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Research

Pharmacognostical And PharmacologicalEvaluation Of Stem Bark Of *Commiphora Berryi* (Arn) Engl

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Abstract

The present thesis deals with the exploration of Pharmacognostical and Pharmacological Evaluation of Stem Bark of *Commiphora berryi* (Arn) Engl, whichis traditionally used by the local people in South India for the treatment of ulcer. The total methanol extract was used instead of isolated compounds, since in Ayurvedic and Herbal medicine practice, the total extract is used as therapeutic agent instead of isolated compounds on the scientific approach that certain components in the extract nullify the side effects of other components. In preliminary phytochemical analysis, the methanol extract of *Commiphora berryi* (MECB) showed the presence of phytoconstituents such as carbohydrates, gum, mucilage, phytosterols, tannins, phenolic compounds and triterpenoids. The MECB was subjected to column chromatography for the separation of its phytoconstituents. The fractions obtained from column chromatography were subjected to gas chromatography coupled with mass spectrometry (GC-MS). Acute oral toxicity study of MECB was conducted as per OECD-423 guidelines and it showed no mortality or acute toxicity up to 3 g/kg, b. wt. by oral dose. Antiulcer activity of MECB was studied by aspirin plus pylorus ligation and stress induced ulcer models in rats. In aspirin plus pylorus ligation model, when compared with ranitidine treated group, the group treated with 500 mg/kg extract showed marginal activity and the group treated with 750 mg/kg extract showed significant activity, which was higher than that of the ranitidine treated group. MECB was tested for the hepatoprotective and antioxidant activity induced by carbon tetrachloride in rats at the dose of 100 mg/kg and 200 mg/kg and standard drug, silymarin at 25 mg/kg. The potential of MECB on liver markers and antioxidantliver enzymes was measured. The MECB and silymarin exhibited significant hepatoprotective effect by reducing the amount of serum enzymes, bilirubin.In antioxidant system, the liver enzyme level of SOD, CAT and glutathione peroxidase increased in a dose dependent manner. The above results reveal that the hepatoprotective effect of MECB may be due to its antioxidant and free radical scavenging properties.

Keywords: *Commiphora berryi*, Pharmacognosy, Antiulcer, Antitumor, Hepatoprotective, Antioxidant.

INTRODUCTION

The human race, since time immemorial, has been using plants as a major source of medicine. Medicinal plants play a key role in the health care system of almost all countries. These medicines have come from various sources of materials including terrestrial plants, terrestrial microorganisms, marine organisms and terrestrial vertebrates and invertebrates. Physical evidence of use of herbal remedies goes back some 60,000 years to a burial site at Shanidar Cave, Iraq, in which a Neanderthal man was uncovered in 1960. He had been buried with eight species of plants, seven of which are still used for medicinal purposes today. Through trial and error, early mankind has found medicinal properties in the seeds, leaves, barks and roots of certain medicinal plants.

Traditional medicine refers to a broad range of ancient and natural health care practices including tribal/folk medical practices as well as classical systems of medicine such as Ayurveda, Siddha, Unani and Amachi. These medical practices originated much before the application of modern scientific methods. Further the herbal medicines are also used in self-medication in all cultures. The Indian subcontinent is endowed with rich and diverse local health traditions, which are matched with an equally rich and diverse plant genetic resource. The resource base of local health traditions is mainly the plant.

The replacement of herbs with synthetic drugs is a relatively new phenomenon, less than a century old, born largely out of economic opportunities afforded by patent laws. Drug companies can not typically patent commonly used plants, but they can develop patented, proprietary synthetic drugs, often reaping profits of billions of dollars in sales. Since 1940's, chemists employed by pharmaceutical companies have developed novel synthetic molecules, which have replaced plant medicines, and are sold both over the counter and by prescription.

The results of this synthetic drug explosion have been unfortunate. Today, drugs prescribed in hospitals constitute the number six cause of death among American adults. This exceeds deaths due to crack, handguns, and traffic accidents combined. Add to that figure, the number of adult and child deaths attributable to over the counter and prescription drugs given outside of hospitals and the figures are even worse.

Plant medicines are far safer, gentler and better for human health than synthetic drugs. This is so because human beings have co-evolved with plants over the past few million years. Ingredients in plants, from carbohydrates, fats and protein to vitamins and minerals, are part of our body composition and chemistry. Some compounds perform the same functions in plants and in the body. Natural antioxidant phenols in plants, for example, protect plant cells from oxidation, and often perform the same function in the human body. Our bodies recognize the substances that occur in plants, and possess sophisticated mechanisms for metabolizing plant materials.

The same cannot be said about synthetic drugs. These agents are most often alien to the chemistry of the human body and are separate from the careful crafting of evolution. Synthetic drugs often act in the body as irritants and toxins, upsetting the balance of whole systems, producing side effects that can be lethal. By contrast, the regular and judicious use of herbs to protect and promote health and as medicines to help treat common ailments is an enlightened approach to personal well-being.

