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 C A R A S



## Phytochemical Analysis, Cytotoxic Activity and Anti-oxidant Potential of some Vital Ficus species

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### ABSTRACT

Larger part of the sicknesses or issues are principally connected to oxidative pressure, because of development of free revolutionaries. Writing review has uncovered the numerous faceted works of gam Ficus (Moraceae) for different infirmities. Thus, the current review is coordinated towards tracking down normally happening cell reinforcements of plant beginning and to lay out a relationship between the cancer prevention agent potential and therapeutics of the underlying foundations of four types of class Ficus viz. *Ficus religiosa* Linn., *Ficus bengalensis* Linn., *Ficus elastica* Roxb. furthermore, *Ficus glomerata* Roxb. In this review, an endeavor has been made interestingly to normalize foundations of these four species. In concentrating on microscopical attributes, restricted, dim, pericleron wide cortex, wide vessels covered by slim parenchymatous cells and long xylem strands with tightening closes were found in *F. religiosa* while in *Ficus bengalensis* periderm was fissured minutely into shallow flimsy cervices, cortex and vessel components were restricted and long slim strands with pointed closes were available. Sporadically fissured periderm with broken phellem cells, straightforward, thin vessel components were found in *F. elastica* and in *F. glomerata* meager periderm with plain cells, long, thin, tube-shaped vessel components and bountiful xylem and phloem strands were noticed. The preliminary phytochemical examination uncovered the presence of steroids, flavonoids, tannins, polyphenolic compounds, and so forth in the ethyl acetic acid derivation, drunkard and fluid concentrate of this multitude of species. The microscopical, physicochemical and UV, HPTLC fingerprints studies would act as a standard reference for recognizable proof and recognizing morphological, from its debasements. This is the primary such review on normalization on Ficus species.

**Key words:** Ficus species, Phytochemical analysis, Cytotoxic activity, Anti-oxidant potential

Ficus family is ordinarily tropical plants and is among the earliest natural product trees developed by people. These species are regularly utilized in conventional medication for a wide scope of infections and contain rich auxiliary metabolites that have shown different applications. Ficus variety the phytochemical compounds, conventional purposes and contemporary pharmacological exercises like cell reinforcement, cytotoxic, antimicrobial, anti-inflammatory, antidiabetic, antiulcer, and anticonvulsant. The patterns in the phytochemistry, pharmacological instruments and exercises of Ficus family are outlined: antimicrobial, antidiabetic, anti-inflammatory and pain-relieving movement, antiseizure and anti-Parkinson's sicknesses, cytotoxic and cancer prevention agent. Health-promoting impacts, ongoing human clinical examinations, security and unfriendly impacts of Ficus plants additionally are covered. The clinical potential and long-term pharmacotherapeutic utilization of the variety Ficus alongside

no genuine revealed unfavorable occasions, proposes that it tends to be considered as being protected [1]. Ficus is a generally utilized therapeutic plant that been developed worldwide since the antiquated times. It started from Africa, yet is at present disseminated in practically all tropical nations. The plant has a place with the Moraceae family [2-4] and around 40 genera [3-4].

*Ficus religiosa* Linn. is found in Hosangabad and accessible all through India, wild as well as developed as a consecrated plant or as a side of the road tree [5]. As Compound constituent's fluid concentrate: hypoglycaemic guideline, tannins, cochotone, wax, glycoside, pitches, 6-sitosterol-1-D-glucoside, aspartic, lanosterol, lupen-3-one. methyloleanolate, n-octacosanol, vitamin K. Phytosterolin, separated from behold is poorwill bed CNS energizer and hypoglycaemic been accounted for some [6].

*Ficus bengalensis* Linn. Hort. Precipice. Dispersion happens from ocean level to 1200 in the deciduous woods area of South India. in the event that is filled in nurseries and street side for conceal [6-8]. An exceptionally huge tree coming up to 30 m stature, sending down numerous aeronautical roots branches and subsequently broadening the development of the tree endlessly. Synthetic constituents Bark: bengalenoside (hypoglycaemic glucoside), leucoanthocyanidins) anthocyanin;

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stem bark: lentic 13-sitosterol a-D-glucoside, meso-in. opelarogonidin-3-0-alpha-L rhamnoside, 3 ketones: 20-tetratriancontene-2-0, Wriacontene-10-one, pentatriacontan-5-one.

*Ficus elastica* Roxb. Hort. Precipice. roots various, fluted in the storage compartment; leaves, hr branches, epiphytic in beginning phases, accomplishing a tallness an enormous, excellent evergreen tree. Synthetic parts are new plastic weak ethereal scent, coagulum gathered from plastic caoutL, sap, protein, insoluble matter, debris, and so forth. The bark of the tree yields 0.7% coallike material (low quality). Leaves contain caoutchouc (0.3%), sugar (1.1%), L-(1%), debris (0.27%) and some polyprenols viz. ficapreno1-10, - 11 and been accounted for [9].

