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ANTITUMORIGENIC EFFECT OF VARIOUS PARTS OF *FICUS RACEMOSA* IN DALTON LYMPHOMA ASCITES TUMOR INDUCED SWISS ALBINO MICE

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ABSTRACT: Medicinal plants play an important role in the development of potent therapeutic agents. In recent years there has been an increased interest in using of herbal medicines. To assess the antioxidative and antitumorigenic efficacy of methanolic extract of bark, fruits, and leaves of *Ficus racemosa* in Dalton Lymphoma Ascites tumors transplanted Swiss albino mice. The results showed that the cytotoxicity study by Trypan blue assay revealed the concentration-dependent cytotoxic activity of MEFrB, MEFrF, and MEFrL to DLA tumor cells with the fifty percent effective dose (ED_{50}) at 54 µg, 58 µg, and 60 µg, respectively. The MTT assay also showed the cytotoxic effect to DLA tumor cells at the concentration-dependent, and the ED_{50} was found to be 40µg (MEFrB), 42 µg (MEFrF), and 46 µg (MEFrL) and indicated their antitumorigenic potential. Intraperitoneal transplantation of DLA tumor cells altered the antioxidant balance of the mice liver by significantly decreasing the activities of enzymic antioxidants (CAT, SOD, and GPx) and non-enzymic antioxidants (Vitamin A, E, and C). Administration and co-administration of all the three extracts individually and to DLA tumor-induced mice significantly enhanced the enzymic and non-enzymic antioxidants status in all treatment periods, and this was found to be more significant than that found in silymarin administration. It can be suggested that all three extracts of MEFrB can be recommended as antioxidative and antitumorigenic agents to individuals suffering from oxidative degenerative diseases and microbial infections.

INTRODUCTION: Medicinal plants have been used as an exemplary source for centuries as an alternative remedy for treating human diseases because they contain numerous active constituents of therapeutic value. Plants are an important source of potentially useful structures for the development of new chemotherapeutic agents.

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Ficus racemosa Linn. (*Moraceae*) is an evergreen, moderate to large-sized spreading, lactiferous, deciduous tree without much prominent aerial roots found throughout the greater part of India in moist localities and is often cultivated in villages for its edible fruit.

Ficus racemosa L. is a large deciduous tree distributed throughout India, particularly in evergreen forests and moist localities. All parts of this plant (leaves, fruits, bark, latex, and sap of the root) are medicinally important in India's traditional system of medicine. The astringent nature of the bark has been employed as a mouth wash in spongy gum and also internally in dysentery, menorrhagia

and haemoptysis [1]. The present study focused on antitumorigenic effect of various parts of *Ficus aacemosa* in DLA tumor-induced Swiss Albino Mice was carried out.

MATERIALS AND METHOD:

Collection of Plant Material: *Ficus racemosa* bark, fruits, and leaves were collected from Coimbatore district, Tamil Nadu. The collected plant parts were washed thoroughly in tap water, shade dried and finely powdered, and plant authentication number (TNAU - BOT-007/2017) were respectively.

Preparation of Organic Extract of Various Parts of *Ficus racemosa*: Twenty gram of bark, fruits and leaf powder of *Ficus racemosa* was filled with thimble and extracted with 200 ml of methanol using Soxhlet apparatus for 24 h. The extract was then distilled and evaporated to dryness. The concentrated extracts were then accurately weighed and stored in small vials at -20 ºC for further studies.

Assessment of MEFrB, MEFrF and MEFrL on *In-vitro* Antitumorigenic Effect to Dalton Lymphoma Ascites Tumor Cells: The cytotoxic effect of MEFrB evaluated the antitumorigenic effect, MEFrF and MEFrL to DLA tumor cells. *In-vitro* cytotoxic studies were carried out to find out the 50 percent effective dose (ED_{50}) of MEFrB, MEFrF, and MEFrL by MTT and Trypan blue exclusion assays.

