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PHARMACOLOGICAL ACTIVITIES OF SPONDIAS MOMBIN L.: A REMARKABLE MEDICINAL PLANT

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ABSTRACT

Background: *Spondias mombin* L. is one of the most useful traditional medicinal plants. In rural areas a lot of people use *Spondias mombin* L. for treating indigestion, infections, lower back pain, angina, sore throat, malarial fever, congestion, pneumonia, flatulence, diarrhoea, dysentery and haemorrhoids. **Aims:** The aim of this study is to open up a new avenue for improving the medicinal uses of *Spondias mombin* L. peels selected primarily for the assessment of antioxidant and cytotoxicity potential. **Methods:** The antioxidant activity was determined using DPPH (1,1-diphenyl-2-picrylhydrazine) radical scavenging assay and cytotoxicity potential was regulate using Brime shrimp Lethality bioassay. **Results:** The antioxidant activity showed an LC50 of methanol extract as (66.29 µg/ml), where the LC50 values of standard Ascorbic acid showed (29.16 µg/ml), respectively as well as cytotoxicity potential showed LC50 of methanol extract as (1.66 µg/ml) where the LC50 values of standard vincristine was (0.25 µg/ml) as positive control, respectively. **Conclusions:** It is obvious from the above findings that, in various research models, *Spondias mombin* L. demonstrated considerable pharmacological potential. This would be a potential source of an isolating the lead compound to treat the healing of the a variety of diseases.

KEYWORDS: Fruit peels, Ascorbic acid, DPPH, Vincristine sulphate, DMSO (Dimethyl sulfoxide), *Artemia salina.*

INTRODUCTION

Bangladesh is a land with various plants of medicine. Around a thousand out of a reported five thousand species are known to have medicinal properties in Bangladesh.[1] Despite huge progress in modern medicine reported in recent years, plants continue to play an important role in health care.[2] *Spondias mombin* L. belongs to the Anacardiacae family. It grows in the coastal region and in the rain forest. It can cross between 15 and 22 meter in height. In the bark, the trunk has deep incisions, which also contain a brown resinous material. At the end of the branches are the leaves and the flowers. It cuts off most of the leaves until the tree begins to bloom. The fruit has leathery skin and a thin coating of fruit pulp with a very exotic flavor. The tree hangs on top of the tree in various clusters of more than a hundred. Apples, very high in vitamin B1 and C, remains more like an oval seed.[3] Bark and flowers are used to produce cures-all teas for urinary tract infections, lower back pain, angina, sore throat, malarial fever, congestion, pneumonia, coughs and colds, hemorrhages, and to cure gonorrhea. Stomach-aches and to alleviate exhaustion. Leaf decoctions are used for the treatment of diarrhea, dysentery, colds, flu, and gonorrhea. The flowers are heart and stomach flowers. There are decoctions used in the treatment of laryngitis and adolescent diarrhea. The laxative effect of the fruit is mild.[4] Antioxidants are the substances which inhibit or delay the oxidation of other molecules by inhibiting the begining or propagation of oxidizing chain reactions.[5] Naturally occurring substances in higher plants have antioxidant activity. Nowadays there has been expanded interest in oxygen containing free-radicals in biological systems. Consequently, consideration is being more focused on the defensive biochemical functions of naturally occurring antioxidants in the cells of the organisms.[6] Abundent physiologicalas well as biochemical modes within the human body may be produced oxygen-centered free radicals and various reactive oxygen species as byproducts. Overproduction of free radicals causing oxidative damage to biomolecules, at last leading to several chronic diseases, like atherosclerosis, cancer, diabetes, aging, as well as other degenerative diseases in humans.[7] Malignant production is an unregulated division of cells that can strike, metastasize and spread to far-off places. For example, vinblastine, irinotecan, topotecan, vincristine, taxanes, a portion of anticancer operators originate from plants. This is for cytotoxic tenderfoot operators from normal-microbial, aquatic as well as plant sources, it continues around the globe. Chemotherapy with cytotoxic drugs is the main treatment for certain types of cancer.[8,9]

Therefore, the aim of the present study is to investigate the antioxidant and cytotoxic activity of methanolextract of *Spondias mombin* L. that might explore the remedial potential of this plant to agreat extent.