*Ficus glomerata* Corm. Pl. All through India, Pakistan, Bangladesh, Sri Lanka [10]. Portrayal an evergreen, medium tall tree 10-18 meters in stature; youthful shoo pubescent or scaberulous; leaves dull green 7.5-15 by 3.2-6.3 cm. Bark: wavy behenate, lupeol and it's a-OAc, a-amyrin [11], sitosterol, gluanol-OAc [12] stigmasterol [13], two leucoanthocyanins (leucocyanidin-3-0-0-D-glycopyranoside leucoelarogonidin-3-a-L-rhamnopyranoside) [14]; ItNP P-amyrin, 0-sitosterol, gluanol-OAc (13a, 1 413, 1 7 (3, 20aH-lanosta-8,22-dien4"

acetic acid derivation); Natural product: lupeol-OAc, P-sitosterol, ester of teraxasterol and glucose, gluanol-OAc, hentriacontane; Heartwood: P-sitosterol [15].

#### Free radicals

Oxygen ( $O_2$ ) is fundamental for high-impact life processes. Nonetheless, around 5% or a greater amount of the breathed in  $O_2$  is changed over to responsive oxygen species (ROS) like superoxide anion extremist (Gracious), hydrogen peroxide ( $H_2O_2$ ), and hydroxyl revolutionary ( $HO^{\cdot}$ ) by univalent decrease of  $O_2$  [16]. Cell reinforcements can act by searching receptive oxygen species by hindering their development (e.g., by obstructing initiation of phagocytes), by restricting progress metal particles and forestalling arrangement of HO as well as decay of lipid hydroperoxides, by fixing harm (e.g., a-tocopherol fixing peroxy extremists thus ending the chain response of lipid peroxidation) or by any blend of the abovementioned [17]. At the point when the harmony between ROS creation and cancer prevention agent guards is lost, oxidative pressure results which through a progression of occasions liberates the cell capacities and lead to different obsessive circumstances.

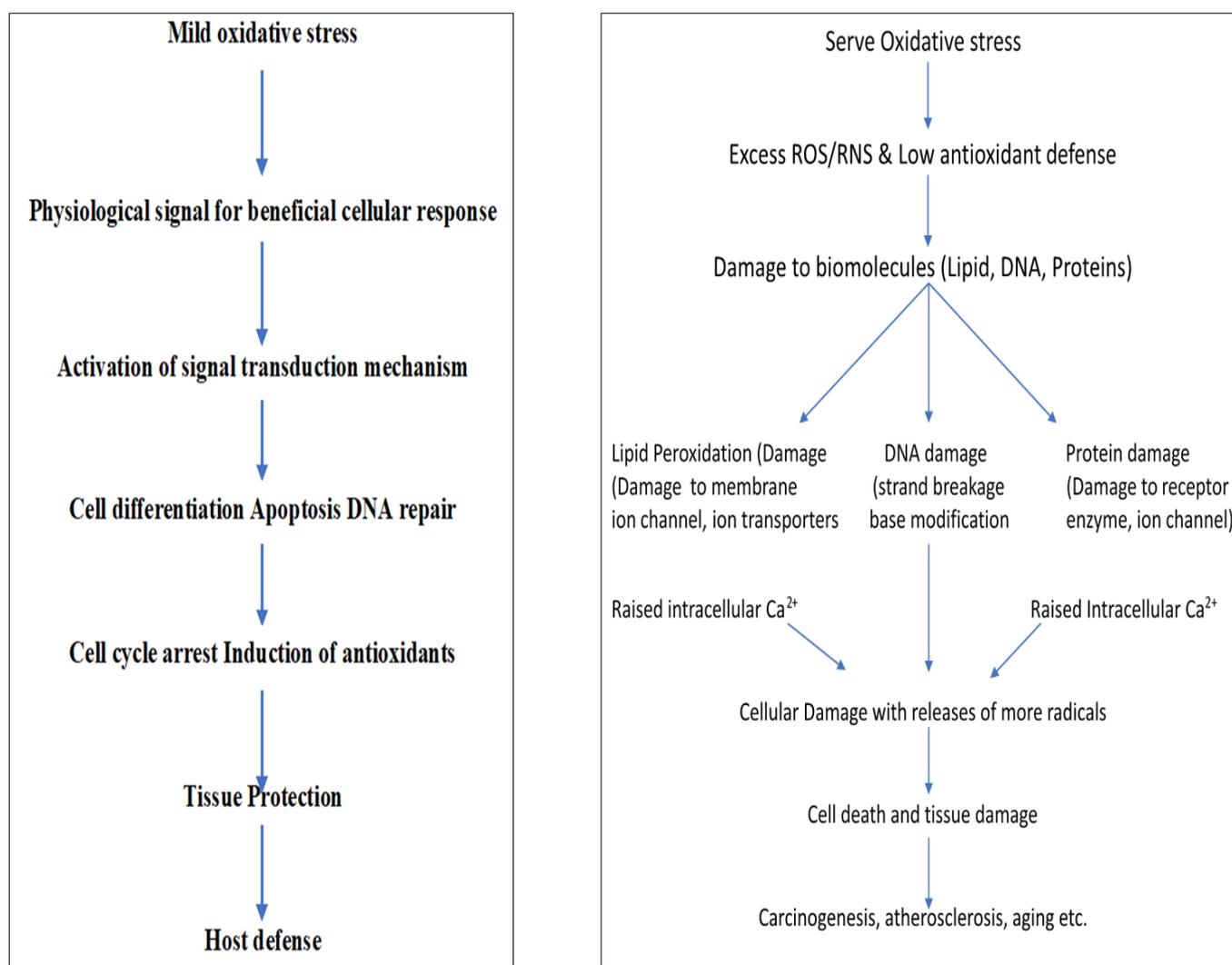


Fig 1 Responses and signals during oxidative stress

Oxidative pressure happens with the arrangement of free extremists, which might create positive result assuming that it is gentle or may deliver an adverse outcome assuming that oxidative pressure is serious (Fig 1). Substance mixtures and responses fit for producing potential harmful oxygen species/free revolutionaries are alluded to as 'favorable to