Maintenance of DLA Tumor Cells: Dalton's Lymphoma Asite (DLA) tumor cells were procured from Amala Cancer Research center, Thrissur, Kerala and were propagated in Swiss albino mice by intraperitoneal transplantation of $1x10^6$cells in 100µl of PBS. After 10 to 15 days, the cells were drawn from the intraperitoneal cavity and were used for the evaluation of *in vitro* antitumorigenic effect of MEFrB, MEFrF, and MEFrL to DLA tumor cells.

MTT Assay: The extent of the viability of DLA cells with different concentrations of MEFrB, MEFrF, and MEFrL were analyzed by MTT assay by the method of Igarashi and Miyazawa [2]. The 2-(4, 4-dimethyl-2-tetrazoyl) - 2, 5 - diphenyl - 2, 4 tetrazolium salt (MTT) is converted into its formazon derivative in living cells.

The amount of formazon formed is a measure of the number of surviving cells. After solubilization of the formazon in a suitable solvent, the cell viability can be measured in a microtitre plate reader at 650 nm. After removing the medium and serum from the treated cells, the cells were incubated with 50 µl of MTT at 37 ºC for 3 h. After incubation 200 µl of PBS was added to all the samples. The liquid was then carefully aspirated. Then 200 µl of acid propanol was added and left overnight in the dark. The absorbance was read at 650 nm in a microtitre plate reader. The optical density of the control cells was fixed to be 100% viability, and the percent viability of the cells in the other treatment groups were calculated.

Trypan Blue Exclusion Assay: The extent of DLA tumor dead cells with different concentrations of MEFrB, MEFrF, and MEFrL were analyzed by Trypan blue exclusion method of Salomi and Panikkar [3]. The viable cells excluded the dye and remained unstained, while non - viable cells take up the dye and are stained blue. The DLA tumor cells propagated in the peritoneal cavity of the mice were taken and washed with saline phosphate-buffered saline thrice by centrifuging at low speed. 0.1 ml containing 1×10^6 cells were used for the *in vitro* assay. Various concentrations of the sample were incubated with DLA cell lines at 37 ºC for three hours. At the end of the incubation period, 0.1 ml trypan blue was added and layered the cells on the hemocytometer for counting. The dead cells were blue in color and counted to calculate the percentage of dead cells.

Percent cytotoxic ty = Dead cell count / Dead cellcount + Viable cell count × 100

Evaluation of MEFrB, MEFrF and MEFrL on *In-vivo* Antioxidative and Antitumorigenic Potential in DLA Tumor Induced Swiss Albino Mice: *In-vivo* studies were carried out by the intraperitoneal administration of 54 µg (ED_{50}) of bark, 60 µg (ED_{50}) of fruits and 58µg (ED_{50}) of leaves of *Ficus racemosa* to examine their antitumorigenic effect.

Maintenance of Experimental Animals: Swiss Albino Mice (20-25 g) were procured from Small Animal Breeding Station, Kerala Agricultural University, Thrissur. Quarantined mice were housed in microloan boxes in a controlled hygienic

environment at temperature 25 ± 2 ºC and dark/ light cycle (14/10 h) and acclimatized to laboratory conditions for 15 days before the commencement of the experiment. The study was conducted as per the rules of the institutional Animals Ethical Committee (Reg no: 623/02/b/CPCSEA). They were fed on a standard pellet diet and water *ad libitium.* Plate I show normal and tumor-bearing Swiss albino mice, and Plate II shows *Ficus racemosa* and its parts were respectively.

Grouping of Animals: The mice were divided into eleven groups, with six mice in each group. In the present research, intraperitoneal administration was carried out for a period of 20 days and 90 days.

Group 1: Mice were administered with 100 µl of PBS and are the vehicle control for DLA transplanted mice (Group 9).

Group 2: Mice were administered with 100 µl of DMSO and are the vehicle control for MEFrB, MEFrF, and MEFrL (Groups 5, 6, and 7).

Group 3: Mice were administered with 100 µl of paraffin oil, which constituted the vehicle control for the standard antioxidant silymarin (Group 5).