METHODS AND MATERIALS

Chemicals and reagents

Ascorbic acid, Vincristine sulphate, DMSO (Dimethyl sulfoxide), DPPH (1, 1-Diphenyl-2-Picrylhydrazyl) were used.

Plant materials

The peels are part of the *Spondias mombin* L. fruit and collected from fields near to Jahangirnagar University, Dhaka, Bangladesh. Experts from the Bangladesh National Herbarium, Mirpur, Dhaka, confirmed the identity of the plant materials.

Drying and Grinding

Separated from undesirable materials is the extracted fruit peels. Then these dried up in the heat for a week and were cut into smaller pieces. The fruit peels were processed with the use of a suitable grinder into coarse powder. The powder was placed in an airtight container and kept until analysis began in a cold, dark and dry spot.

Preparation of methanol extract

A clean, flat-bottomed glass container was first taken and roughly 380 gm of powdered samples were applied to the bottle. Then 1200 ml of 90 percent methanol was applied to the container and the powder was soaked into the methanol. The bottle was then sealed with its contents and held for 10 days, followed by intermittent shaking and stirring. After that, using white cotton, the coarse sections of the fruits were removed from the mixture. With the aid of white cotton, the liquid part was also purified three times. Again, using whatman filter paper, these were filtered. In the Rotary evaporator unit, which separates solvent and suitable crude extract, the filtrates were then held.

Antioxidant activity

Antioxidant activity of the extract was determined on the basis of their scavenging potential of the stable DPPH (1, 1-Diphenyl-2- Picrylhydrazyl) free radical in a quantitative assay. In short, 2.5 mg extract was mixed with 25 mL of ethanol to prepare 100 µg/mL solution of the extract as stock solution. From the stock solution of the extract, a serial dilution was carried

out to obtain a concentration of 1, 5, 10, 50, 100, 500 µg/ml. Test tubes and volumetric flasks are wrapped with foil paper. In 6 Test tubes, serial dilution of the extract is done and marked them respectively. 1ml of the sample from each concentration and 3 ml of 0.004% DPPH solution is taken with the help of pipette in 6 test tubes respectively. Then the solution is kept in the dark place for 30 minutes with raping each test tube with foil paper. In another test tube 3ml 0.004% DPPH & 1ml MeOH was taken to prepare a blank solution. Then absorbance is taken at 517nm by UV Spectroscopy.[10,11]

Cytotoxic activity

For cytotoxicity screening, DMSO (Dimethyl sulfoxide) solutions of the methanolic fruit peels extracts were applied to *Artemia salina* in a one-day in vivo assay. For the experiment, 4 mg of each of the extracts were dissolved in DMSO and solutions of varying concentrations (640, 320, 160, 80, 40, 20, 10 µg/ml) were obtained by serial dilution technique. The solutions were then added to the pre-marked vials containing ten live brine shrimp nauplii in 5 ml simulated sea water. After 24 hours, the vials were inspected using a magnifying glass and the number of survived nauplii in each vial was counted. From this data, the percent of lethality of the brine shrimp nauplii was calculated for each concentration. The lethal concentration (LC50 and LC90) of the test samples were obtained by plotting percentage of the shrimp killed against the logarithm of the sample concentration.[12]

RESULTS AND DISCUSSIONS

Antioxidant activity

The antioxidant activity was determined using DPPH (1,1-diphenyl-2-picrylhydrazine) radical scavenging assay, and showed an LC50 of methanol extract as (66.29 µg/ml), where the LC50 values of standard Ascorbic acid showed (29.16 µg/ml), respectively. Due to their antioxidant effects, phenolic compounds have therapeutic ability against several diseases. The category of poly phenolic compounds are flavonoids. They occur in most plants and are regarded as responsible for numerous biochemical operations as well. In numerous studies, the antioxidant properties of flavonoids from plant extracts have been recorded. It exerts the action of antioxidants by radical scavenging and chelation of metal ions.[13] The DPPH radical scavenging behavior of test extracts demonstrated the capacity to donate protons and thus serve as antioxidants. In a previous study, phytochemical studies revealed the presence of alkaloids, tannins, glycosides, flavonoids and saponins in extracts from *Spondias mombin*

L. The presence of these phytochemical compounds may be linked to *Spondias mombin* L.biological activities.[14]

Table 1: DPPH free radical scavenging standard (Ascorbic acid) at different concentration.

