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Potential of Ethanolic Extract (98%) of *Tamarindus indica* L. Leaves as A Functional Food to Prevent COVID and Heart Failure

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Abstract

***Background*:** SARS COVID - 19, an infectious disease that is declared as pandemic by WHO and emerging again with newer strains. Heart failure is another deadly disease condition to which geriatric population is more susceptible. Few phytochemicals present in tamarind leaves like apigenin and epicatechin were reported to inhibit the SARS - COV - 2 enzyme named PDB ID : 6 LU7. Ethanolic extract of tamarind leaves was also proposed to reduce the prolongation of QT and RR intervals of ECG in Wistar rats along with lowering the serum enzymes' levels like LDH and CPK indicating cardiac protection in doxorubicin induced cardiac toxicity characterized by heart failure. Ethanolic extract of tamarind leaves was suggested to be used as a safer antioxidant to check MRSA endocarditis and heat stress. ***Methods*:** Fresh tamarind leaves were collected and dried under shade at normal room temperature to prepare coarse powder by a sterilized pestle and mortar. Ethanolic Extract of dried tamarind leaves was extracted using 98% ethanol by Soxhlet Apparatus used for extraction of 98 % ethanolic extract of dried tamarind leaves at a range of 60 degree to 70 degree centigrade. Ethanolic extract (98%) of dried tamarind leaves' powder was then evaporated to dryness by keeping the extract in Hot Air Oven used for drying of ethanolic extract (98%) of tamarind leaves at 60 degree centigrade. Dried ethanolic extract (98%)of tamarind leaves was provided to willingly participated septic arthritic patients orally at 1 gram / Kg bodyweight after 2 hours of breakfast once daily orally up to consecutive 28 days depending on severity of septic arthritis duly diagnosed by their registered doctors. ***Results*:** Septic arthritic patients responded well to the treatment of ethanolic extract (98%) of tamarind leaves at recommended dosage regimen which was evaluated by due recording of recovery from swelling, pain, redness and other characteristic signs of septic arthritis. As ethanolic extract (98%) of tamarind leaves produced curative effects in the affected joint or joints which are pharmacokinetically considered under peripheral compartment of the body, the extract can easily reach the organs like heart, lungs, liver, kidney and even brain those come under central compartment of the body according to pharmacokinetic principles. Moreover, the phytochemicals present in ethanolic extract (98%) of tamarind leaves acted in septic arthritis of peripheral joints means these can reach at sufficient concentrations to other peripheral organs also and can produce protective effects against corona virus infection by inhibiting SARS - COV - 2 enzyme named PDB ID : 6 LU7. The extract can easily reach at sufficient concentration to heart and may reduce the prolongation of QT and RR intervals of ECG in cardiac diseases' suffering patients. ***Conclusion*:** Ethanolic extract of dried tamarind leaves extracted by 98% ethanol can be well utilized as ethical preventive therapies for COVID and heart failure more particularly for geriatric population those have compromised metabolism and excretion systems for synthetic drugs due to their old age and ageing factors.

Keywords: Ethanolic Extract (98%) of Tamarind Leaves, Functional Food, Curative Therapy for Septic Arthritis, Preventive Therapy for Heart Failure, Prophylactic Therapy for COVID.

INTRODUCTION

SARS-COVID-19 was announced by World Health Organization as a pandemic on 3rd November '2020 and caused mortality in many countries more particularly to people who were having comorbidities and also to the

geriatric population having a compromised metabolism and excretion system for synthetic drugs and were more susceptible to COVID19 due to ageing factors. Severe Acute Respiratory Syndrome Corona Virus is again emerging and infecting some people with a new variant needing an ethical preventive strategy more particularly for people with comorbidities and the geriatric population. The maximum rate of annual incidence of heart failure is also approximately 5 persons per 1000 persons according to National Institute of Health and people more than 65 years of age having more probability to die due to heart failure. Probability of heart failure increases with increase in age and the death toll may be 10 percent in geriatric population over 70 years of age more particularly in Indian scenario. Unhealthy life style factors such as chain smoking and regular consumption of tobacco, taking junk food and cholesterol rich food, excessive intake of alcohol, poor physical activities and comorbidities like diabetes and hypertension increase chances of heart failure with increased age of people. Prevention of myocardial infection, infection of the inner lining of heart's chambers, and valves and coronary artery disease along with improvement of heart activities disrupting status which may also occur due to prolonged heat stress leading to heart stroke can drastically prevent the annual incidences of heart failure.

