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Review on pharmacological and phytochemical activity of *Thespesia populnea* linn

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Abstract
One of the significant drugs utilized in herbal medicine is Thespesia Populnea (TP) Linn.. For the purpose of ornament along with shade, it is cultivated. In the tropics, it blossoms all through the decennia. For the epidemic affections' treatment like eczema, herpetic, guinea worm, ringworm, psoriasis, and scabies diseases, the plant TP is conventionally asserted to be helpful. In scabies and psoriasis, the oil made by boiling the ground bark in coconut oil is applied outwardly. To set up scientific data for its conventional claim as anti- psoriatic, the TP plant has been selected. The TP plant's diverse parts are identified to have valuable medicinal features like purgative, Anti-Bacterial (AB), hepatoprotective, Anti-Inflammatory (AI), and Anti-Oxidant (AO) activities. Hence, TP, the TP's pharmacological activity, along with TP's Phytochemical (PC) had been illustrated, in this work. 2, 2-Diphenyl-1-Picryl-Hydrazyl-Hydrate (DPPH) activity of Ethanolic Extract (EE) of flowers of TP, In-Vitro AI by Human Red Blood Cell (HRBC) Membrane stabilization technique, along with the EE of TP on human erythrocyte is also examined in this work.

Keywords: *Thespesia populnea* Linn, pharmacological activity, phytochemical activity, ethanolic extract, Anti-diabetic activity, and antioxidant

Introduction

From antiquity, nature has been employed as the source of medicinal agents. In India, a plant is a medicines' source and turns out to be a significant health care system's component. For several years, plants have been a crucial part of preserving human health and enhancing life's quality. The global thrust areas for drugs as of Medicinal Plants (MPs) include disease conditions whose occurrence is inaccessible. For MPs, the international market is worth greater than the US $ 60 billion per year; then it is growing at a rate of 7 % annually [1]. In recent days, to display the plants' immense potential utilized in numerous conventional systems, the focus on TP Linn plant study has been augmented throughout the globe; also data have been gathered. TP Linn is a member of the Family Malvaceae, which is generally called Hibiscus populnea. Malvaceae belongs to the flowering plant family, which is estimated to have 244 genera with 4225 known species. Durian, Cacao, Cotton, and Okra are renowned members of this family. Regarding the number of species, the largest genera embrace Sida (200 species), Pavonia (200 species), Dombeya (250 species), Sterculia (250 species), along with Hibiscus (300 species). A medium-sized evergreen tree with a dense crown that grows up to 20 m tall is TP. With brown to silvery scales, glabrescent, the twigs are closely covered. Largely ovate, simple, pointed at the tip, alternate, along with heart-shaped is the shape of leaves [2]. Prior to falling, they are glossy with palmate veins, plump, turning yellow and red. Huge, bell-shaped, and solitary are the flowers. There are five petals, which are wide, rounded, overlapping, and at the inside base of the corolla, there is yellow with a maroon heart that corresponds to every petal. The TP's leaves and flowers are depicted in figure 1.

In addition, for chronic dysentery, scabies, psoriasis, AI diseases, cutaneous, and hemorrhoids diseases, the diverse components of TP like leaf, fruit, root, and bark are utilized [3]. Skin, epidermic infections, and liver diseases are the major medicinal uses. For scabies, insect bites, rheumatism sprains, warts, and swellings the fruit juices are exploited. For the relief of migraine, the pulps of fresh fruits are used [4]. A few of the conventional claims in the TP are as follows [5]:

- Cooling, rough, haemostatic, anti-diarrhoeal, AB and AI are the properties of the plant. For dematopathy like diabetes, scabies, cough, ringworm, asthma, ulcer, catarrh, and cholera it is useful.