oxidants'. Then again, mixtures and responses arranging off these species, rummaging them, smothering their arrangement or restricting their activities are called 'enemies of oxidants'. In a typical cell, there is a proper prooxidant-cancer prevention agent balance. In any case, this equilibrium can be moved towards the prooxidant when creation of receptive oxygen

species (ROS) is expanded or when levels of enemies of oxidants are lessened. This state (oxidative pressure) can bring about genuine cell harm assuming that the pressure is monstrous or delayed. An inappropriate harmony among arrangement and obliteration of free revolutionaries might assume a part in the event of rundown of infirmities including maturing, joint pain, asthma, atherosclerosis, immune system illnesses, bronchopulmonary dysplasia, carcinogenesis, cardiovascular brokenness, waterfall, diabetes, Helps, gastroduodenal pathogenesis, hereditary issues, incendiary sicknesses, ischemia reperfusion injury, liver problems, solid dystrophy, neurodegenerative infections (Parkinson's dementia, Alzheimer's sickness pneumonic fibrosis, radiation harm retinopathy; amyotrophic horizontal sclerosis), ailment, skin discase porphyria, feeble dementia stroke [18].

Free revolutionaries are not completely hurtful rather the macrophages and neutrophils use them to annihilate microorganisms and other unfamiliar intruders. Phagocytic cells like neutrophils, monocytes, or macrophages safeguard against unfamiliar life forms by creating O<sub>2</sub> and nitric oxide as a piece of the killing instrument. Notwithstanding, a lot of creation or creation in some unacceptable spot can be destructive, both intensely and persistently. For this reason, the body needs cancer prevention agent compounds. Cancer prevention agents are otherwise called free extremists' scroungers and these are atoms that kill the impact of free revolutionaries and can forestall the harm to our phones. A few cancer prevention agents are inside created by our bodies (endogenous cell reinforcements) and some come from outside sources, for example, plants viz. products of the soil which are the rich sources (exogenous cell reinforcements) [19].

#### Generation of free radicals/oxidants

The oxidants/free extremists (might be non-revolutionary) are species with exceptionally short half-life [20], high reactivity and harming action towards macromolecules like proteins, DNA and lipids. These species might be either oxygen determined (ROS, receptive oxygen species) or nitrogen inferred (RNS, responsive nitrogen species), further these might be as free revolutionaries or non-extremists for instance HO' (hydroxyl), RO. (alkoxyl), RO. (peroxyl), O<sub>2</sub> (superoxide), as free revolutionaries and 1O<sub>2</sub> (singlet oxygen), H<sub>2</sub>O<sub>2</sub> (hydrogen peroxide) as non-extremists are a few models for receptive oxygen species (ROS) and negative. (Nitric oxide) as free revolutionary and negative (peroxynitrite) as non-extremist are the models for responsive nitrogen species (RNS) [21].

The half-lives change from a couple of nanoseconds for the most receptive mixtures to seconds or hours. Hydrogen peroxide can be put away endlessly under reasonable circumstances. Superoxide is shaped by one-electron decrease of oxygen interceded by chemicals like NADPH oxidase or xanthine oxidase or by the respiratory chain [22]. Hydrogen peroxide can diffuse promptly between cells. It is proficiently changed over to water by the chemical catalase or by glutathione peroxidase, an interaction that decides its half-life [23]. The hydroxyl revolutionary is the most receptive oxygen species with an expected half-existence of a couple of nanoseconds. It is shaped in vivo upon high energy light (e.g., x-beams), by hemolytic cleavage of water, or from hydrogen peroxide in a metal-catalyzed process. Bright light energy is deficient to part water, yet it can sever hydrogen peroxide to yield the hydroxyl extremist. Because of its high reactivity, this extremist quickly responds with encompassing objective atoms at the site where it is created. Peroxyl revolutionary is generally enduring species (seconds) and can be produced during the time spent lipid.