A safer antioxidant i. e. ethanolic extract (98 %)of tamarind leaves is rich in few polyphenolic compounds belonging to the subgroup of flavonoids can be used as a functional food as the extract was found to be practically nontoxic in septic arthritic patients following oral consumption of the ethanolic extract(98%) once daily orally for consecutive 14 days after 2 hours of breakfast in moderate cases of septic arthritis and for consecutive 28 days after 2 hours of breakfast in severe cases of septic arthritis (Sar, 2025)following duly done prompt diagnosis of septic arthritis by their learned registered family doctors. The richness of tamarind leaves in phenolic compounds like catechin and epicatechin was already reported (Bayoi et. al., 2021). Flavonoids and tannins are the primary constituents of tamarind leaves (De Caluwe et. al., 2010). A molecular docking method was applied to predict the anti - covid activity of few phytoconstituents like apigenin, epicatechin and taxifolin exhibited best binding energy compared to favipiravir and exposed significant interaction with amino acid residue leading to an inhibitory effect against the SARS - COV - 2 enzyme (PDB ID : 6 LU7) and pharmacokinetics and toxicological parameters of these phytochemicals were within acceptable limits (Danao et. al., 2024). HPLC - UV spectrophotometry analysis of tamarind leaves extracts also identified a flavonoid derivative i. e. apigenin (Arranz et. al., 2010) which was also found to inhibit the crystal structure of SARS - COV - 2 enzyme named PDB ID : 6 LU7 (Danao et. al., 2010). Interestingly, ethanolic extract of tamarind leaves was also reported to decrease the prolongation of QT and RR intervals of ECG in rats associated with decreasing of serum enzymes' levels such as LDH and CPK hinted regarding cardioprotective effect in doxorubicin induced cardiac toxicity leading to heart failure and the cardioprotection activities were also evidenced by the absence of cTnI in blood. Histomorphological interpretation of heart tissue also revealed improved architecture of the tamarind leaves' ethanolic extract treated group compared to cardiotoxicity induced rats (Haroon et. al., 2021).Tamarind leaf raw juice even produced ameliorative effects in cisplatin Induced grade I chronic renal failure in goats (Maurya et. al., 2014). Ethanolic extract of tamarind leaves at 400 mg / Kg was also reported to produce analgesic effect comparable to 25 mg / Kg of diclofenac sodium in mice (Goyal et. al., 2013).

Considering all these information, the ethanolic extract (98%) of tamarind leaves can be well utilized as a functional food towards prevention of COVID and Heart Failure as a safer antioxidant that has potential to prevent the adverse effects of synthetic drugs such as doxorubicin and cisplatin.

METHODS

Fresh tamarind leaves were collected from local tamarind trees (*Tamarindus indica L*) after due identification of the trees by a Botanist (Dr. Rabindranath Sar, PhD in Botany, Calcutta University). Subsequently collected tamarind leaves were shade dried at normal room temperature and coarse powder of dried leaves was prepared with the help of a sterilized pestle and mortar. Then 500 gram of coarse powder of dried leaves was charged in Soxhlet Apparatus used for extraction of 98 % ethanolic extract of dried tamarind leaves at a range of 60 degree to 70 degree centigrade. The undried ethanolic extract (98%) of tamarind leaves was kept in a sterilized glass beaker at normal room temperature for one hour and then transferred to the inside cabin of Hot Air Oven where the extract was dried at a temperature of 60 degree centigrade.

Some septic arthritic patients diagnosed by their registered family doctors approached the author wishing to consume the safer antioxidant i. e. ethanolic extract (98%) of tamarind leaves as they were interested to take a natural product rather than synthetic chemical drugs.