Group 4: Mice were administered with 25 mg/Kg body weight of standard antioxidant silymarin Fraschini *et al.* [4] in 100 µl of Paraffin oil.

Group 5: Mice were administered with 54 µg (ED_{50}) of MEFrB in 100 µl of DMSO.

Group 6: Mice were administered with 60 µg (ED_{50}) of MEFrF in 100 µl of DMSO.

Group 7: Mice were administered with 58 µg (ED_{50}) of MEFrL in 100 µl of DMSO.

Group 8: Mice were transplanted with one acute dose of 1×10^6 DLA tumor cells in 100 µl of PBS and also administered with 54 µg (ED_{50}) of MEFrB in 100 µl of DMSO

Group 9 mice were transplanted with one acute dose of 1×10^6 DLA tumor cells in 100 µl of PBS and also administered with 60µg (ED_{50}) of MEFrF in 100 µl of DMSO.

Group 10: Mice were transplanted with one acute dose of 1×10^6 DLA tumor cells in 100 µl of PBS and also administered with 58 µg (ED_{50}) of MEFrL in 100 µl of DMSO.

Group 11: Mice transplanted with one acute dose of 1×10^6 DLA tumor cells in100 µl of PBS. Experimental groups 5 & 8, 6 & 9, 7 &10 were administered with MEFrB, MEFrF, and MEFrL for the entire period of the study. At the end of 20 days and 90 days of the study, the mice were kept for overnight fasting and then sacrificed.

The liver was quickly excised and plunged into sterile, ice-cold saline for the removal of blood. The washed organ was blotted dry on sterile filter paper and immediately and stored in a deep freezer at -20 ºC. A part of the liver homogenate was prepared using PBS and used for the determination of enzymic antioxidants, and non-enzymic antioxidants were also carried out

PLATE I: NORMAL AND TUMOR BEARING SWISS ALBINO MICE

WHOLE PLANT

BARK

LEAVES

FRUIT

PLATE II: *FICUS RACEMOSA* AND ITS PARTS

Enzymatic Antioxidants:

Catalase (CAT): The UV light absorption of hydrogen peroxide solution can be easily measured between 230 and 250 nm. On the decomposition of H_2O_2 by catalase, the absorption decreases with time. The enzyme activity can be calculated from this decrease. Pipetted out 3.0 ml of H_2O_2 Phosphate buffer into the experimental cuvette and mixed in 0.01 - 0.04 ml sample with a glass rod flattened at one end. Noted the time Δt required for a decrease in absorbance from 0.45 to 0.4 at 240 nm.

This value was used for the calculations. If Δt was greater than 60 seconds, then the measurements was repeated with a more concentrated solution of the sample. Calculated the activity and expressed in units per mg protein. One enzyme unit was the amount of enzyme required to decrease the absorbance at 240 nm by 0.05 units.

Glutathione Peroxidase (GPx): A known amount of enzyme preparation was allowed to react with H_2O_2 in the presence of reduced glutathione (GSH) for a specified time period. Glutathione peroxidase converts GSH to oxidized glutathione. Then the remaining GSH was measured at 421 nm. To 2 ml of Tris buffer, 0.2 ml of EDTA, 0.1 ml of sodium azide and 0.5 ml of tissue homogenate were added. 0.2 ml of glutathione and 0.1 ml of hydrogen peroxide were also added. The contents were mixed well and incubated at 37 °C for 10 min along with a tube containing the reagents except tissue homogenate. After 10 min, the reaction was arrested by the addition of 0.5 ml of 10 percent TCA, centrifuged and the supernatant was assayed for glutathione by Moron method and the activities were expressed as µg of GSH oxidized / min / mg protein.

Superoxide Dismutase (SOD): The superoxide dismutase uses the photochemical reduction of riboflavin as oxygen generating system and catalyses the inhibition of NBT reduction, the extent of which can be assayed spectro-photometrically. The incubation medium contained a final volume of 3 ml, 50 mM potassium phosphate buffer (pH 7.8), 45 µM methionine, 5.3 µM riboflavin, 84 µM NBT and 20 mM potassium cyanide. The tubes were placed in an aluminium foil lined box maintained at 25 °C and equipped with 15 W fluorescent lamps. Reduced NBT was measured spectrophotometric ally at 600 nm after exposure to light for 10 min. The maximum reduction was evaluated in the absence of enzyme. Calculated the activity and expressed in unit / mg / protein. One unit of the enzyme activity was defined as the amount of enzyme giving 50 percent inhibition of the reduction of NBT.