- For piles, dysentery, haemorrhoids, and diabetes it is useful. The itching, ulcers, scabies, other skin diseases, along with urinary disorders are cured by it. The bark is utilized as a substitute, which is rough inside. To treat scabies along with other skin diseases, the fruits together with leaves are applied on the exterior.
- In treating particular diseases, the juice of fruits is exploited. A principal in the fruit acts actively against Gram-Positive Bacteria (GPB) and Gram-Negative Bacteria (GNB), which is utilized for curing intestinal diseases.
- Gossypol [6], 7 Hydroxy-2,3,5,6-tetrahydro-3,6,9-Trimethylnaphto [1,8-B, C] Pyran-4,8-Dione, Kaempferol, Quercetin, Kaempferol 3-glucoside, Quercetin 3-glucoside, Rutin, Nonacosane, Lupenone, Myricyl alcohol, Lupeol, β-sitosterol and β-sitosterol-β-D-glucoside, 5, 8-dihydroxy-7-methoxy flavone, 7-1ydroxyisoflavone and Thespone, Mansonones D E and F Populneol, Thespesin[7] are the several chemical constituents separated from TP.

In the department of chemistry together with pharmaceutical sciences, the TP has turned out to be highly demanding and propitious. Only a few experts examined the TP profoundly, even though several experts examined TP. Hence, TP, the TP's pharmacological activity, along with the PC of the TP are surveyed in this research.

Fig 1: Leaves and flower of TP

Literature Review

A small evergreen tree or shrub that can reach a height of 18 m is the TP. It has dense growth, thick, and light to dark-gray fissured bark. In coastal woodlands throughout the Caribbean and somewhere in America, the Portia tree has been introduced and has become naturalized. Hence, in this work, the TP is illustrated in section 2.1; the TP's pharmacological activity is expounded in section 2.2; the PC activity of TP is exhibited in section 2.3; the outcomes and discussion are illustrated in section 3.

2.1. Thespesia Populnea

TP is acclimatized for sea dispersal along with growth in island environments, which are native to the old world tropics. Before the Austronesian expansion, no leftovers of TP have been recovered as of Polynesia, although the plant seeds can remain for months on sea currents. In a range of soil kinds found in coastal surroundings like the soils derived from basalt, limestone, quartz (sand), the Portia tree is capable to thrive.

M. Kathirselvam, *et al*. [8] illustrated the cellulose assessment in bark fibers of TP. In natural fibers, cellulose was the chief element and with the plant's growth, its proportion considerably varied. The XRD result predicted a crystallinity index of 44-49% with an average crystalline size of 29.625Å. The fiber failed mainly by brittle fracture, under the tensile load; then, its tensile strength lay betwixt 559 MPa and 329 MPa with an average elongation betwixt 2.9% and 1.7%. The bark of TP is depicted in figure 2.

Fig 2: Bark of TP

A. Kumaravel, et al. [9] illustrated the cellulose fibers' characterization in TP barks. In selective applications, natural fibers were rising as the best alternatives meant for synthetic materials. The removal of non-cellulosic compounds was authenticated by Fourier transform infrared spectra. Then, on optimally treated fibers, the X-ray diffraction studies exhibited 13.6% of growth in the cellulose crystal's size. In large quantity, every plant and tree was packed with cellulose; however, they were not exploited in the best manner.

Pharmacological activity of *Thespesia populnea*

By analyzing its microscopical characters with the major focus on its leaf, the plant TP was pharmacognostically recognized. The existence of epidermis, vascular glandular trichomes that are peltate type, cleared leaf displaying vein-islet, mucilage masses, and vein termination all are exhibited by the leaf's TP [10]. The TP plants' common parts utilized for pharmacological activity are illustrated in table 1.

Table 1: Common parts of the TP plant used for pharmacological activity

Part of the Plant Used	Activity Done
Bark	Dyeing property
	Anti-diarrheal
	Anti-microbial
	Anti-Diabetic (AD)
	Anti-bacterial and Cytotoxic
	Memory enhancing effect
	Anti-oxidant
	Wound Healing (WH) activity
	Anti-nociceptive
Leaf	Anti-diabetic
	Hypo-glycemic
	Anti-ulcer
	Anti-bacterial
	Anti-hepatotoxic
	Alpha-amylase inhibitory activity
Flower	Anti-bacterial
	Synergistic activity
	Anti-steroidogenic activity
	Anti-diabetic
Seed	Anti-hyperglycemic
Arial Parts	Anti-oxidant
	Anti-inflammatory

