

Review Article

AN OVERVIEW ON THE BIOLOGICAL PERSPECTIVES OF *SAMANEA SAMAN* (JACQ.) MERR
(RAIN TREE)

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ABSTRACT

The ancient Indian systems of medicine (AYUSH – Ayurveda, Yunani and Siddha) had explored many medicinal plants which can cure many diseases. The extracts of the medicinal plants possess remarkable biological perspectives. Rain tree (*Samanea saman*) is one of the tropical tree which possess a wide variety of pharmacological activities. The size of the rain tree generally attains maximum height of 15-25m (50-80ft). It has a distinctive, umbrella –shaped crown which is broad and domed. It is a native in Northern America and in Central America. The various parts of the tree (*Samanea saman*) possess different biological perspectives such as antioxidant, antibacterial potential, analgesic, antifungal, insecticidal, anti ulcer and cytotoxic activities. However, the study made in the perspectives of biological activity are limited and further studies should be conducted to confirm the reported effects. Such evidence is needed to provide scientific credence to the folklore use of traditional medicines which are helpful to develop new medicines and to explore its treatment guidelines.

Keywords: *Samanea saman*; Biological activities

INTRODUCTION

Herbal and natural products are being used as a folk medicine for centuries and in every culture throughout the world. Medical professionals and herbalist had shown an extensive interest in this field and recognized that these natural products are the true remedies for the health benefits of the humankind. "Food be your medicine and medicine be your food" was quoted by the father of medicine, Hippocrates over the millennium year ago, which possess variety of pharmacological activities. *Samanea saman* is an unsung medicinal tree, which has different biological perspectives. The synonym of the *Samanea saman* is "Monkey pod" which is a fast growing tree that is been introduced to many tropical countries throughout the world from its native habitats in Central America and Northern South America. Even though, it has been planted as an ornamental tree, it has a great value of pastures as shade for the cattle [1]. Rain tree exhibits several bioactive compounds which produce different medicinal properties such as antioxidants, anti ulcer, antibacterial, analgesic, antifungal, insecticidal and cytotoxic activities [2]. The crude drug is always been cheaper and readily available in abundance with negligible side effects and it is suitable for the patients of all age groups. The multiple therapeutic actions of *Samanea saman* are evidently supported by the minimal classical literatures [3]. Hence the present study, review the following pharmacological activities which have recently explored.

Antioxidant activity

P Arulpriya et.al 2010 [4] studied the antioxidant activity of *Samanea saman* by DPPH (1,1 diphenyl-2-picrylhydrazyl) radical scavenging assay and reducing power assay. The petroleum ether, ethyl acetate, chloroform, aqueous and HCl extracts of *Samanea saman* increases with antioxidant activity with increasing in concentration and follows with the order of petroleum ether > ethyl acetate > chloroform > aqueous > HCl. Around 10-15mg of the extracts gives 68% DPPH scavenging activity.

Ferdous et.al 2010 [5] investigated the n-hexane, chloroform and carbon tetra chloride fractions of crude methanolic bark extract of *Samanea saman* and are tested for antioxidant activity by free radical scavenging assay and total antioxidant activity test. 10mg/mL of the plant extracts is prepared in ethanol from which serial dilutions are obtained to carry out at the concentrations of 1,5,10,50,100 & 500µg/ml. To these concentrations, 2ml of DPPH is added and the absorbance is measured at 517 nm using ascorbic acid as control.