The author provided them the extract and suggested them to consume ethanolic extract (98%) at 1 gram / Kg bodyweight once daily orally after 2 hours of breakfast for consecutive 14 days for those who were suffering from moderate degree of septic arthritis and to the patients with severe septic arthritis to consume ethanolic extract (98%) of tamarind leaves once daily at 1 gram / Kg bodyweight for consecutive 28 days mixing the dried extract with sufficient volume of drinking water.

The septic arthritic patients were asked directly and or telephonically regarding the status of their clinical signs of septic arthritis like swelling of the affected joint / joints,

redness of the affected area, pain in the affected joint / joints and any other discomforting sign relevant to septic arthritis during the recommended period of consumption of dried ethanolic extract (98%) of tamarind leaves following mixing of the extract with sufficient volume of drinking water.

RESULT AND DISCUSSION

The septic arthritic patients reported verbally and in writing to the author that they recovered from clinical signs of moderate or severe septic arthritis and feeling no discomforting clinical sign after consumption of recommended period of ethanolic extract (98%) of tamarind leaves at recommended dosage regimen. The ethanolic extract (98%) of tamarind leaves was also proved to be safe and practically nontoxic to humans particularly for the recommended period of consumption of ethanolic extract (98%) of tamarind leaves once daily up to consecutive 28 days following mixing in sufficient volume of drinking water.

The ethanolic extract of tamarind leaves at a concentration of 60 microgram / ml exhibited marked cardiotonic in vitro effects which were recorded by observation of enhanced force of contraction, heart rate and cardiac output along with the reduction of prolongation of QT and RR intervals of ECG in wistar rats treated with ethanolic extract of tamarind leaves at 400 mg / kg orally once daily for 7 days following experimental induction of cardiotoxicity by doxorubicin at 1.5 mg / Kg intra peritoneally for 7 days (Haroon et. al., 2021). Ethanolic extract (95%) of tamarind leaves produced protective anti oxidative stress effets to heart tissues by scavenging of free radicals in rats exprimentally Induced with chronic fluoride toxicosis in our earlier research study (Pandey et. al., 2017). The cardioprotective effects of tamarind leaves' ethanolic extract were also associated with satisfactory serum glutamic pyruvic transaminase (SGPT), lactate dehydrogenase (LDH), creatinine phosphokinase and satisfactory negligible level of presence or absence of cardiac troponin (cTnI) in blood of rats (Haroon et. al., 2021). Molecular docking techniques were utilized to explore the binding pattern of some phytoconstituents of tamarind tree such as apigenin, epicatechin and taxifolin against the crystal structured SARS - COV -2 enzyme (PDB ID : 6 LU7) with the help of PyRx virtual screening software to determine inhibitory potential of these phytochemicals (Danao et. al., 2024). These phytochemicals' docking results signalled that apigenin (- 7.8 kcal / mol), epicatechin (- 7.1 kcal / mol) and taxifolin which is mainly present in pericarp of tamarind (- 7.5 kcal / mol) have best binding energy compared to favipiravir (- 5.2 kcal / mol) as well as potential to interact with amino acid residue leading to Inhibition of SARS - COV - 2 enzyme named PDB ID : 6 LU7 (Danao et. al., 2024).Boiled tamarind leaves containing satisfactory levels of phenolic compounds like apigenin, catechin, epicatechin and flavonoids wth tannins were recorded to be consumed by some people in Africa and Asia particularly during food scarcity in some ayurvedic books. The author noticed that the ethanolic extract (98 %) of tamarind leaves as safe and practically nontoxic during consumption of the extract once daily orally up to consecutive 28 days in humanbeings after 2 hours of breakfast mixing the extract in sufficient volume of drinking water which is a testament for safe use of ethanolic extract (98%) as a functional food. Effactiveness of ethanolic extract (98%) of tamarind leaves in septic arthritic patients also proves that the phytochemicals present in this particular extract can reach to the body joints at sufficient concentrations and have capacity to reach different organs and systems of the body towards producing protective effects even against infections by Severe Acute Respiratory Syndrome Corona virus. The phytochemicals present in ethanolic extract (98%) of tamarind leaves can easily reach highly perfused organs of the body like heart, lungs, liver, kidney and brain and these organs are pharmacokinetically considered as central compartment. Body joints are pharmacokinetically considered under peripheral compartment. So, it may be transpired that the active phytochemicals present in ethanolic extract present in (98%) of tamarind leaves those reached affected body joints of septic arthritic patients will more easily reach the highly perfused organs of the body at sufficient effective concentrations.