The activities entailed in the TP's pharmacological behavior are Anti-hepatoprotective activity, Anti-steroidogenic activity, WH activity, AO activity, Anti-implantation activity, AD activity, AD Activity, Anti-Ulcer (AU) activity, and Immunomodulatory (IM) Activity.

a. Anti-hepatoprotective activity

In the metabolism, storage, secretion, and endogenous and exogenous substances' detoxification, Anti-hepatoprotective activity in the liver serves an indispensable role. TP's ethanol extract fraction administered orally to diverse collections of rats was appraised utilizing the Carbon tetrachloride (CCl4) model of liver injury exhibited important activity.

R.ilavarasan, et al.[11] expounded the TP bark extracts' anti-hepatoprotective activity against CCl_4 induced liver toxicity in rats. Using water and methanol, TP bark was extracted. To produce the respective Methanol Extract (MET) along with the Aqueous Extract (AET), the extracts were vacuum dried. The biochemical observations' outcomes were supplemented by rat liver sections' histopathological examination. When analogized to AET, MET was discovered to display greater hepatoprotection. The mortality was not caused by the extracts; then, in the CCl_4 group, the total protein was reduced.

b. Anti-steroidogenic activity

The TP's diverse extract is displayed in albino mice along with it are noticed that the uterus' weight along with ovaries is decreased considerably. In the ovaries, the cholesterol together with ascorbic acid content is considerably increased.

G. Chandru, et al.[12] presented the TP's anti-steroidogenic effect in female mice. An anti-steroidogenic effect had been noticed in the TP Corr. floral extract. A considerable augment in the uterus' wet weight in OVX + EDP group 6; OVX + EDP + Extract mice group 7 had been perceived as of the investigation. Owing to exogenous, there was a considerable augment in the uterine cholesterol content together with serum estrogen level in OVX +

EDP and OVX + EDP +Extract treated mice; however, this could be on account of the extract, as there was no considerable dissimilarity betwixt OVX+EDP and OVX+EDP + Extract.

c. Wound healing activity

The process of repair that pursues injury to the skin along with other soft tissues is called WH. In the Excision Wound (EW) together with incision wound models in rats, the AET of TP fruit at 200 mg/kg of dose level exhibited important activity.

H. Shivakumar, et al. [13] expounded on the leaves' WH activity of TP. In the EW along with incision wound models in albino rats of either sex under light ether anesthesia, the extracts were screened for WH properties. The outcomes exhibited that, in EW along with incision wound models, the AET of TP leaves has more important WH properties than the Petroleum Ether (PE) and alcoholic extracts

T. Shekshavali, et al. [14] analyzed the antimicrobial of WH activity of TP. By the diffusion technique against '4' bacteria and '2' fungi, the plant's bark was illustrated. When analogized to the MET and AET, the outcomes exhibited that the PE extract possessed substantial anti-microbial activity against the experimented bacterial along with fungal organisms. However, to optimize the perceived activities, there was a requirement to follow the active principles' characterization.

d. Anti-oxidant activity

The lipids and proteins' inhibition by restraining oxidative chain reactions is called AO activity. At 500 mg/kg dose level, the TP bark's AET and METs exhibited that considerable AO activity was analyzed in rats. When induced liver injury with CCl4: olive oil (1:1), the extracts displayed substantial activity, which showed augmented levels of superoxide dismutase, glutathione peroxidize glutathione S-transferees, glutathione reductase, along with catalyze together with lipid peroxidation's decreased level.

Sheetal Anandjiwala, et al. [15] illustrated the stem bark's AO activity of TP. In '4' vitro/ ex vivo models, TP stem bark's AO activity was discussed. The presence of a higher amount of flavonoids, tannins, along with phenolics is displayed during the initial PC screening. Following quantification by the Folin Ciocalteau technique exhibited the occurrence of a greater amount of total phenolics. Regarding a reduction in Malondialdehyde (MDA) formation by the sample extract, the outcomes were portrayed.

e. Anti-implantation activity

In female albino rats, it is the consecutive extracts of PE and Ethyl Acetate (EA) along with following Crude Alcoholic Extract (CAE) of TP's seeds. In rats of normal oestrus cycle subsequent to overnight cohabitation with males of confirmed fertility, the active principles' Graded doses and the CAE (in 1%gum acacia suspension) is examined intended for probable anti-implantation activity.