Concentration (µg/ml)	Absorbance	% of scavenging	IC_{50} (µg/ml)
1	0.808	0.37	15.31
5	0.791	2.5	
10	0.762	6.0	
50	0.711	12.3	
100	0.687	15.3	
500	0.661	18.5	

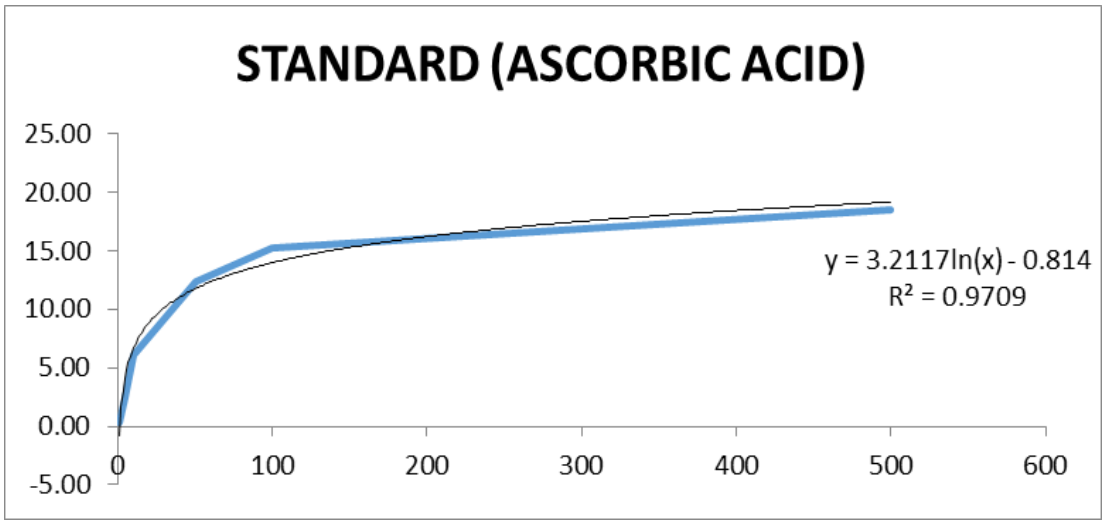

Figure 1: DPPH scavenging effect of Standard Ascorbic Acid shows the IC50 (15.31µg/ml) as positive control.

Table 2: DPPH scavenging effect of *Spondias mombin* L. fruit peels extract (methanol) at different concentration.

Concentration (µg/ml)	Absorbance	% of scavenging	IC_{50} (µg/ml)
1	0.808	0.37	15.31
5	0.791	2.5	
10	0.762	6.0	
50	0.711	12.3	
100	0.687	15.3	
500	0.661	18.5	