#### Taxonomic classification

Domain	Eukaryotes
Kingdom	Plantae
Subkingdom	Viridiaeplantae
Phylum	Tracheophyta
Subphylum	Euphylllophytina
Class	Magnoliopsida
Subclass order	Urticales
Family	Moraceae
Genus	Ficus

The selected plant species is utilized to treat various issues. All plant portions of FS are pharmacologically dynamic and utilized in conventional and current medication to treat various problems. Past a few investigations showed that the plant huge action and it is utilized for the treatment of different infirmities. The chose plant species are utilized as society medication by various customary frameworks for the therapy of different afflictions connected with various frameworks like the CNS, ANS, cardiovascular framework, richness framework and so on [24]. Because of its critical pharmacological power, the plant is utilized to treat various diseases [25], GIT issues, different irritations [26-29], diabetes [30-34] and malignant growth [35]. Nigerian individuals utilize the *Ficus platyphylla* species customarily for the treatment of epilepsy [36]. In Ayurveda framework, the Indian public utilize the *Ficus racemose* species to treat diabetes, liver, the runs, skin aggravation, hemorrhoids, cardiovascular sicknesses and urinary plot diseases [37]. The *Ficus glomerata* species is additionally utilized in Ayurveda framework to fix diarrhea, menorrhagia and hemoptysis [38]. On their part, the Omanis utilize the chose plant species to deal with different aliments like hacks, looseness of the bowels, skin contaminations, stomach issues, liver illnesses, epilepsy, tuberculosis, lactation problems, helminthiasis, barrenness and sterility [39].

#### Biochemical studies

In excess of 130 bioactive mixtures have been detached from various pieces of *Ficus* species since old times [40]. The majority of the mixtures will be disengaged from the ethereal and root parts by the specialist. The confined mixtures are various kinds of terpenoids, flavonoids and phenolic subsidiaries [41]. Past examinations showed that *Ficus macrocarpa* species contains friedelin, lupeol, oleanolic corrosive, taraxastene-3 β, α-diol and ursolic corrosive. The said plant species likewise contains various subsidiaries of friedelane, ursane, oleanane, lupane, cycloartane, tetraxetan, peroxy and cyclopropyl.

The tetraterpenoids four six-rings and one five-ring betulonic corrosive, betulonic corrosive, lupeol and lupeol will be additionally separated from the aeronautical pieces of one of the *Ficus* animal groups. As per writing the majority of the confined mixtures from the flying piece of FS are high atomic weight compounds, triterpenoids, phenylpropanoids, chalcone, flavonoids and phenolic acids (Fig 2). Likewise, the main metabolic mixtures, for example, flavonoids are confined from the airborne pieces of a large portion of the *Ficus* species. A large portion of the separated mixtures are removing a portion of various organic exercises like anticancer, antiviral, hostile to oxidant, antimicrobial, hepatoprotective and cardio tonic properties [42]. By and large, the plant constituents contrast starting with one country then onto the next due to natural, precipitation and soil conditions. As of now, our exploration bunch is additionally attempting to disconnect compound from the aeronautical piece of neighborhood FS.

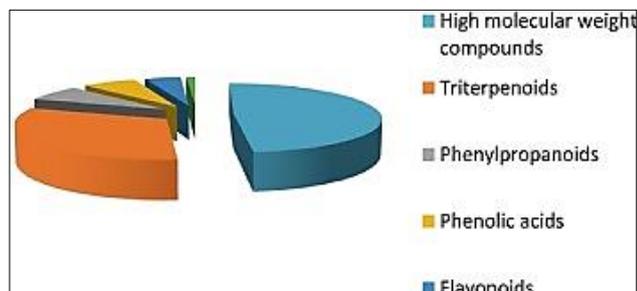
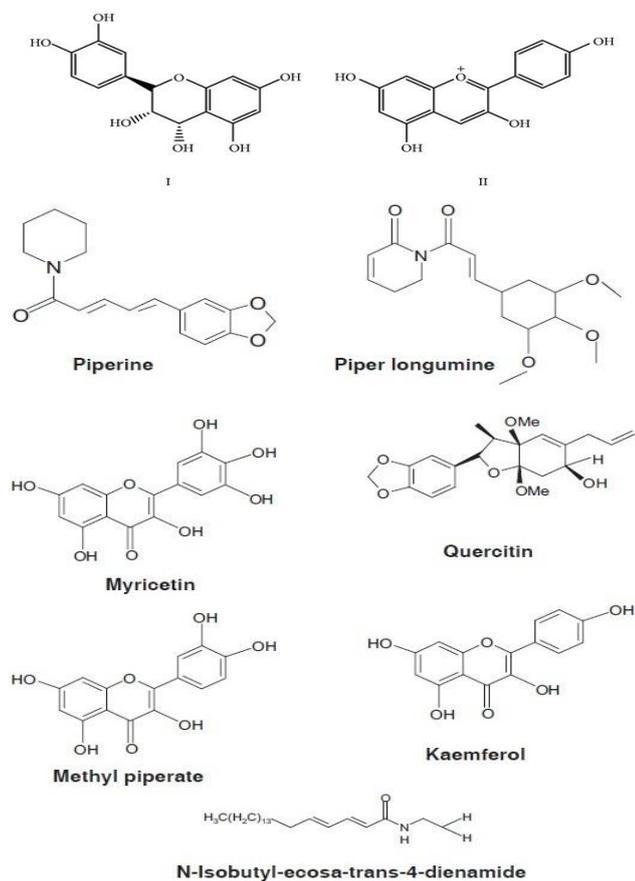


Fig 2 Total chemical compounds isolated from the FS.

### Pharmacological activities

*Ficus* species is perhaps the main gatherings of therapeutic plant all around the world. From past examinations, it is showed that all pieces of the chose plant give critical action. This action is because of the substance compounds and on the extremity of the mixtures [43]. Different extremity rough concentrates showed different huge movement on antimicrobial, cancer prevention agent, antifungal, cytotoxic, cardio tonic exercises [44]. Leucocyanidin (I) and pelargonidin (II) separated from the bark of *Ficus bengalensis* show hypoglycemic movement.