Hexane soluble fraction showed high antioxidant potential (IC₅₀ = 14µg/mL). The carbon tetra chloride fraction of the methanolic extract showed moderate antioxidant activity having IC₅₀ = 65µg/mL. The total antioxidant activity is determined by Phosphomolybdenum method. The carbon tetra chloride fraction shows the highest activity which is followed by n- hexane and chloroform fractions. Patel Jignesh Kanubai 2011 [6] explored the antioxidant property and organo protective effects on the leaves of the *Samanea saman*. This study is designed to determine the bioactive constituent which enables for the antioxidant activity. The various extracts and the extracts which contains flavanoids and tannins is selected for antioxidant activity. The antioxidant activity is determined by reducing power activity and Nitric oxide radical scavenging activity. In the reducing power activity 70% of alcoholic extract of the leaves of *Samanea saman* are employed for diluting into different concentrations ranging from 50-200µg mixed with phosphate buffer and potassium ferri cyanide. This mixture is incubated at 50°C for 20 minutes. 10% of trichloroacetic acid is added and the mixture is measured for its absorbance at 700 nm. 70% of alcoholic extract of *Samanea saman* which shows an increase in reducing property against the standard (Ascorbic acid) at the concentration of 20µg/mL. Nitric oxide radical scavenging activity is demonstrated in the 70% alcoholic extract of *Samanea saman*. Nitric oxide (NO) radical is generated from sodium nitroprusside solution at physiological PH. Different concentrations of the alcoholic extracts of *Samanea saman* is prepared by mixing with sodium nitroprusside solution at different concentrations ranging from 200-1000µg/mL in a two fold dilution. This mixture is incubated at 25°C and 1% solution of Griess reagent is been added to the above mixture and the absorbance is read at 546 nm. Alcoholic extracts of *Samanea saman* showed an inhibitory effect on the anion scavenging activity against ascorbic acid as a standard (50µg/mL).

Anti ulcer activity

Suresh Arumugam et.al 2011 [7] evaluated the anti ulcer activity of *Samanea saman* bark on ethanol and stress induced gastric lesions in albino rats. Gastric lesions were induced in rats by oral administration of absolute ethanol (5mL/kg) and stress induced by water immersion. The anti ulcer activity of methanolic extract of *Samanea saman* at the concentration of 100mg/kg, 200mg/kg and 400mg/kg and it is compared to sucralfate (100mg/kg). The percentage of inhibition is 65.67, 72.43 & 86.49 respectively. The sucralfate (100mg/kg) exhibits the inhibition of 92.16. The effects of

methanolic extract of *Samanea saman* on acid parameters showed significant ($P < 0.001$) effect at 200mg/kg and 400mg/kg doses compared to ulcer control animals. In water immersion stress induced ulcers, the mean score value of ulcer inhibition is found to be significantly ($P < 0.001$) effective at 200mg/kg and 400mg/kg of the extract. The percentage ulcer inhibition is 53.30, 71.11 and 87.69 to 100mg/kg, 200mg/kg and 400mg/kg respectively, and that of the standard and found to be 92.68. Since *Samanea saman* has free radical scavenging and hydrogen cation (H^+) potassium cation (K^+) and ATPase inhibition activity. Hence *Samanea saman* can also exhibit its anti ulcer activity through H^+ , K^+ and ATPase inhibition.



Fig. 1



Fig. 2

Antimicrobial activity

Ragavendra et al. 2008 [8] exhibited the aqueous extracts of leaves of *Samanea saman* is assayed for antibacterial activity by cup diffusion method against three phytopathogenic *Xanthomonas pathovars*. *Xanthomonas* species are 14 pathogenic bacteria. The pathovars is associated with an angular spot of cotton, common blight bean and bacterial spot of tomato respectively. Aqueous and methanol extracts shows significant antibacterial activity against all the 14 human pathogenic bacteria. The active fraction recorded highly significant antibacterial activity *in vitro* MIC 6.6&4µgmL for *Xanthomonas pathovars*. The active fraction is confirmed to be alkaloids. The *In vitro* screening of antibacterial activity is carried out with the marked standard antibiotics such as Baciterimycin 2000 and strepto cycline discs for human pathogenic bacteria.