Priya, et al. [16] expounded the TP's (l.) anti-implantation activity in wistar albino rats. For probable anti-implantation activity in proestrus cycle's albino female rats subsequent to overnight cohabitation with males of confirmed fertility, the extracts had experimented with. In the uterus, the TP bark extract's short-term treatment decreased the number of implantation sites that were exhibited in the outcomes. Owing to their anti-implantation, anti-zygotic, blastocytotoxic, or by early unusual effect 7 of plant extracts, the implantation's loss might occur.

f. Anti-diabetic activity

For blood sugar, the EE of the plant TP bark along with leaf were assessed, against the Streptozotocin (STZ)–induced diabetic rats along with analogized to normal drug glibenclamide.

R. Parthasarathy, et al [17]. illustrated the AD activity of TP bark along with Leaf Extract (LE) against STZ-induced diabetic rats. For the impact on the blood sugar, the EE of The Plant Bark Extract (TPBE) and The Plant LE (TPLE) were analyzed, against the STZ-induced diabetic rats. The outcomes exhibited that both the EE had an AD impact against STZ induced diabetic rats; then it as well displayed the probable mechanism because of inhibition of free radical's generation. EE of TP bark along with leaf didn't generate lethality.

Gowtham R, et al [18]. expounded the AO activity of MPs in TP and Abutilon Indicum L. by diverse techniques. With diverse concentrations of 0.2, 0.4, 0.6, 0.8, and 1.0 percentage, the '3' solvent extracts were prepared. The observations verified that the MET of TP and Abutilon Indicum leaves had diverse polyphenolic elements and their significance in AO activity.

g. Antibacterial activity

The bacteria are annihilated or their development is defeated in AB activity. Several pharmacological activities such as antimicrobial, AO, cytotoxic, chemoprevention activities are said to be in Flavonoids. They have powerful anti-proliferative effects associated with cell cycle progression's inhibition along with apoptosis induction. Broad-spectrum antimicrobial activity against GPB together with GNB is displayed by TP and EE portrayed utmost inhibition.

A.Jayasri, et al [19]. inspected the TP-mediated Nano-particles' AB activity. In everyday life, to treat microbial diseases, several MPs had been exploited for centuries. When analogized to TP Nano Zinc (TPNZ) (25 µg/ml) and TP Extract (TPE) (125 µg/ml) against Staphylococcus aureus as of milk sample of clinical bovine mastitis case, the outcomes of in vitro AB studies designated the maximum AB activity for TP Nano Silver (TPNS**)** as authenticated by the least MIC value (10.62 µg/ml).

h. Anti-ulcer activity

In the upper gastrointestinal tract, prostaglandins of the misoprostol, enprostil have AU activity. At self-effacing doses, they inhibit gastric acid secretion and offer mucosal protection against noxious agents, encompassing non-steroidal AI drugs, smoking, chemotherapy, along with alcohol. In the folk medicine of diverse cultures, the TP (L.) is utilized for ulcers' treatment. In the rat model, TP leaves displayed significant AU activity in experimentally induced ulcers by minimizing the gastric secretions, with improving glycoprotein levels.