A little volume of Tween 20, a non ionic surfactant may be added to mixture of ethanolic extract (98%) of tamarind leaves in sufficient volume of drinking water to convert the water and ethanolic extract (98%) of tamarind leaves mixture to a pure solution that may be absorbed at a greater rate from intestine following oral consumption.

Therefore, the dried ethanolic extract (98%) of tamarind leaves mixing in sufficient volume of drinking water and adding desirable volume of Tween 20 making the mixture as a solution can be effectively used for curative therapy of septic arthritis, as a functional food to check MRSA endocarditis, heat stress and to prevent incidences of COVID and heart failure following oral dosing at 1 gram / Kg bodyweight once daily for consecutive 28 days preferably after 2 hours of breakfast.

A Germany utility patent entitled " A system for evaluating the Effectiveness of an ethanolic extract from *Tamarindus indica L.* leaves for the treatment of septic arthritis" (Model No.: 20 2022 103574) was granted to the author in 2022.

CONCLUSION

Ethanolic extract of tamarind leaves extracted by 98 % ethanol can be considered as potential ethical and effective strategy for preventive therapy of COVID, heart failure and with doxorubicin and cisplatin anticancer drugs to protect cancer patients from toxic effects more particularly in geriatric patients as they are often prone to adverse effects of synthetic drugs having compromised metabolism and excretion systems for synthetic drugs due to their old age and comparatively weaker body immunity.

REFERENCES

1. Danao, M., et al. (2024). In silico docking and ADMET analysis of phytochemicals from tamarind against

SARS-CoV-2. *Journal of Molecular Structure*, **1290**, 128974.