### Antioxidant activity

The cell reinforcement action of various extremity unrefined concentrates not entirely set in stone by deep rooted altered DPPH strategy [2-4]. Every one of the rough concentrates showed critical cancer prevention agent movement against DPPH free extremist. The outcomes additionally showed that the most polar unrefined concentrate showed the most elevated movement. The cell reinforcement movement would in general diminish as the extremity of unrefined concentrate diminished. The chose plant contains a few dynamic mixtures and those are considered as polar

mixtures since they are separated by the polar dissolvable. In any case, the polar rough concentrates contain a large portion of those polar mixtures which is answerable for the cancer prevention agent action. As indicated by writing, the level of absolute flavonoids and phenols mixtures will be extremely high in the polar rough concentrates [2-3]. Along these lines, those phenolic and flavonoids mixtures can speed up to expand the action of the polar unrefined concentrates. Then again, the most reduced movement will be seen in non-polar dissolvable. That implies that the non-polar concentrates don't contain more dynamic mixtures which can straightforwardly take an interest to the natural exercises. All things considered, not comparable cell reinforcement results likewise got from same and different species from various nations. Our extraction strategy from the plant materials isn't like others. Furthermore, the natural and soil conditions are additionally not comparable. Because of that our exploratory outcomes are not the same as the others. As indicated by our outcomes, the polar rough concentrates of FS could be utilized as normal cell reinforcement to forestall different serious illnesses.

### Antimicrobial activity

The antimicrobial movement of various extremity unrefined concentrates not set in stone by the notable circle dispersion technique [2-4]. All plant unrefined concentrates showed wonderful action against chosen Gram positive and Gram-negative bacterial strains. The polar rough concentrates of the privately gathered *Ficus* species showed the greatest movement against both Gram (+ and -) bacterial strains. All centralization of polar unrefined concentrates showed movement inside the scope of hindrance zone 0-13 mm against the Gram (+ and -) bacterial strains. The antimicrobial movement chiefly relies upon the sort of bacterial strains, portion focus and synthetic mixtures of the plant separates. In our chose Omani *Ficus* species, the majority of the organically dynamic gatherings of substance mixtures like alkaloids, steroids, saponins, tannins, glycosides, terpenoids, and flavonoids are available in the polar concentrates which are mindful in expanding the microbial movement [45]. The most extreme number of naturally dynamic mixtures or greatest convergence of organically dynamic mixtures contributed the most extreme antimicrobial action. The greatest action will be gotten in chloroform separate from the nearby *Ficus* species (FS) and the base movement will be hexane extricate. Past reports by different analysts showed that other *Ficus* species gathered from different nations likewise gave comparative examples of action results. A portion of the outcomes from different nations somewhat vary from our outcomes might be because of the natural circumstances. The environment of Inlet area it is extremely hot to incorporate Oman. Hence, a portion of the naturally dynamic mixtures which are answerable for movement either disintegrated or dissipated because of the great temperatures the plants will be presented to. Along these lines, the outcomes acquired from our investigation will be some way or another low contrasted with the other revealed values [46].

### Cytotoxic activity

The cytotoxic movement of the pre-arranged different extremity rough concentrates not entirely set in stone by salt water shrimp lethality strategy [2-3]. In our investigation, fake shrimp and BSL strategies will be utilized to decide the cytotoxic action. Among the six unrefined concentrates, the most extreme harmfulness will be gotten in ethyl acetic acid derivation with a  $LC_{50}$  worth of 26.82 mg/ml and the base poisonousness will be in butanol with a  $LC_{50}$  worth of 463.44 mg/ml separately, in correlation with the negative control DMSO. Once more, the harmfulness of the rough concentrates

totally relied upon the quantity of poisonous mixtures and grouping of the poisonous mixtures. That implies that the quantity of harmful mixtures and the grouping of poisonous mixtures will be expanded in the concentrate and the harmfulness of the unrefined concentrates will be expanded. Not definite comparative harmful outcomes will be gotten from different nations and other *Ficus* species [47] since the gathered plant tests and the extraction methods will be not comparative. Furthermore, the natural and soil conditions likewise are additionally unique. Because of that, our trial results will quite often vary from the others. In non-industrial nations, customary and natural medication including the people restorative practice disperse to 70% of the populace, because of openness, moderateness as well as tried steadfastness, symptoms of the vast majority of the cutting-edge drug. In this way, natural medication will use for present exploration. It is realized that therapeutic plants have been utilized overall since old times for the treatment of different infections, including asthma, stomach issues, skin sicknesses, respiratory and urinary entanglements, and liver and cardiovascular illness [48]. This experimental information comes from the plant guard framework, which creates various accumulates with different sub-atomic designs, infinitely better to those got from engineered items, so the extraordinary interest in the explanation of new dynamic standards. Just over the most recent twenty years, concentrates on zeroed in on normal mixtures with cancer prevention agent exercises have shown tremendous development, since a significant measure of proof demonstrated that cell harm brought about by oxidative pressure been viewed as a significant component in maturing and in the advancement of a wide assortment of pathologies, like immune system sicknesses, irresistible as well as provocative illnesses, and degenerative and neurodegenerative infections [49]. Subsequently, the significance of the quest for normal items with cell reinforcement impact is exhausted, as they can forestall, balance out, or handicap free extremists before they assault organic focuses in cells (DNA, proteins, and lipids). Frequently, individuals use plants to treat an assortment of illnesses, without knowing their poisonous potential, which can be destructive to human wellbeing. One of the principle issues in the utilization of regular items is the conviction that results of plant beginning are liberated from unfriendly responses and poisonous impacts. In this way, studies on the poisonousness of restorative plants are significant, to characterize the gamble related with phytotherapy, as well as guide research for the seclusion of specific mixtures until the improvement of new medications [50].