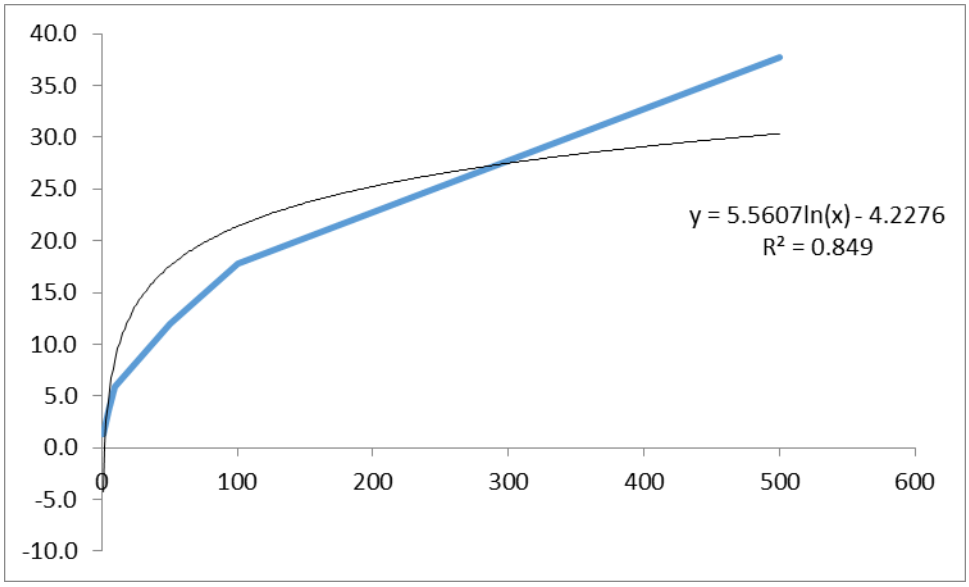

Figure 2: DPPH scavenging effect of *Spondias mombin* L.

Cytotoxic potential

The cytotoxic potential was shown LC50 of methanol extract as (1.66 µg/ml) where the LC50 values of standard vincristine was (0.25 µg/ml) as positive control, respectively. This evidentlyintroduces the presence of bioactive principles in these both extracts which may be very necessary as antiproliferative, antitumor, pesticidal as well as other bioactive agents.[15] Brine shrimp lethality is a general bioassay that is typical of exercises for cytotoxicity, pesticide effects and other pharmacological practices. The findings illustrate the ability of the concentration of the plant to destroy malignant cells in cell culture, kill pests, and apply a wide variety of pharmacological effects. The presence of saponins, alkaloids and cardiac glycosides may be responsible for the extract's reported lethality of brine shrimp activity.[16]

Table 3: Brine shirmp lethality assay of *Spondias mombin* L.

Conc. (µg/ml)	Log C	Total Nauplii	No. of nauplii dead	No. of nauplii alive	% of mortality	LC_{50} (µg /ml)
10	1	10	0	10	0	0.050
20	1.30	10	2	8	20	
40	1.60	10	3	7	30	
80	1.90	10	5	5	50	
160	2.20	10	6	4	60	
320	1.47	10	8	2	80	
640	2.80	10	9	1	90	

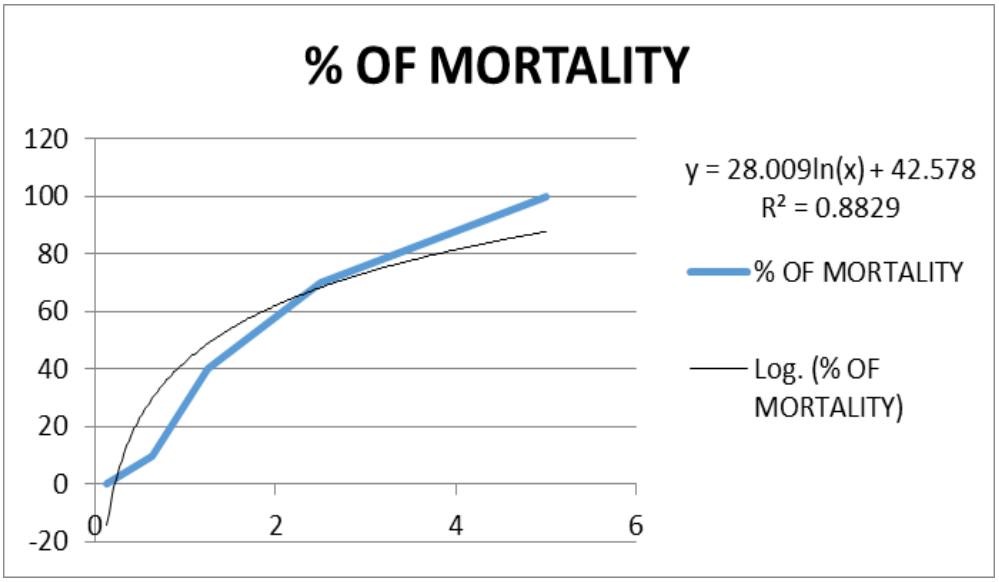

Figure 3: Brine shrimp lethality assay by *Spondias mombin* L.