Sharma Praveen, et al [20]. described the pharmacological assessment of TP's bark extract for AU activity in rats. By using acute gastric lesions' models, the AU activity of EE of the TP's bark was estimated. AET of the TP's bark exhibited good AU activity, confirming the folk use of TP preparations and contributing to its pharmacological corroboration. The procedure was again repeated with greater doses if mortality was not noticed.

i. Immunomodulatory Activity

The substances that alter the immune system's response to a threat are called Immunomodulators. The immune deficit's reconstruction like AIDS treatment together with the normal immune responses' suppression is the probable use of immunomodulators in clinical medicine. As a standard IM drug, the MET of TP is provided at doses of 100, 200, along with 400 mg/kg b.w; p.o. Levamisole (50 mg/kg b.w, p.o) are exploited. To these phytoconstituents, the IM activity of plants may be accredited. Santhi Ramalingam, et al [21]. elucidated the IM activity of EA flavonoid extract of TP leaves. One of the most significant body's biological systems is the immune system. When analogized to cell line-induced animals on both treatment periods, the co-administration of TpFf to DLA along with EAC tumor-induced mice revealed a considerable reduction in IL-2 and IFN- γ. Induced by ELA and DLA, the EA extract was established to stimulate immune responses in Balb/c mice.

Phytochemical activity of *Thespesia populnia*

In the healing of diverse health issues, the PCs are the best sources. In the bioactive compounds' recognition present in plants, the preliminary PC screening is a basic step; it may result in finding new environmentally friendly natural chemicals and drugs [10]. The TP plant's common parts utilized for the PC activity are depicted in table 2.

Table 2: Common parts of the TP plant used for phytochemical activity

Part of the Plant Used	Compounds Isolated
Bark	Gossypol,
	Mansonone D, E, and F
	Flavonoids TpF-1, TpF-2, sterol TpS
	8-sesquiterpenoids populene A to H
	3,6,9-trimethyl-2,3-dihydro-benzo
	Populin, Populneol, Populnatin
	Thespesenone,
	Stearic acid, Betulin
Leaf	Quercetin-7-O-rhamnoglucoside
	Lupeol, Leupenone
Fruit	Herbacetin, Thespesin
Flower	Kaempterol, Gossipetin, Rutin, Quercetin

Phytochemical analysis of Thespesia Populnia

As chemical elements may be therapeutically active or inactive, there is a purpose for PC analysis. For identifying varied groups of naturally happening PCs, numerous PC investigations have been done. In finding the plant's bioactive profile of therapeutic importance, the PC research method is regarded as efficient. D. S. Chumbhale, et al.[22] described the phytopharmaceutics and PC attributes of TP. Diverse parts of the plant namely fruits, flowers, leaves, bark, along with roots have dissimilar pharmacological properties. Preliminary anti-cancer, diuretic, anthelmintic, antidiarrheals, anti-implantation, AD, AO, hepatoprotective, analgesic and AI, wound healing, antimicrobial, memory-improving activity, and in the Alzheimer patients' management were all pointed out in the outcomes. Jayapriya.S, et al. [23] illustrated the PC screening of TP leaf along with flower extracts. It was clear that TP leaf along with extracts logged superior therapeutic efficiency, having a majority of PC classes of compounds and the Phyto constituents' presence. The PC screening of TP leaf and flower is explained in table 3.

Table 3: Phytochemical screening of TP leaf and flower

Phyto Chemicals	Leaf Extract			Flower Extract		
	Petroleum Ether	Methanol	Aqueous	Petroleum Ether	Methanol	Aqueous
Alkaloids	✓	×	×	✓	✓	×
Tannins	×	×	×	✓	×	×

Saponins	×	✓	✓	×	✓	×
Steroids	×	✓	×	×	✓	×
Terpenoids	✓	×	×	×	✓	✓
Flavonoids	✓	✓	✓	✓	×	✓
Phenolics	×	✓	✓	✓	×	✓
Anthroquinones	×	✓	×	×	×	×

The presence is denoted by ✓and the absence is denoted by ×in table 3. In the AET of TP, the flavonoids, phenolic, and saponins are the compounds present. In the AET of TP flower extract, phenolics, flavonoids, and terpenoids are present. But, the other constituents didn't make any clear existence in the PE, MET, and AET of TP. K. Parameswara Rao, et al [24]. Illustrated the PC screening and AO potential of TP seed extract. The presence of '6' compounds is exhibited by the GC-MS investigation. The existence of diverse elements namely terpenoids, steroids, esters, tannins, acids, etc is displayed by the extracts' PC investigation. By comparing their retention time and peak area, the elements were recognized. It was evinced that the n-butanol extract possessed AO activity, as of the outcomes. Siddharth Shrivastav, et al [25]. surveyed the PC assessment of TP bark extracts. In the TP's bark, the existence of proteins, phytosterols, triterpenoids, flavonoids, tannins, glycosides, lipids/fixed oils, and carbohydrates was exhibited by the PC analysis. From the bark powder, '3' compounds TpF-1, TpF-2 along with TpS-2 was isolated. In tables 4 and 5, physical features, the amount of respective dried extract, along with qualitative chemical investigation of TP bark's diverse extracts were presented.