Non Enzymatic Antioxidants:

Vitamin A: The color produced by Vitamin A acetate or palmitate with TCA is proportional to the to its concentration, which is measured at 620 nm in a spectrophotometer. Aliquots of the standard were pipetted out into a series of clean, dry test tubes in the concentration range of 0-7.5 µg. The volumes in all the test tubes were made up to 0.1 ml with chloroform. From a fast delivery pipette, added 2 ml of TCA reagent rapidly, mixing with the contents of the tube. The absorbance was recorded immediately at 620 nm in a spectro-photometer. The procedure was repeated for the sample tubes. Constructed a standard graph and read off the concentration in the samples. Vitamin A levels were expressed as µg/g tissue.

Vitamin E: Tocopherol can be estimated using Emmerie - Engel reaction which is based on the

reduction of ferric ions by tocopherol, which then forms a red color with 2, 2' - dipyridyl. Tocopherol and carotenes are first extracted with xylene, and the extinction read at 460 nm to measure carotenes. A correlation is made for these after adding ferric chloride and reading at 520 nm. into 3 stoppered centrifuge tubes (test, standard, and blank) pipetted out 1.5 ml of each tissue extract, 1.5 ml of the standard and 1.5 ml of water, respectively. To the test and blank added 1.5 ml of ethanol and to the standard added 1.5 ml of water. Added 1.5 ml of Xylene to all the tubes, stoppered, mixed well, and centrifuged. Transferred 1.0 ml of xylene layer into another stoppered tube, and care should be taken not to include any ethanol or protein. Added 1.0 ml of 2, 2' dipyridyl reagent to each tube, stoppered, and mixed. Pipetted out 1.5 ml of the mixtures into colorimeter cuvettes and read the extinction of the test and standard against the blank at 460 nm. Then, in turn, with the blank, added 0.33 ml of ferric chloride solution. Mixed well and after exactly 15 min read test and standard against the blank at 520 nm. The amount of Vitamin E can be calculated using the formula,

Amount of tocopherol = Reading at 520 nm - Reading at 460 nm / Reading of standard at 520 nm × 0.29 × 15

Vitamin C: Ascorbate is converted to dehydroascorbate by treatment with activated charcoal or bromine. Dehydroascorbic acid reacts with 2, 4 - dintrophenyl hydrazine (DNPH) to form osazones, which dissolve in sulphuric acid to give an orange colored solution whose absorbance can be measured spectrophotometrically at 540 nm. The working standard of 0.2 to 1.0 ml containing 20 -100 µg of ascorbate respectively was pipette out in clean, dry test tubes, the volumes of which were also made up to 2.0 ml with 4% TCA. DNPH reagent of volume 0.5 ml was added to all the tubes, followed by 2 drops of 10% thiourea. The tubes were incubated at 37°C for 3 hours. The osazones formed were dissolved in 2.5 ml of 85% H_2SO_4, in cold, drop by drop, with no appreciable rise in temperature. To the blank alone, DNPH reagent and thiourea were added after the addition of sulphuric acid. After incubation for 30 minutes at room temperature, the absorbance was read spectrophotometrically at 540 nm. The content of ascorbic acid was calculated in the liver sample using the standard graph.

RESULTS AND DISCUSSION:

Effect on the activities of Enzymic Antioxidants: The enzymatic antioxidants such as catalase (CAT), superoxide dismutase (SOD), and glutathione peroxidase (GPx) play a protective role against oxidative damage caused by free radicals through their free radical scavenging activity. Hence, an attempt was made to study the effect of MEFrB, MEFrF, and MEFrL on the activity of enzymic antioxidants in the liver of Swiss albino mice transplanted with and without DLA cells.