Thippeswamy et al. 2011 [9] evaluated the antibacterial efficacy of 6 different solvent extracts and isolated constituents of *Samanea saman* against 21 microorganisms. This result revealed that methanol extracts showed the highest antibacterial activity with zone of inhibition ranging from 11.0mm to 3.5mm at 1mg/mL concentration. The MIC value of the methanol extract for the tested bacteria ranged between 15µg/mL to 500µg/mL. The most susceptible organism in the present investigation is *Streptococcus faecalis* (MIC 15µg/mL) followed by *Staphylococcus aureus* (MIC 62µg/mL). The highly significant anti fungal activity against all the fungi is observed in ethanol extract with percentage of inhibition ranging from 20.4% to 81.6% depending upon the fungal species at 1mg/mL concentration. The IC_{50} Value of the methanol extracts ranged from 0.3mg/mL to 5mg/mL.

Naveen Prasad et al. 2008 [10] illustrated the antimicrobial activity of aqueous extract of the plant *Samanea saman* by well diffusion method against three organisms : *E.Coli*, *Staph. aureus* and *K.Pneumoniae*. The plant extract showed inhibitory activity against all the tested organisms. *E.coli* has combated and defeated at the concentration of 5mg/mL. On contrary, 10mg/mL is necessary to show inhibition against *S.aureus* and *K.pneumoniae*. Phytochemical screening of the plant reveals the presence of tannins, Flavanoids, saponins, steroids, cardiac glycosides and terpenoids.

Arul priya et al. 2010 [11] elaborates the fractions obtained from the solvent extracts of the Pet ether, ethyl acetate, chloroform and aqueous and hydrochloric acid. These fractions are collected for the individual plant extracts using hydrochloric acid, dichloromethane, hexane and acetone. The plant extracts and its fractions were tested for their antibacterial and antifungal activity. Two bacteria - *E.Coli*, *S.aureus* and two fungal species such as *A.niger* and *C.albicans* are selected for the antimicrobial screening. The antimicrobial testing is carried out by disc method and streak plate method. The dichloromethane fraction showed good antimicrobial activity against the *E.Coli* and *S.aureus*. The hexane and acetone fractionated portion are found to be moderately sensitive against *E.Coli*. All these fractions were showed moderately sensitive against *Aspergillus* species. The chloroform and dichloromethane fraction showed good activity against *Aspergillus niger*. On contrary all these fractions showed good activity against *Candida albicans*.

Analgesic activity

Ahmed Syed Muzammil et al. 2013 [12] studied the analgesic activity of the methanol extracts of the leaves of *Samanea saman* and *Prosopis Cinneria* using tail immersion test. The painful reactions in mice were produced by thermal stimuli through dipping the tail of mice into hot water. Methanol extracts of the leaves of *Samanea saman* were administered intraperitoneally at the dose of 100mg/kg body weight. Pethidine was used as a standard analgesic drug at the concentration of 50mg/kg body weight intraperitoneally. The tail flick latency delay was measured at 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 hours after the intraperitoneal administration of the standard drug and the *Samanea saman* leaf extracts.

Insecticidal activity

Iqbal Azhar et al. 2009 [13] subjected the extracts of *Samanea saman* to a battery of assays which include antibacterial, antifungal, brine shrimp and insecticidal activity. The hexane and methanol extracts were been used. The hexane extract showed that 50% of the mortality against *Rhyzopertha dominica* and *Tribolium granarium* whereas methanol extract remained inactive against all tested insects.

Cytotoxic activity

Sundis M.Sahib Ajam et al. 2012 [14] performed the bioassay guided fractions and isolation of compounds with antimicrobial activity performed on the 80% methanolic extract of a legume tree (*Samanea saman*) leaves yielded two macrocyclic spermine alkaloids - Pithe ceolobine -1-2. These structures are being elucidated by spectral analysis. Both the compound showed good cytotoxic activity in the concentration range of 0.019-0.625 mg/mL.