Table 4: Amount of respective dried extract and physical characteristics of the various extracts of TP bark

Extracts	Dry WT GMS	Color	Odour	Consistency
Alcoholic	16.88	Brownish red	Characteristic	Granular solid
Ether (60°-80°C)	6.33	Dull-Yellow	Characteristic	Granular solid
Butanolic	3.12	Blackish red	Characteristic	Lustrous solid
Ethyl acetate	0.15	Light brown	Characteristic	Powdery
95% Alcohol	8.68	Orange – red	Characteristic	Granular solid

For the feasible antipsoriatic activity, successive pet-ether, alcoholic extract, Butanolic (B-nol), EA, Successive Alcoholic Extract (SAE) along with isolated compounds (TpF-1, TpF- 2, and TpS-2, at 50 mg dose) as of TP bark are screened. The qualitative chemical investigation of TP bark's diverse extracts is illustrated in table 5.

Table 5: Qualitative chemical analysis of various extracts of TP bark

Phyto Constituents	Alcoholic Extract	Successive Extraction			
		PE	B-NOL	EA	SAE
Alkaloids	×	×	×	×	×
Carbohydrates	✓	×	×	✓	✓
Glycosides	✓	×	✓	✓	✓
Flavonoids	✓	✓	✓	✓	✓
Tannins	✓	×	✓	✓	✓
Proteins & Amino acids	✓	×	×	×	✓
Sterols	✓	✓	✓	×	×
Triterpenoids	✓	✓	✓	×	×

PE = PE extract (60-80ºC), B-nol = B-nol extract, EA = EA extract, SAE = Successive Alcoholic extract, "+" = Present, "-" = absent, in the table 5. The existence of proteins, lipids/fixed oils, phytosterols, triterpenoids, flavonoids, tannins, glycosides, and carbohydrates are exhibited by the PC analysis of TP bark extracts.

Results and Discussion

The In-Vitro AI by HRBC Membrane stabilization technique, DPPH activity of EE of TP's flowers, along with the EE of TP on human erythrocyte is explained in this part. A process in which the integrity of the membranes is stabilized by utilizing AI drugs is termed Membrane stabilization. Lysosomal membrane lysis occurs amid inflammation, which leads to the enzymes' release that gives rise to numerous disorders like cardiovascular diseases along with cancer. The effect of EE of TP on human erythrocyte haemolysis is described in table 6.

Table 6: Effect of EE of TP on human erythrocyte haemolysis

Concentration (µg/ml)	% Inhibition
250	28
500	46
1000	63
50	71

At 560 nm, employing UV analysis, the hemoglobin content in the solution was evaluated. By assuming heamolysis generated in the presence of distilled water as 100%, the percentage heamolysis was computed. With the aid of the subsequent equation, the HRBC membrane stabilizations' percentage generated was calculated.

Percentage inhibition of haemolysis = 100×OD1-OD2/OD1 (1)

The absorbances of diclofenac sodium and EE of TP are indicated as OD1 and OD2. 250 µg/ml**,** 500 µg/ml, 1000 µg/ml along with 50 µg/ml were the 4 concentrations regarded [26]. The pictorial depiction of EE of TP on human erythrocyte haemolysis is displayed in figure 3.