Catalase (CAT): Catalase activity was found to be significantly increased in mice treated with silymarin, MEFrB, MEFrF, and MEFrL in all the treatment periods when compared to their respective controls. MEFrB, MEFrF, and MEFrL administration showed a more significant increase in catalase activity than that of silymarin administration in 90 days when compared to 20 days treatment period. **Fig. 1** shows the Effect of MEFrB, MEFrF, and MEFrLon on the activity of Catalase.

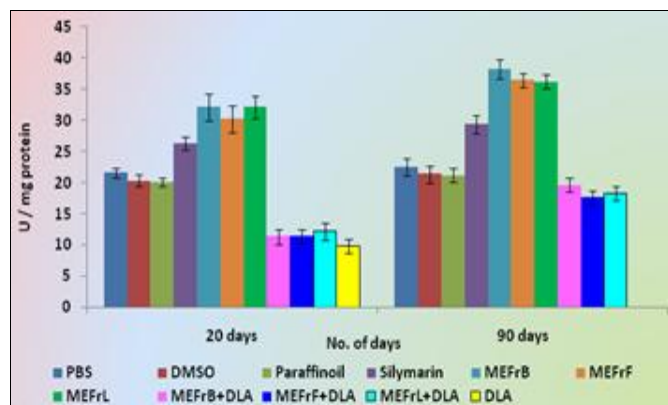

FIG. 1: EFFECT OF MEFrB, MEFrF AND MEFrLON THE ACTIVITY OF CAT

DLA tumor-induced mice showed a significant decrease in CAT activity in 20 days of treatment period when compared to all the controls and all the treatments. Catalase activity was significantly increased in MEFrB, MEFrF, and MEFrL administration individually and coad-ministration to DLA tumor induced mice in 90 days of treatment periods when compared to 20 days treatment period. MEFrB showed a more significant increase in catalase activity than that of MEFrL and MEFrF.

Glutathione Peroxidase (GPx): The activity of GPx was found to be increased significantly by the

administration of MEFrB, MEFrF, MEFrL, and silymarin in all the treatment periods when compared to the controls. GPx activity was found to be increased in MEFrB, MEFrF, and MEFrL treated mice in all treatment periods when compared to silymarin.

The activity of GPx in DLA tumor-induced mice was found to be significantly decreased in 20 days treatment period when compared to all the controls and all the treatments.

The activity of GPx in DLA tumor-induced mice administered with MEFrB, MEFrF, and MEFrL was found to be significantly increased in the 90 days treatment periods when compared to 20 days treatment period. **Fig. 2** showed the Effect of MEFrB, MEFrF, and MEFrL on the activity of GPx.

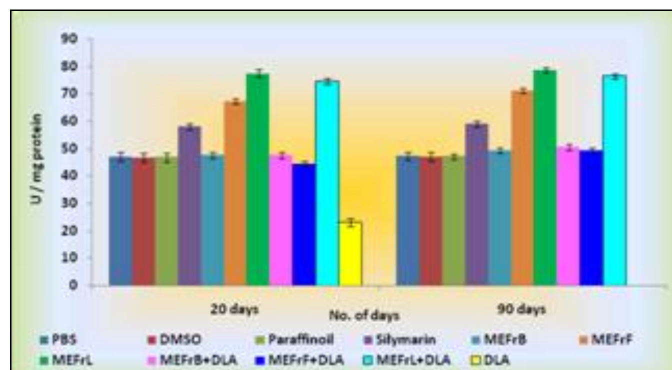

FIG. 2: EFFECT OF MEFrB, MEFrF AND MEFrL ON THE ACTIVITY OF GPX

Superoxide Dismutase (SOD): The SOD activity was found to be significantly increased in mice administered with silymarin, MEFrB, MEFrF, and MEFrL when compared to their controls in all treatment periods.

MEFrB, MEFrF, and MEFrL administered mice showed a more significant increase in SOD activity than that found in silymarin treatment. DLA tumor-induced mice showed a significant decrease in SOD activity in 20 days treatment period when compared to all the controls and all the treatments.