Table 4: Brine shrimp lethality assay standard (Vincristine).

Concentration (µg/ml)	Total Nauplii	No. of nauplii dead	No. of nauplii alive	% of mortality	LC_{50} (µg/ml)
5	10	2	8	100	0.25
2.5	10	7	3	100	
1.25	10	4	6	70	
0.625	10	10	3	40	
0.320	10	10	3	20	

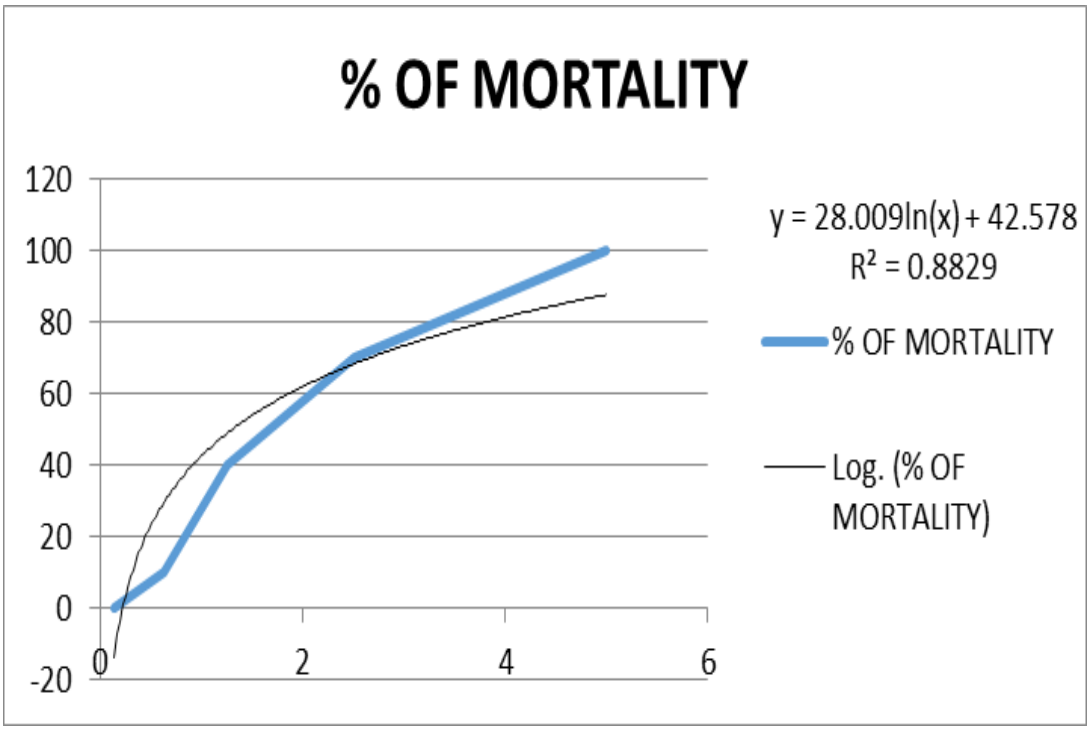

Figure 4: Brine shrimp lethality assay standard (Vincristine).

CONCLUSIONS

The extract of *Spondias mombin* L. were discovered in this research. They may be used as a medium for both antioxidant and cytotoxic procedures. This species may be promoted both for large-scale cultivation and for the good of the local community for marketing.

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Compliance with ethical standards

The handling and use of animals were in accordance with the National Institute for Health Guide for the Care and Use of Laboratory Animals. Our study was approved by a Research Ethics Committee for animal house of department of pharmacy, Faculty of Allied Health Sciences, Daffodil International University.