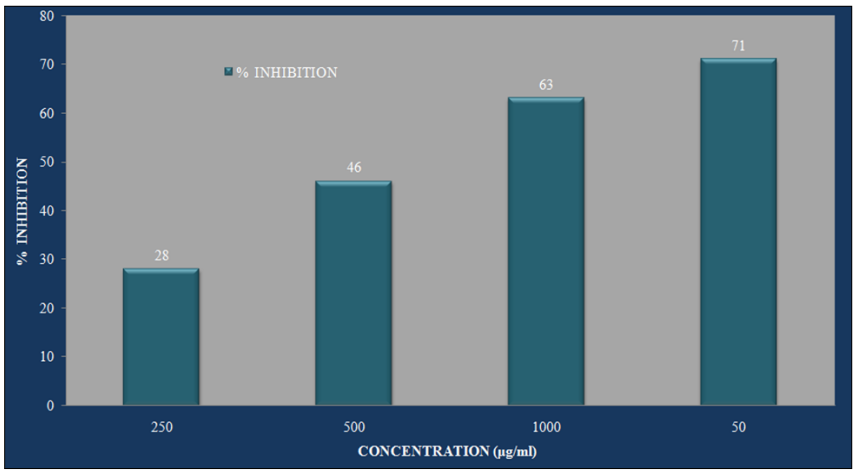

Fig 3: Graphical representation of EE of TP on human erythrocyte haemolysis

The concentration of 50µg/ml exhibited a superior effect (71%) of EE of TP when analogized to other concentrations (250,500 and 1000). The lesser effect of EE of TP is produced by the 250 µg/ml of concentration. Good in-vitro AO along with in-vitro AI activities are also possessed by TP, which are owing to the phenolic compounds' existence namely flavonoids and tannins that would have played a vital function in evincing the biological activity. The AO values by the nitric oxide technique are evinced in table 7.

Table 7: Antioxidant values by nitric oxide method

Concentration	% Inhibition for test Drug	% Inhibition for standard drug
31.25	21.94	64.94
62.5	25.78	67.97
125	37.21	71.99
250	47.99	77.05
500	53.63	84.22
1000	65.69	88.58

The procedure contains the oxidation of nitric oxide to nitrite by alkaline permanganate solution.
After adding alkaline arsenite solution to precipitate the permanganate as insoluble manganese dioxide, the Nitrite is quantitatively recovered. In both instances, for both EE and standard drugs, as the concentration increases, % of scavenging activity also increases. The pictorial representation of In-Vitro AI by HRBC Membrane stabilization technique is evinced in figure 4.

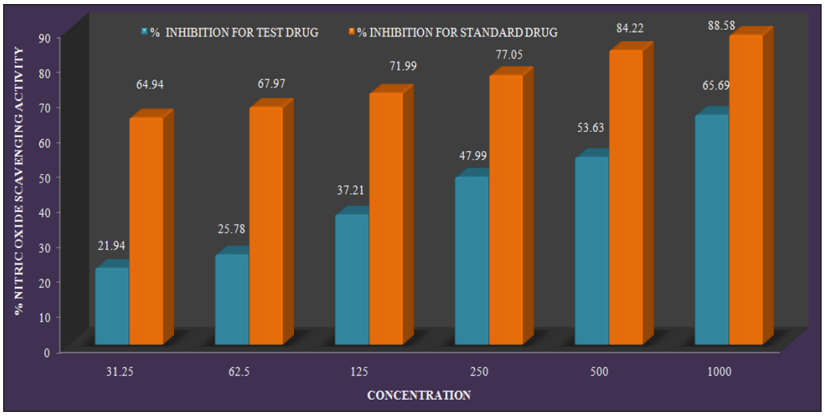

Fig 4: Graphical representation of *In-Vitro* Anti-inflammatory by HRBC Membrane stabilization method

For all the concentrations of 31.25, 62.5, 125, 250, 500, and 1000, the percentage of inhibition for standard drugs evinced greater (64.94, 67.97, 71.99, 77.05, 84.22, and 88.58). However, in all the concentrations, the percentage inhibition for test drugs is less.

When analogized to the standard drug (ascorbic acid), AO activity by nitric oxide technique asserts that EE of TP evinces good AO activity.