#### *Phytochemical evaluation by IR, NMR, mass spectrophotometer*

UV spectra on Systronics twofold bar spectrophotometer (2203 Brilliant) and XThax values are in nm. IR spectra on a Parkin Elmer FTIR utilizing KBr pellets and  $\mu\text{max}$  values are

in  $\text{cm}^{-1}$ .  $^1\text{H}$  NMR spectra on a Bruker Advance II 400 NMR spectrophotometer utilizing DMSO- $d_6$  or  $\text{CDCl}_3/\text{CD}_3\text{OD}$  as solvents, with TMS as inner norm. Compound movements are communicated in 6 ppm regarding the inside TMS and the coupling constants (J values) are communicated in Hertz (Hz). Documentations utilized for turn coupling design all through the text are assigned as: s-singlet, d-doublet, dd-twofold doublet, ddd-doublet of twofold duplicates, t-trio, q-quartet, m-various, unsettled expansive singlet, w/2-half-width. FABMS information on a J1VIX-PX 303 mass spectrophotometer (Joel, USA). The m/z upsides of the more extraordinary pinnacles are referenced and the figures in section connected to every m/z values demonstrate relative forces regarding the base pinnacle.  $^{13}\text{C}$  NMR will be gotten on a Bruker Advance II 400 NMR spectrophotometer in  $\text{CDCl}_3$  and  $\text{C}_6\text{D}_6$  and kept in ppm with TMS as inner reference. Tender loving care on plates covered with silica gel G. The dried plates will be initiated in an electric broiler at  $110^\circ\text{C}$  for two hours. The broke down parts will be spotted on the plates with the fine slender cylinders and afterward dried in air. The spotted plates will be kept in chromatographic chambers containing the dissolvable blend and covered with lubed glass plates. The spots will be imagined under UV light 254 nm or openness to iodine fumes on sunshine in the wake of showering with sulfate-sulphuric corrosive (65%) and warming at  $105^\circ\text{C}$  for 10 min. Anhydrous sodium sulfate for drying oil ether, chloroform, ethyl acetic acid derivation and methanol.

## CONCLUSION

It is reasoned that *Ficus religiosa* Linn., *Ficus bengalensis* Linn. what's more, *Ficus glomerata* Roxb. are promising cell reinforcements and would he be able to have utilized as an available wellspring of normal cancer prevention agents and as a hepatoprotective. studies in future could be embraced to research the specific mechanists of activity of *Ficus* species being an antioxidative. Greater part of the infection or confusion are predominantly connected to oxidative pressure because of development of free extremists. The current review is coordinated towards observing normally happening cancer prevention agent plant beginning and laid out a connection between the cell reinforcement potential and therapeutics of the foundations of four types of variety *Ficus*. Cell reinforcement in vitro assessment of root separate with hepatoprotective action. Cytotoxicity assists with deciding if the assurance utilization of all phytochemicals that are separate from *Ficus* species play avital job in the improvement of a Characteristic cancer prevention agent and hepatoprotective and produce any antioxidative against a few free revolutionaries causing sicknesses. The aftereffects of the current review accentuation that the concentrate of *Ficus* species is a decent wellspring of cancer prevention agent compound and can be utilized in the field of therapeutics.

## LITERATURE CITED

1. Zhi-Yong Q, Jia-Ying Z, Fang-Jun L, Wan-Lai Z, Ren-You G. 2021. Bioactive compounds, therapeutic activities, and applications of *Ficus pumila* L. *Agronomy* 11(1): 89.
2. Sheikh Khamis Al-Matani, Ruqaiya Nasser Said Al-Wahaibi, Mohammed Amzad H. 2015. Total flavonoids content and antimicrobial activity of crude extract from leaves of *Ficus sycomorus* native to Sultanate of Oman. *Karbala International Journal of Modern Science* 1: 166e171.
3. Sheikh KM, Ruqaiya NSW, Hossain MA. 2015. Total flavonoids content and antimicrobial activity of crude extract from leaves of *Ficus sycomorus* native to Sultanate of Oman. *Karbala Inter. Jr. Mod. Sciences* 1: 166-171.
4. Bhanwase AS, Alagawadi KR. 2016. Antioxidant and immunomodulatory activity of hydroalcoholic extract and its fractions of leaves of *Ficus benghalensis* Linn. *Pharmacognosy Research* 8(1): 50-55.
5. Chandrasekar SB, Bhanumathy M, Pawar AT, Somasundaram T. 2010. Phytopharmacology of *Ficus religiosa*. *Pharmacogn. Review* 4(8): 195-199.