CONCLUSION

In the present world, human ailments are playing a vital role in the life cycle resulting in the increased fatal mortality. Various kinds of diseases are being affected the human population. Medicinal chemists are competing with the present scenario to explore new drug molecules which are potent and therapeutically active. Alternate medicine systems plays significant role in exploring the pharmacological perspectives. *Samanea saman* (Rain tree) is the one medicinally potent tree gifted by the nature. It is easily recognized by its characteristic umbrella -shaped canopy. It is a natural habitant tree which grows about 15-25m. The present review reports the various pharmacological potentials which are explored by the herbalists and medicinal chemists in the *Samanea saman*. Yet more biological potentials are still untapped. The leaves, bark, root, seeds and pods of the tree are used in the traditional system of medicine for various diseases related to human race.

REFERENCES

1. Rosherko JM. *Albiza saman*: pasture improvement, shade, timber and more.(NFTA -95-01).Winrock international. Morrilton.Arkansas;1995.
2. Anonymous. CAB International: Medicinal compendium.CAB International Wallingford. UK; 2003.
3. Clarke WC and Thaman RR. Agroforestry in the pacific islands:systems for medicinal sustainability.United Nations.University Press, Tokyo; 1993
4. Arulpriya P, Lalitha P and Hemalatha S. *In vitro* antioxidant testing of the extracts of *Samanea saman* (Jacq.) Merr. Der Chemica Sinica, 1(2) :73-79,(2010).
5. Afia Ferdous, Mohammed Zafar Imam and Tajnin Ahmed. Antioxidant, Antimicrobial and cyto toxic activities of *Samanea saman* (Jacq.) Merr. Stamford Journal of Pharmaceutical Sciences,3(1) : 11-17,(2010).
6. Patel Jignesh Kanubhai. Study on antioxidant and organprotective effects of leaves of *Samanea saman* (Jacq.) merr. (rain tree). RGUHS, 1-95,(2011).
7. Suresh Arumugam, Senthil Velan Selvaraj, Suresh Velayutham, Senthil Kumar Natesan, and Karthikeyan Palaniswamy. Evaluation of anti-ulcer activity of *Samanea saman* (Jacq.) Merr bark on ethanol and stress induced gastric lesions in albino rats.Indian Journal of Pharmacology,43(5) : 585-590,(2011).
8. Raghavendra MP, Sathish S and Ravessha KA. *In vitro* Antibacterial potential of Alkaloids of *Samanea saman* (Jacq.) Merr. Against Xanthomonas and Human Pathogenic Bacteria. World Journal of Agricultural Sciences, 4(1) : 100-105,(2008).
9. Thippeswamy S, Praveen P and Manjunath K. Antimicrobial evaluation and phytochemical analysis of a known medicinal plant *Samanea saman* (Jacq.) Merr against human and plant pathogenic bacteria and fungi. International Journal of Pharma and Biosciences, 2(2) : 443-452,(2011).
10. Naveen Prasad, Viswanathan, Renuka Devi, **Vijayashree Nayak**, Johanna Raj kumar and Parthasarathy. Preliminary phytochemical screening and antimicrobial activity of *Samanea saman*. Journal of Medicinal Plants Research, 2(10) : 268-270,(2008).
11. Arulpriya P, Lalitha P and Hemalatha S. Antimicrobial testing of the extracts of *Samanea saman* (Jacq.) Merr. Der Pharma Chemica,2(6) :73-83,(2010).
12. Ahmed Syed Muzammil, Tasleem Farhana and Ahmed Salman. Analgesic activity of leaves extracts of *Samanea saman* (Jacq.) Merr. International Research Journal of Pharmacy,4(1) :93-95,(2013).
13. Iqbal Azhar M, Moht Asheemul Hasan and Farah Mazhar. Some biological evaluations of *Samanea saman*. Pakistan Journal of Pharmacology, 26(1) : 47-53,(2009).
14. Sundis M. Sahib Ajam,Baharuddin Salleh, Suleiman Al- Khalil and Shaida F. Sulaiman. Cytotoxic activity of Spermene Alkaloids from *Samanea saman* against Microbes associated with sick buildings. International Conference on Environment, chemistry and Biology,49 (1) : 150-155,(2012)