Besides this, DPPH activity was carried out. When the DPPH free radical reacts with hydrogen donors, it is decreased to corresponding hydrazine. The color of the DPPH radical is purple; then upon reaction with hydrogen donor, it changes to yellow color. It is a decoloration assay, which is estimated by the AO's addition to a DPPH solution in ethanol. The DPPH assay activity of EE of flowers of TP is evinced in table 8.

Table 8: DPPH assay activity of EE of flowers of TP

Concentration (µg/ml)	% Cytotoxicity
1000	85.49
500	72.13
125	54.75
31.25	45.17

There were a few concentrations like 1000, 500, 125, and 31.25 respectively, in the DPPH assay activity of EE of TP. A strong AO activity was evinced by total AO and ABTS. The AI activity was exhibited by the HRBC membrane stabilization, inhibition of albumin denaturation [27]. The pictorial depiction of the DPPH assay activity of EE of TP's flowers is displayed in figure 5.

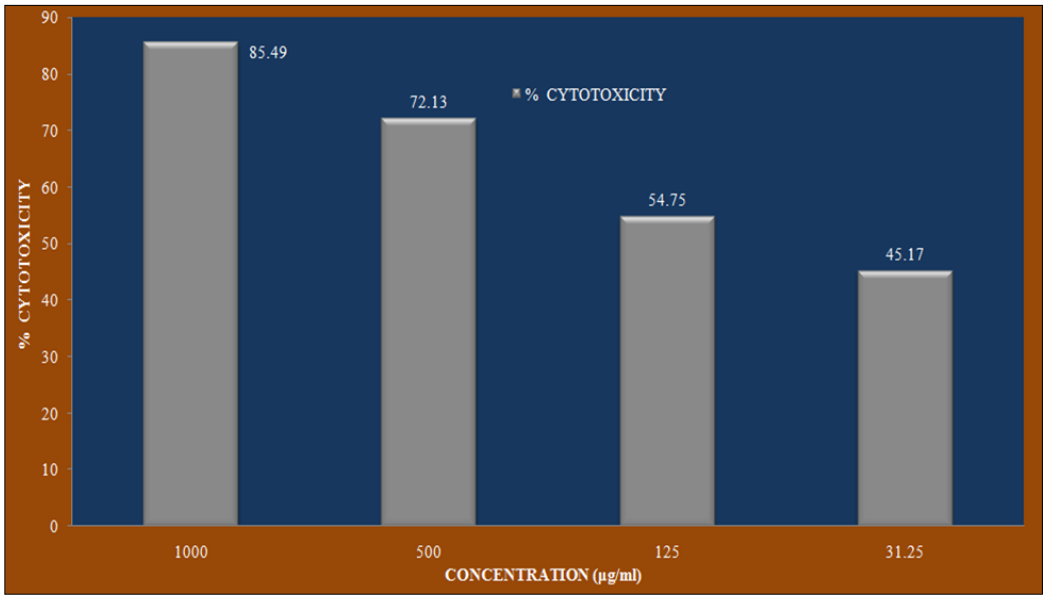

Fig 5: Graphical representation of DPPH assay activity of EE of flowers of TP

When analogized to the other concentrations 500, 125, and 31.25, the percentage of cytotoxicity is higher (85.49) in the concentration of 1000 µg/ml. A sturdy connection betwixt the AI and AO activities of TP flowers is expressed by the analyses.

Conclusion

To append further information about this precious plant, the researchers' major focus on the pharmacological potentials of TP was very useful. Besides this, centered on their uses, there are still some choices to examine the unexplored potential of plants. Several chemical constituents present in the plant are accountable for the assorted pharmacological and medicinal properties. The presence of the diverse constituents embracing acids, steroids, tannins, terpenoids, esters, etc is evinced by the PC analysis of the extracts. Hence, TP, the pharmacological activity of TP, and PC of TP had been illustrated in this work. Examination of In-Vitro AI by HRBC Membrane stabilization technique, EE of TP on human erythrocyte, and DPPH activity of EE of flowers of TP are done. To corroborate the tradition, the active constituent required to be isolated and should be regarded for further in-vivo or in-vitro investigation.

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