DISCUSSION

The present study aimed to do a comparative study about the antioxidant activity of three plants The antioxidant activity of polyphenols is mainly due to their redox properties, which can play an important role in adsorbing and neutralizing free radicals, quenching oxygen, or decomposing peroxides. Indeed the antioxidant activity of the plants extracts is highly correlated with the total phenol content.

Table: 4 Inhibitory concentrations (IC50) of *Ficus religiosa*, *Aegle marmelos*, *Butea monosperma* and Ascorbic acid.

S.No.	Test	<i>Ficus religiosa</i>	<i>Aegle marmelos</i>	<i>Butea monosperma</i>	Ascorbic acid
1	DPPH antioxidant activity	36.48	40.41	55.45	14.38

2	H2O2 radical scavenging activity	49.16	68.54	86.55	30.70
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In vitro antioxidant assay

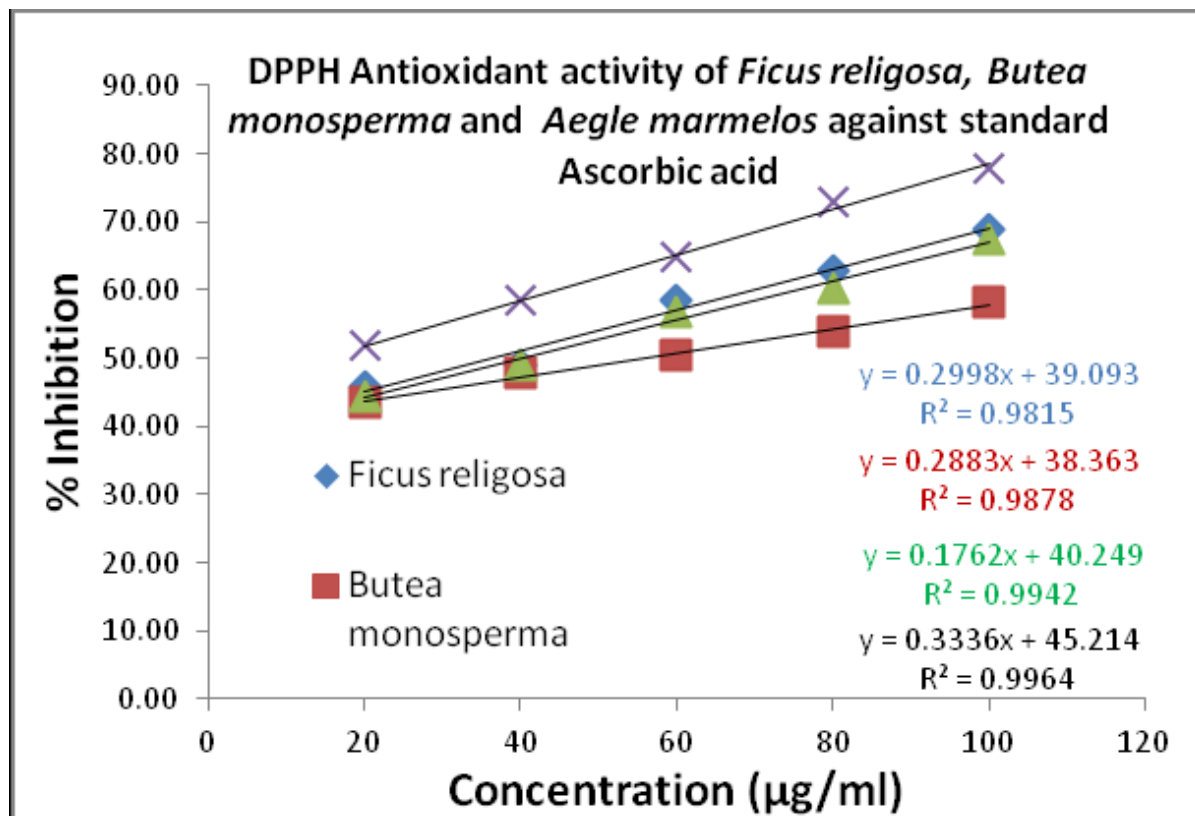


Figure 1: DPPH Antioxidant Activity.