The technologies of combinatorial chemistry have not yielded the promised new drugs in a timely and more efficient manner; the heavily-marketed drugs that are introduced are often for benign diseases where both prescription charges and re- imbursement rates are high, and the public trust in big pharma as a result of unethical withholding of unfavorable clinical data prior to or post introduction has led to important clinical entities being withdrawn and voluminous litigation ensuing. As safety standards, and therefore costs, to introduce new entities increases, even fewer companies will be fiscally able to introduce new entities. Failure rates in Phase III trials have risen dramatically, and thus fewer drugs are now being introduced annually in the US, and yet the waiting time for approval is again on the rise.

Due to the structural and biological diversity of their constituents, terrestrial plants offer a unique and renewable resource for the discovery of potential new drugs and biological entities . However, only approximately 5000 of the world's estimated 2,50,000-4,00,000 flowering plants have as yet been analyzed for their possible medicinal uses. A recent estimate indicates that between 39-43% of endemic plant and vertebrate animal species in 25 ecological hotspots would become extinct by 2100 .

Hence, there is an urgent need to screen the medicinal plants for their biological properties and to isolate their active constituents. Therefore, in the present study, we were interested in screening Commiphora berryi (Arn) Engl stem bark for its biological properties.

Antioxidant-based drugs/formulations for the prevention and treatment of complex diseases like atherosclerosis, stroke, diabetes, Alzheimer's disease and cancer have appeared during the last 3 decades . This has attracted a great deal of research interest in natural antioxidants. Subsequently, a worldwide trend towards the use of natural phytochemicals present in berry crops, tea, herbs, oilseeds, beans, fruits and vegetables has increased . Several herbs and spices have been reported to exhibit antioxidant activity, including rosemary, sage, thyme, nutmeg, turmeric, white pepper, chilli pepper, ginger and several Chinese medicinal plant extracts. The majority of the active antioxidant compounds are flavonoids, isoflavones, flavones, anthocyanins, coumarins, lignans, catechins, and isocatechins. In addition to the above compounds found in natural foods, vitamins C and E, β-

carotene and α-tocopherol are known to possess antioxidant potential. A direct relationship between antioxidant activity and phenolic content of plant extracts has been reported . Epidemiological studies have shown that the consumption of foods and beverages rich in phenolic content can reduce the risk of heart disease.

MATERIALS AND METHODS

Pharmacognostical and Phytochemical Studies

Collection and Authentication of *Commiphora berryi* (Arn) Engl

Commiphora berryi (Arn) Engl is widely distributed in Namakkal district of Tamil Nadu state, India. Fresh plant was collected in the month of December 1999 and authenticated (Specimen No. 1523) by DR. P. Daniel, Director, Botanical Surveyof India, Southern Circle, Coimbatore District, Tamil Nadu, India. The authenticationcertificate enclosed in annexure – I.

Macroscopical Evaluation of *Commiphora berryi* Stem Bark

Macroscopical evaluation refers to evaluation of drugs by colour, odour,taste, shape and special features like touch and texture. It is a technique of qualitativeevaluation based on the study of morphological and sensory profiles of the stem bark.The dried bark was taken for macroscopical evaluation.

Microscopical Evaluation of *Commiphora berryi* Stem Bark

The bark was selected and fixed in FAA (formalin 5 mL + acetic acid 5 mL + 70 % ethyl alcohol 90 mL). After 24 hours of fixing, the specimens were dehydrated with tertiary-butyl alcohol. Infiltration of the specimens was carried by gradual addition of paraffin wax (melting point 58-60 ˚C) until tertiary-butyl alcoholsolution attained super saturation and the specimen was cast into paraffin blocks.

The paraffin embedded specimens were sectioned with the help of Rotary Microtome. The thickness of the transverse section was 10-12 □m, and was stained with toluidine blue and focused under the microscope. Since toluidine blue is a polychromatic stain, the staining results were remarkably good, and some cytochemical reactions were also obtained.

Photographs of different magnifications were taken with Nikon Labphot 2 Microscopic Unit; bright field was used for normal observations. Polarized light wasemployed for the study of crystals, starch grains and lignified cells, since these structures having birefringent property; they will appear bright against dark background under polarized light.

Analytical Parameters

Determination of Ash Values and Extractive Values of *Commiphora berryi* StemBark Powder

Ash values and extractive values were determined by the procedures given in Indian Pharmacopoeia and Ayurvedic Pharmacopoeia. The different ash values such as total ash, acid insoluble ash, water soluble ash, sulphated ash and extractive values such as alcohol soluble extractive, water soluble extractive were found out.

Determination of Total Ash

About 3 g of powdered bark was accurately weighed and taken in a silica crucible,which was previously ignited and weighed. The powdered bark was spread as a fine even layer on the bottom of the crucible. The crucible was incinerated gradually by increasing the temperature to make it dull red hot until freed from carbon. The crucible was cooled and weighed. The procedure was repeated to get the constantweight. The percentage of the total ash was calculated with reference to the air driedbark powder.