6. Sekar D, Kolanjinathan K, Saranraj P, Gajendiran K. 2012. Screening of *Phyllanthus amarus*, *Acalypha indica* and *Datura metel* for its antimicrobial activity against selected pathogens. *Inter. Jr. Pharm. Biol. Arc.* 3: 1231-1235.
7. Sheikh KM, Ruqaiya NSW, Hossain MA. 2015. In vitro evaluation of the total phenolic and flavonoid contents and the antimicrobial and cytotoxicity activities of crude fruit extracts with different polarities from *Ficus sycomorus*. *Pac. Sci. Rev. A: Nat. Sci. Eng.* 17: 103-108.
8. Kar UK, Stampar F, Veberic R. 2011. Effect of drying of figs (*Ficus carica* L.) on the contents of sugars, organic acids, and phenolic compounds. *Jr. Agric. Food Chemistry* 59(21): 11696-11702.
9. Aftaf MW, Afaf AMB, Hossain MA. 2015. Evaluation of antioxidant and antimicrobial potential of different leaves crude extracts of Omani *Ficus carica* against food borne pathogenic Bacteria. *Asian Pac. Jr. Trop. Dis.* 5(1): 13-16.
10. Maryam R, Negisa ST, Solmaz MD. 2015. Pharmacological and medicinal aspects of the verses containing fig (at-tin) in Holy Quran. *Health, Spirituality Med. Ethics* 2(3): 30-36.
11. Ahmed H, Irshad Khan M, Waseem D, Nazli A, Waleed Baig M. 2017. Phytochemical analysis and antioxidant potential of *Ficus benghalensis* L. *Journal of Bioresource Management* 4(3): 17-26.
12. Chaudhary LB, Sudhakar JV, Kumar A, Bajpai O, Tiwari R, Murthy G. 2012. Synopsis of the genus *Ficus* L. (Moraceae) in India. *Taiwania* 57(2): 193-216.
13. Joseph B, Raj SJ. 2010. Phytopharmacological and phytochemical properties of three *Ficus* species-an overview. *Int. Jr. Pharma. Bio. Sciences* 1(4): 246- 253.
14. Manian R, Anusuya N, Siddhuruju P, Manian S. 2008. The antioxidant activity and free radical scavenging potential of two different solvent extracts of *Camellia sinensis* (L.) O. Kuntz, *Ficus bengalensis* L. and *Ficus racemosa* L. *Food Chemistry* 107(3): 1000-1017.
15. Asolkar LV, Kakkar KK, Charke OJ. 1992. Second supplement to glossary of Indian medicinal plants with active principles Part-I (A-K) (1965-1981). Publications and Information Directorate (CSIR), New Delhi, India.
16. Harman E. 1993. Ph. D. C.S.C.S. Exercise Physiology. *National Strength and Conditioning Association Journal* 15(6): 18-21.
17. Niwa K, Porter VA, Kazama K, Cornfield D, Carlson GA, Iadecola C. 2001. A beta-peptides enhance vasoconstriction in cerebral circulation. *Am. Jr. Physiology Heart Circ Physiol.* 281(6): 2417-2424.
18. Gayathri MR, Rao AV, Raja A. 2000. Role of antioxidant enzymes in brain tumours. *Cillica Chillica Acta* 296: 203.
19. Aleksandra K, Beata K, Kamila P. 2018. Relationship between the degree of antioxidant protection and the level of malondialdehyde in high-performance Polish Holstein-Friesian cows in peak of lactation. *PLOS One* 13(3): e0193512.
20. Stahl W, Sies H. 1997. Antioxidant defense: Vitamins E and C and carotenoids. *Diabetes* 46: 14-18. doi: 10.2337/diab.46.2.S14.
21. Schmidt J, Francois V, Bier E, Kimelman D. 1995. Drosophila short gastrulation induces an ectopic axis in *Xenopus*: evidence for conserved mechanisms of dorsal-ventral patterning. *Development* 121(12): 4319-4328.
22. Irshad M, Chaudhuri PS. 2002. Oxidant-antioxidant system: Role and significance in human body. *Indian Journal of Experimental Biology* 40: 1233-1239.
23. Bendich A. 1990. Micronutrients and immune functions. *Cytokines and Metabolism* 587(1): 168-180.
24. Singh D, Singh B, Goel RK. 2011. Traditional uses, phytochemistry and pharmacology of *Ficus religiosa*: a review. *Journal of Ethnopharma.* 134(3): 565-583.
25. Farsi AS, Hor SY, Ahamed MB, Yam MF, Asmawi MZ. 2013. Genotoxicity and acute and subchronic toxicity studies of a standardized methanolic extract of *Ficus deltoidea* leaves. *Clinics* 68(6): 865-875.
26. Kara RRB, Murugesan T, Sinha S, Saha BP, Pal M, Mandal SC. 2002. Glucose lowering efficacy of *Ficus racemosa* bark extract in normal and alloxan diabetic rats. *Phytother. Research* 16(6): 590-592.
27. Rønsted N, Salvo G, Savolainen V. 2007. Biogeographical and phylogenetic origins of African fig species (*Ficus* section *Galaglychia*). *Mole. Phylo. Evol.* 43(1): 190-201.
28. Adewole SO, Adenowo T, Naicker T, Ojewole JA. 2011. Hypoglycaemic and hypotensive effects of *Ficus exasperata* vahl. (Moraceae) leaf aqueous extract in rats. *Afr. Jr. Trad. Compl. Alter. Med.* 8(3): 275-283.
29. Choo CY, Sulong NY, Man F, Wong TW. 2012. Vitexin and isovitexin from the leaves of *Ficus deltoidea* with in-vivo alpha-glucosidase inhibition. *Jr. Ethnopharma.* 142(3): 776-781.
30. Ilyanie Y, Wong TW, Choo CY. 2011. Evaluation of hypoglycemic activity and toxicity profiles of the leaves of *Ficus deltoidea* in rodents. *Jr. Compl. Integ. Med.* 8(10): 1553-1560.
31. Mawa S, Husain K, Jantan I. 2013. *Ficus carica* L. (Moraceae): phytochemistry, traditional uses and biological activities. *Evid. Based Compl. Alter. Med.* 8: 2013-2017.
32. Chindo BA, Anuka JA, McNeil L, Yaro AH, Adamu SS, Amos S. 2009. Anticonvulsant properties of saponins from *Ficus platyphylla* stem bark. *Brain Res. Bull.* 78(6): 276-282.
33. Ahmed F, Urooj A. 2010. Traditional uses, medicinal properties, and phytopharmacology of *Ficus racemosa*: A review. *Pharm. Biol.* 48(6): 672-681.
34. Subhaktha PK, Rajasekaran R, Narayana A. 2007. Udumbara (*Ficus glomerata* Roxb.): A edicohistorical review. *Bull. Indian Inst. Hist. Med.* 37(1): 29-44.
35. Hedberg I, Staugard F. 1989. Traditional medicine in Botswana, traditional medicinal plants, The Nordic School of Public Health Stockholm. Pelegeng Publishers. pp 324-330.
36. San S, Lawal M, Muhammad B, Umar R. 2007. Effects of anthraquinone glycosides and aqueous ethanol extracts of *ficus sycomorus* l. (moraceae) on rat liver and kidney functions. *Asian Jr. Biochemistry* 2: 136-141.
37. Chiang YM, Chang JY, Kuo CC, Chang CY, Kuo YH. 2005. Cytotoxic triterpenes from the aerial roots of *Ficus macrocarpa*. *Phytochemistry* 66(4): 495-501.
38. Chiang YM, Kuo YH. 2001. New peroxy triterpenes from the aerial roots of *Ficus macrocarpa*. *National Prod. Reprod.* 64(4): 436-439.
39. Chiang YM, Kuo YH. 2002. Novel triterpenoids from the aerial roots of *Ficus macrocarpa*. *Journal of Org. Chemistry* 67(22): 7656-7661.