Administration of MEFrB, MEFrF, and MEFrL individually and to DLA tumor-induced mice showed a significant increase in the activity of SOD activity in 90 days treatment period when compared to 20 days treatment period. **Fig. 3** shows the Effect of MEFrB, MEFrF, and MEFrL on the activity of SOD.

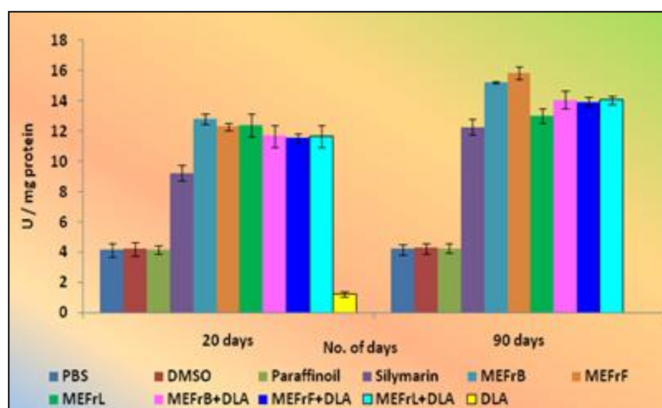

FIG. 3: EFFECT OF MEFrB, MEFrF AND MEFrL ON THE ACTIVITY OF SOD

The MEFrB, MEFrF, and MEFrL were found to significantly enhance the activities of all the enzymes analyzed. A significant increase in the activity of SOD was found to be more significant in DLA + MEFrB than that was found in MEFrL and MEFrF and DLA + MEFrL and DLA + MEFrF in 20 days treatment period whereas in 90 days period the order was found to be MEFrF> MEFrB > MEFrL individually and in DLA induced mice it was MEFrB >MEFrF > MEFrL. The MEFrB showed maximum significant activities of all the enzymic antioxidants followed by the MEFrL and MEFrF. The results are in tune with the report of Santhi *et al.* reported that the activities of hepatic GPx, SOD, and CAT increased by the administration of *Cynodon dactylon* protein fraction on ELA-induced toxicity in mice model [5].

Effect on the Levels of Non-Enzymic Antioxidants: The non-enzymic antioxidants such as Vitamin A, E, C, and reduced glutathione act as the second line of defense to cope up with the deleterious effects of free radicals. So, the levels of non-enzymic antioxidants such as Vitamin A, C, E, and Reduced glutathione in the liver of Swiss albino mice in different treatment periods in all the treatment groups were assessed [6].

Vitamin A: The effect of MEFrB, MEFrF, and MEFrLon the levels of Vitamin A in the liver of controls and experimental mice. Silymarin treated group showed significantly increased Vitamin A level in 20 days and 90 days of treatment periods compared to paraffin oil treated mice.

A significant increase in the level of Vitamin A was noticed in MEFrB, MEFrF, and MEFrL administered mice when compared to DMSO and

silymarin treated mice in all the treatment periods. The DLA tumor-induced mice showed a significant decrease in Vitamin A in 20 days of treatment when compared with all the controls. The level of Vitamin A was found to be increased in DLA tumor-induced mice administered with MEFrB, MEFrF, and MEFrL in 90 days treatment period when compared to 20 days treatment period. **Fig. 4** shows the Effect of MEFrB, MEFrF, and MEFrLon on the levels of Vitamin A.