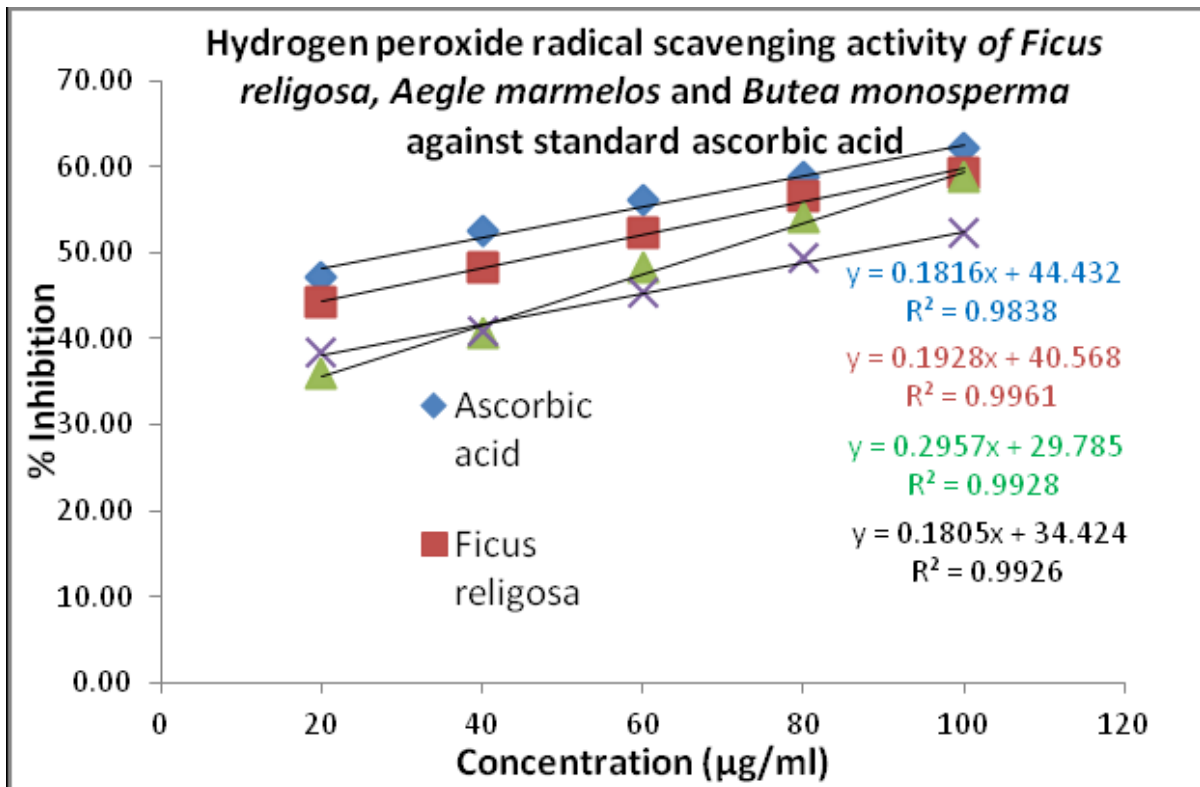


Figure 2: Hydrogen Peroxide Scavenging.

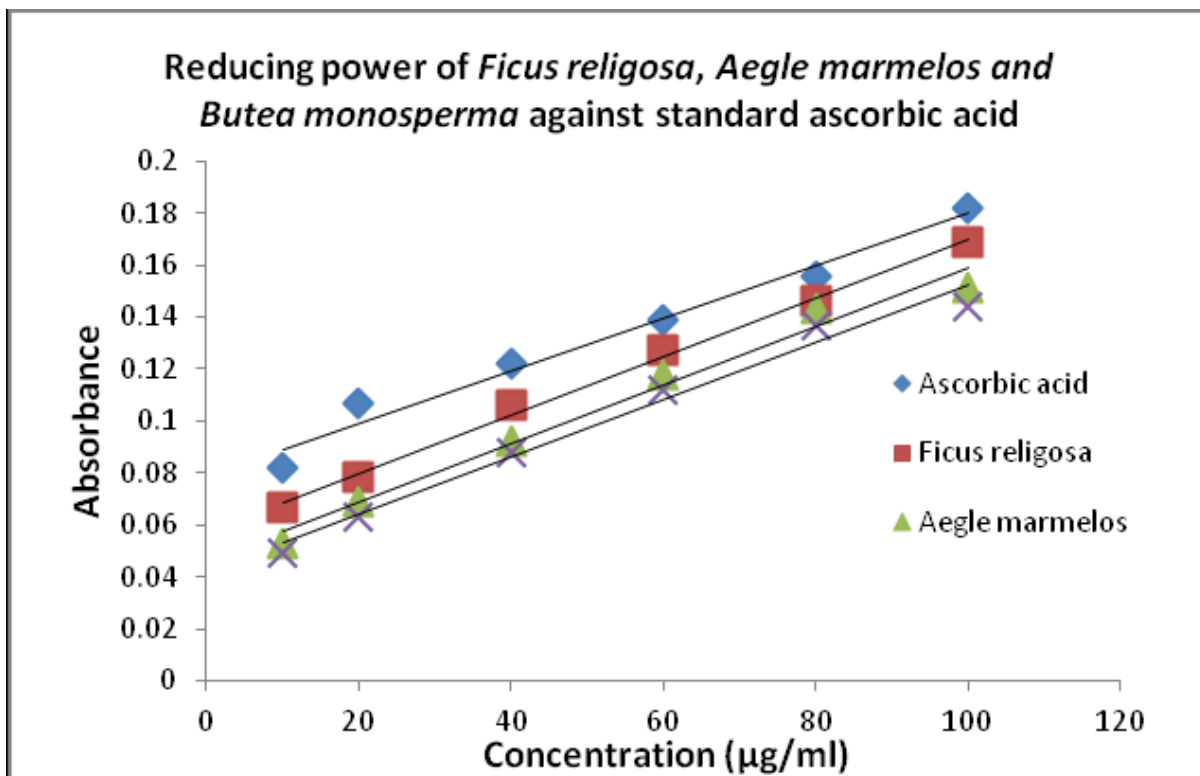


Figure 3: Reducing Power Assay.

CONCLUSION

The present study concludes that the crude methanolic extract of *Ficus religiosa*, *Aegle marmelos* and *Butea monosperma* exhibited a significant antioxidant activity which may be relevant in the treatment of oxidative stress. The antioxidant activity was measured as free radical scavenging activity DPPH method, Reducing power determination method, Hydrogen peroxide method. All the methods show good response due to the presence of phenolic compounds and flavonoids in three species. Among all the three extracts tested, showed highest antioxidant activity with IC 50 value in the order of *Ficus religiosa* > *Aegle marmelos* > *Butea monosperma* when compared to the standards. The result reveals that all the extracts have the scavenging character in accordance with the standards. The further work has been developed for the isolation of particular phenolic compound for this activity, and also can be used for the new formulation development.

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