40. Dzubak P, Hajduch M, Vydra D, Hustova A, Kvasnica M, Biederman D. 2006. Pharmacological activities of natural triterpenoids and their therapeutic implications. *Nat. Prod. Reprod.* 23(3): 394-411.
41. Kuo YH, Li YC. 1977. Constituents of the bark of *Ficus microcarpa* L. *Journal of Chin. Chemical Society* 44(3): 321-325.
42. Yan XJ, Gong LH, Zheng FY, Cheng KJ, Chen ZS, Shi Z. 2014. Triterpenoids as reversal agents for anticancer drug resistance treatment. *Drug Disco. Today* 19(4): 482-488.
43. Salvador JAR, Moreira VM, Gonçalves BMF, Lealab AS, Jing Y. 2012. Ursane-type pentacyclic triterpenoids as useful platforms to discover anticancer drugs. *Nat. Prod. Reproduction* 29(12): 1463-1479.
44. Laszczyk MN. 2009. Pentacyclic triterpenes of the lupane, oleanane and ursane group as tools in cancer therapy. *Planta Med.* 75(15): 1549-1560.
45. Watt JM. 2013. Breyer-brandwijk: The medicinal and poisonous plants of Southern and Eastern Africa. (Second Edition), E & S Livingstone Ltd, Edinburgh and London. pp 94.
46. Tijjani A, Sallau MS, Sunusi I. 2011. Synergistic activity of methanolic extract of *Adenium obesum* (apocynaceae) stembark and oxytetracycline against some clinical bacterial isolates. *Bayero Jr. Pure Appl. Science* 4: 79-82.
47. Varahalarao V, Kaladhar DSVGK. 2012. Antimicrobial study of plant extracts of *Datura metel* L. against some important disease-causing pathogens. *Asian Pac. Jr. Trop., Dis.* pp S94-S97.
48. Lansky EP, Paavilainen HM, Pawlus AD, Newman RA. 2008. *Ficus spp.* (fig): ethnobotany and potential as anticancer and anti-inflammatory agents. *Jr. Ethnopharma.* 119: 195-213.
49. Tijjani A, Ndukwe IG, Ayo RG. 2011. Studies on antibacterial activity of *Adenium obesum* (Apocynaceae) stem-bark. *Cont. Journal of Microbiology* 5: 12-17.
50. Wang XY, Zhang XL, Gao L, Zang QF, Kang SH. 1990. Antitumor activity of *Ficus Can.* *China* 9: 223-225.