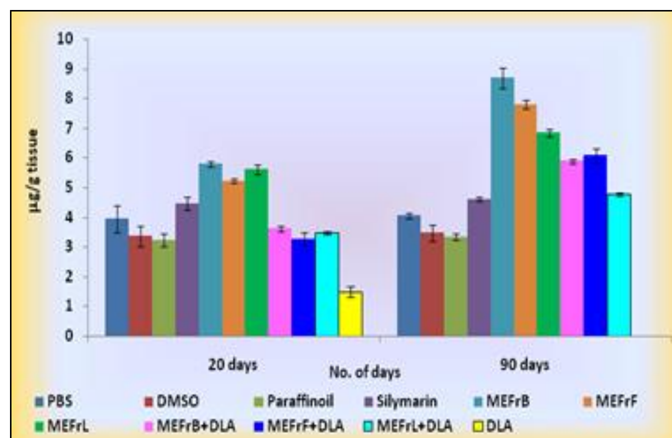

FIG. 4: EFFECT OF MEFrB, MEFrF AND MEFrL ON THE LEVELS OF VITAMIN A

The significant effect of the extract on Vitamin A levels was found to be MEFrB and DLA +MEFrB, which was followed by MEFrL and DLA+MEFrL and MEFrF and DLA+ MEFrF in 20 days treatment periods. In 90 days of treatment period the order was found to be MEFrB> MEFrF and MEFrL and DLA + MEFrF> DLA + MEFrB and DLA + MEFrL. The decreased levels of Vitamin A in the liver of tumor-induced mice may be due to the increased levels of ROS and RNS in tissues. The significant increase in Vitamin A levels in the tumor-bearing mice by MEFrB, MEFrF, and MEFrL may be due to the regeneration of Vitamin A by their antioxidative role [7].

Vitamin E: The significant increase in Vitamin E level in MEFrB, MEFrF and MEFrL administered mice compared to DMSO control mice in 20 days and 90 days of treatment periods. When compared to paraffin oil control, the silymarin-treated mice showed a significant increase in the level of Vitamin E in all the treatment periods. Silymarin treated groups showed a significant increase in the Vitamin E levels on 20 days and 90 days treatment periods when compared to MEFrB, MEFrF and MEFrL treated groups.

The level of Vitamin E was found to be significantly decreased in DLA tumor-induced mice in 20 days of the treatment period. The level of Vitamin E in 90 days treatment periods was found to be increased significantly in DLA-induced mice co-administered with MEFrB, MEFrF, and MEFrL when compared to the 20 days treatment period. A more significant increase in the level of Vitamin A was noticed in MEFrB than that found in MEFrF and MEFrL.

A significant increase in Vitamin E level in DLA induced mice co-administered with MEFrLwas found to be more than that found in DLA + MEFrF followed by DLA + MEFrL and DLA + MEFrB [8]. **Fig. 5** shows the Effect of MEFrB, MEFrF, and MEFrL on the levels of Vitamin E.

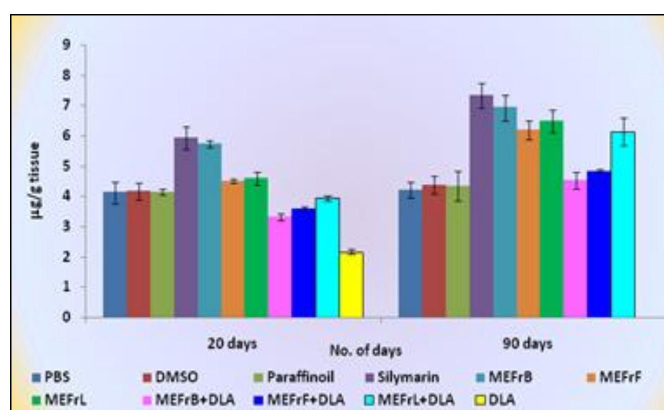

FIG. 5: EFFECT OF MEFrB, MEFrF AND MEFrL ON THE LEVELS OF VITAMIN E

Vitamin C: Silymarin treated group showed a significant increased level of Vitamin C in 20 days and 90 days treatment periods when compared to paraffin oil-treated mice. A significant increase in the level of Vitamin C was noticed in MEFrB, MEFrF, and MEFrL administered mice when compared to DMSO and silymarin treated mice in all the treatment periods. The increase in Vitamin A was found to be more significant in MEFrB than that of MEFrF and MEFrL in 20 days treated mice. In 90 days of treatment period the order was found to be MEFrB> MEFrF and MEFrL and DLA + MEFrB> DLA + MEFrF and DLA + MEFrL.