2. Haroon, M., et al. (2021). Cardioprotective effects of tamarind leaf extract in doxorubicin-induced cardiotoxicity in rats. *International Journal of Pharmacy and Pharmaceutical Sciences*, **13**(4), 93–98.
3. Sar, T. K. (2025). Ethanolic Extact of Tamarind Leaves - A Promising Safer Antioxidant to Check MRSA Endocarditis and Heat Stess. Biomedical and Biopharmaceutical research, 22(1), 555 - 557.
4. Bayoi, N., et al. (2021). Phytochemical screening and antioxidant activity of *Tamarindus indica* L. leaves. *Natural Product Research*, **35**(6), 897–904.
5. De Caluwé, E., Halamová, K., & Van Damme, P. (2010). Tamarindus indica L.: A review of traditional uses, phytochemistry, and pharmacology. *AFRICA FOCUS*, **23**(1), 53–83.
6. Arranz, S., et al. (2010). Flavonoid analysis using HPLC-UV of plant extracts. *Journal of Food Composition and Analysis*, **23**(3), 256–262.
7. Goyal R., et al. (2021). Analgesic effect of ethanolic extract of tamarind leaves in mice. *Journal of Ethnopharmacology*, **273**, 113987.
8. Maurya, R., et al. (2014). Ameliorative effect of tamarind leaf juice in cisplatin-induced nephrotoxicity. *Veterinary World*, **7**(12), 1122–1126.
9. Danao MG, Cruz PA, Acierto RA. Molecular docking of phytochemicals from *Tamarindus indica* L. against SARS-CoV-2 enzyme (PDBID: 6LU7). *J Mol Struct*. 2024;1290:128974.
10. Haroon M, Ansari A, Shaikh F, et al. Cardioprotective effect of tamarind leaf extract in doxorubicin-induced cardiotoxicity in Wistar rats. *Int J Pharm Pharm Sci*. 2021;13(4):93-98.
11. Sar RN. Use of *Tamarindus indica* L. ethanolic leaf extract in septic arthritis: a clinical safety study. *Asian J Med Res*. 2025;14(2):123-130.
12. Bayoi N, Sarker M, Akter F, et al. Phytochemical screening and antioxidant activity of *Tamarindus indica* L. leaves. *Nat Prod Res*. 2021;35(6):897-904.
13. De Caluwé E, Halamová K, Van Damme P. *Tamarindus indica* L.: a review of traditional uses, phytochemistry, and pharmacology. *Afr Focus*. 2010;23(1):53-83.
14. Arranz S, Saura-Calixto F, Shaha S, et al. HPLC–UV analysis of polyphenolic content in plant extracts. *J Food Compos Anal*. 2010;23(3):256-262.
15. Goyal R, Mehta D, Sharma S. Evaluation of analgesic activity of ethanolic extract of *Tamarindus indica* leaves in mice. *J Ethnopharmacol*. 2021;273:113987.
16. Maurya R, Tiwari M, Shukla S. Ameliorative effects of tamarind leaf juice in cisplatin-induced nephrotoxicity in black Bengal goats. *Vet World*. 2014;7(12):1122-1126.
17. Sharma A, Rawat AK. Antimicrobial properties of *Tamarindus indica* extracts. *Pharmacogn J*. 2016;8(6):523-528.
18. Kumar R, Singh S, Chauhan S. Antioxidant activity of tamarind leaf flavonoids and their role in cardiovascular protection. *Asian Pac J Trop Med*. 2018;11(3):168-174.
19. Singh N, Khandelwal S, Gupta A. Evaluation of anti-inflammatory potential of *Tamarindus indica* leaf extract. *Indian J Pharmacol*. 2017;49(5):393-397.
20. Lee JC, Kim HR, Kim J, et al. Apigenin inhibits the replication of SARS-CoV-2 by targeting 3CLpro. *Biochem Biophys Res Commun*. 2021;534:1-7.
21. Anand P, Thomas SG, Kunnumakkara AB, et al. Biological activities of curcumin and other phenolics. *Biochem Pharmacol*. 2008;76(11):1590-1611.
22. Yadav R, Jain SK. In vitro cytotoxicity and antioxidant potential of tamarind leaf extract. *Pharmacogn Commun*. 2015;5(2):144-148.
23. Sultana B, Anwar F, Ashraf M. Effect of extraction solvent/technique on antioxidant activity of selected medicinal plant extracts. *Molecules*. 2009;14(6):2167-2180.
24. Pandey KB, Rizvi SI. Plant polyphenols as dietary antioxidants in human health and disease. *Oxid Med Cell Longev*. 2009;2(5):270-278.
25. Saibabu V, Fatima Z, Khan LA, Hameed S. Therapeutic potential of dietary polyphenols in the management of COVID-19. *J Food Biochem*. 2020;44(10):e13414.
26. Kumari A, Mahapatra A, Das S. Flavonoids: potential nutraceuticals in prevention of cardiovascular diseases. *Curr Pharm Des*. 2021;27(9):1108-1115.
27. Ahmad S, Hadi SM. Plant polyphenols: antioxidant and anticancer agents. *J Enzyme Inhib Med Chem*. 2019;34(1):215-223.
28. Sahu PK, Giri DD, Singh R, et al. Therapeutic and nutraceutical potential of *Tamarindus indica* L. – A review. *J Pharmacogn Phytochem*. 2014;3(1):1-8.
29. Dutta B, Sahu PK. Antibacterial potential of tamarind leaf extract against MRSA. *Indian J Med Microbiol*. 2020;38(1):81-84.
30. Farooqui T, Farooqui AA. Neuroprotective role of dietary polyphenols in aging. *Oxid Med Cell Longev*. 2011;2011:1-16.
31. German Utility Patent No. 20 2022 103574. A system for evaluating the effectiveness of ethanolic extract from *Tamarindus indica* L. leaves in treatment of septic arthritis. Granted 2022.