REFERENCES

1. Munna MM, Azad AK, Islam F, Ahmed MF, Parvez A, Rahman MM, Hossain MS. PHYTOCHEMICAL INVESTIGATION, EVALUATION OF ANTIOXIDANT AND CYTOTOXIC ACTIVITY OF THE METHANOL EXTRACT OF CUSCUTA REFLEXA (STEM).
2. Arfan, N. B., Islam, T., Mohiuddin, A. K., Alam Khan, S., & Labu, K. Thrombolytic, membrane stabilizing, antidiarrhoeal, and antimicrobial properties of bioactive compounds isolated from leaves of Sesbania grandiflora naturally growing in Bangladesh. Iranian Journal of Pharmaceutical Sciences, 2016; 12(3): 31-46.
3. Ayoka AO, Akomolafe RO, Akinsomisoye OS, Ukponmwan OE. Medicinal and economic value of Spondias mombin. African Journal of Biomedical Research, 2008; 11(2).
4. Acharya, Deepak and ShrivastavaAnshu: Indigenous Herbal Medicines: Tribal Formulations and Traditional Herbal Practices. Aavishkar Publishers Distributor, Jaipur / India, 2008; 440: ISBN 978-81-7910-252-7.
5. Velioglu YS, Mazza G, Gao L, Oomah BD. Antioxidant activity and total phenolics in selected fruits, vegetables, and grain products. Journal of agricultural and food chemistry, 1998; 19, 46(10): 4113-7.

6. Mensor LL, Menezes FS, Leitão GG, Reis AS, Santos TC, Coube CS, Leitão SG. Screening of Brazilian plant extracts for antioxidant activity by the use of DPPH free radical method. Phytotherapy research, 2001; 15(2): 127-30.
7. Cai Y, Luo Q, Sun M, Corke H. Antioxidant activity and phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer. Life sciences, 2004; 12, 74(17): 2157-84.
8. Ruffa MJ, Ferraro G, Wagner ML, Calcagno ML, Campos RH, Cavallaro L. Cytotoxic effect of Argentine medicinal plant extracts on human hepatocellular carcinoma cell line. Journal of ethnopharmacology, 2002; 1, 79(3): 335-9.
9. Koch S, Mayer F, Honecker F, Schittenhelm M, et al. Efficacy of cytotoxic agents used in the treatment of testicular germ cell tumours under normoxic and hypoxic conditions in vitro. Br. J. Cancer, 2003; 89: 2133–2139.
10. Rafshanjani MA, Parvin S, Kader MA. In vitro antibacterial activities and brine shrimp lethality bioassay of ethanolic extract from Moringa oleifera Lam. Leaves. Int Res J Pharm, 2014; 5(11): 856-60.
11. Clarkson PM. Antioxidants and physical performance. Critical Reviews in Food Science & Nutrition, 1995; 1, 35(1-2): 131-41.
12. Abdul MM, Sarker AA, Saiful IM, Muniruddin A. Cytotoxic and antimicrobial activity of the crude extract of Abutilon indicum. International Journal of Pharmacognosy and Phytochemical Research, 2010; 2(1): 1-4.
13. Mohsen MS, Ammar SMA. Total phenolic contents and antioxidant activity of corn tassel extracts. Food Chem, 2008; 112: 595-598.
14. Rahman MM, Azad MA, Ahmed T, Nizhum NR, Islam F, Jahan N, Sumi MA, Akter KS. Phytochemical investigation and evaluation of antioxidant and thrombolytic properties of leave extracts of Gardenia coronaria Buch-Ham. Journal of Medicinal Plants, 2020; 8(2): 44-8.
15. Ripa FA, Nahar L, Haque M, Islam MM. Antibacterial, cytotoxic and antioxidant activity of crude extract of Marsilea quadrifolia. Eur J Sci Res, 2009; 33(1): 123- 9.
16. Abd-Elmageed MA, Hussein BA. Cytotoxicity and antimicrobial activity of Salvia officinalis L. flowers. Sudan Journal of Medical Sciences, 2008; 3(2): 127-32.