The DLA tumor-induced mice showed a decrease in the level of Vitamin C in 20 days of treatment period when compared to all the controls. The level of Vitamin C was found to be increased in DLA tumor-induced mice when administered with the MEFrB, MEFrF, and MEFrL in 90 days treatment

periods when compared to 20 days treatment period. The significant increase in Vitamin A levels was found to be in the order of MEFrB, MEFrL, and MEFrF in DLA-induced mice in both the treatment periods [9]. **Fig. 6** shows the Effect of MEFrB, MEFrF, and MEFrLon on the levels of Vitamin C.

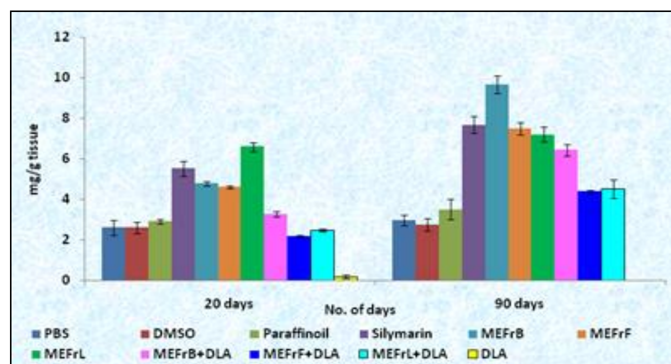

FIG. 6: EFFECT OF MEFrB, MEFrF AND MEFrL ON THE LEVELS OF VITAMIN C

Significant improvement in vitamins A, E, C levels in mice supplemented with silymarin, MEFrB, MEFrF, and MEFrL individually and with DLA tumor-induced mice could be due to their antioxidative role. The decreased non-enzymic antioxidants in DLA tumor-treated mice in our study might due to excess utilization of these antioxidants by the tumor cells.

The present findings very well indicated that MEFrB, MEFrF, and MEFrL had very rich potential to improve human antioxidant status and could prevent normal oxidative stress that happens daily due to normal exposure to many causal chemicals and conditions. So, the use of these plant extracts, as herbal medicine, is highly recommended [10]. The above results of the activities of enzymic antioxidants (CAT, GPx, and SOD) and the levels of non-enzymic antioxidants (Vitamins A, E, and C) revealed that MEFrB is the most effective, followed by MEFrF and MEFrL, and silymarin, the standard antioxidant. These results clearly indicated that *Ficus racemosa* is a very good inducer of enzymic and non-enzymic antioxidants.

CONCLUSION: It can be concluded that the *in-vitro* cytotoxicity study by Trypan blue assay revealed the concentration-dependent cytotoxic activity of MEFrB, MEFrF, and MEFrL to DLA tumor cells with the fifty percent effective dose (ED_{50}) at 54 µg, 58 µg, and 60 µg, respectively. The MTT assay also showed the cytotoxic effect to DLA tumor cells at the concentration-dependent and the ED_{50} was found to be 40µg (MEFrB), 42 µg (MEFrF), and 46 µg (MEFrL) and indicated their antitumorigenic potential.

Intraperitoneal transplantation of DLA tumor cells altered the antioxidant balance of the mice liver by significantly decreasing the activities of enzymic antioxidants CAT, SOD, and GPx and also the levels of non-enzymic antioxidants Vitamin A, E and C. Administration of all the three extracts individually and to DLA tumor-induced mice significantly enhanced the enzymic and non-enzymic antioxidants status in all treatment periods and this was found to be more significant than that found in silymarin administration.

These results indicated that all, the coadministration of three extracts significantly enhanced the enzymic and non-enzymic antioxidant stats and protected the cells from oxidative damage caused by DLA tumor cells. These results indicated the antioxidative potential of MEFrB, MEFrF, and MEFrL. It can be suggested that all three extracts of MEFrB can be recommended as antioxidative and antitumorigenic agents to individuals suffering from oxidative degenerative diseases and microbial infections.

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CONFLICTS OF INTEREST: The authors declared that there are no conflicts of interest.

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