Determination of Acid Insoluble Ash

The ash obtained as described in total ash was boiled with 25 mL of2 N hydrochloric acid for 5 minutes. The insoluble ash was collected on an ashless filter paper and washed with hot water. The insoluble ash was transferred into silica crucible, which was ignited and weighed. The procedure was repeated to get the constant weight. The percentage of acid insoluble ash was calculated with reference tothe air dried bark powder.

Determination of Water Soluble Ash

Ash from total ash was boiled for 5 minutes with 25 mL of distilled water. The insoluble matter was collected in ashless filter paper and washed with hot water. Theinsoluble ash was transferred into silica crucible and ignited for 15 minutes and weighed. The procedure was repeated to get the constant weight. The weight of insoluble matter was substracted from the weight of the total ash. The difference in the weight was considered as the water soluble ash percentage with reference to the air dried bark powder.

Determination of Sulphated Ash

About 3 g of powdered bark was weighed accurately and taken in silica crucible,which was previously ignited and weighed. The bark was moistened with concentrated sulphuric acid, ignited gently and again moistened with concentrated sulphuric acid and re-ignited. The crucible was cooled and weighed. The procedure was repeated to get the constant weight. The percentage of sulphated ash was calculated with reference to the air dried bark powder and recorded.

Determination of Alcohol Soluble Extractives

About 5 g of the dried coarse powder bark was macerated with 100 mL of90 % ethyl alcohol in a closed flask for 24 hours. It was shaken frequently during thefirst 6 hours and allowed to set aside for 18 hours and finally it was filtered. About 25 mL of the filtrate was evaporated to dryness in a tarred flat bottomed shallow dish,dried at 105 °C and weighed. The percentage of the alcohol soluble extractive value was calculated with reference to the air dried bark powder.

Determination of Water Soluble Extractives

About 5 g of the dried coarse powder bark was macerated with 100 mL of2 % chloroform water in a closed flask for 24 hours. It was shaken frequently duringthe first 6 hours and allowed to set aside for 18 hours and finally it was filtered. About25 mL of the filtrate was evaporated to dryness in a tarred flat bottomed shallow dish,dried at 105 °C and weighed. The percentage of the water soluble extractive was calculated with reference to the air dried bark powder.

Microchemical Test of *Commiphora berryi* Stem Bark Powder

The reactions of bark powder barks with different reagents like glacial acetic acid,sulphuric acid, hydrochloric acid, nitric acid, picric acid, sodium hydroxide, iodine solution and ferric chloride solution were carried out in a test tube and observed the colour changes under ordinary light and ultra violet light.

Extraction of *Commiphora berryi* Stem Bark Powder

The *Commiphora berryi* stem bark was dried under shade and then powdered to get a coarse powder. About 300 g of powdered bark was extracted with methanol bycold maceration method for 72 hours. The methanol extract has concentrated to a drymass by using vacuum distillation. After complete drying, the extracted materialwas weighed and the percentage extractive value was calculated with reference to theair dried sample.

RESULTS & DISCUSSION

Bark

Colour Outer surface-Greenis hbrown

:

Inner surface -Brown

Inner bark - Reddish brown in colour

Odou : No characteristic odour

Taste: Astringent

Shape: Dried bark is generally quill and channel form

Fracture: Short fracture

Surface: Outer surface is rough and wrinkles are seen

Inner surface shows longitudinal striationThe macroscopical evaluation can be used as an identification parameter for the dried stem bark of *Commiphora berryi*.

Fig 1: Morphology of *Commiphora berryi* stem bark

Table 1: The different ash values of *Commiphora berryi* stem bark

S. No	Type of ash	Ash values in percentage w/w
01	Total ash	08.96
02	Acid insoluble ash	01.40
03	Water soluble ash	08.00
04	Sulphated ash	21.80

Table 2: The extractive values of *Commiphora berryi* stem bark

S. No	Extractives	Extractive values in percentage w/w
01	Alcohol soluble extractive	11.96
02	Water soluble extractive	07.69

Microchemical Test of *Commiphora berryi* Stem Bark Powder

Table 3: Behaviors of *Commiphora berryi* stem bark powder with variousreagents

S. No	Reagents	Colour observedin visible light	Colour observedin u.v. light
01	Powder as such	Brown	Brown
02	Powder + Glacial acetic acid	Yellowish brown	Pale green
03	Powder + Iodine solution	Brown	Brown
04	Powder + conc. H_2SO_4	Red	Pale violet
05	Powder + conc. HCl	Brown	Green
06	Powder + conc. HNO_3	Red	Yellowish brown
07	Powder + NaOH	Dark green	Pale green
08	Powder + Picric acid	Yellowish brown	Yellowish brown
09	Powder + 5% $FeCl_3$	Dark violet	Green

Extraction of *Commiphora berryi* Stem Bark Powder

Table 4: The percentage yield of methanol extract of *Commiphora berryi* stembark

S. No	Solvent	Colour ofthe extract	Nature ofthe extract	Percentagew/w
01	Methanol	Dark brown	Resinous mass	12.16

Heavy Metal Analysis of Methanol Extract of *Commiphora berryi* Stem Bark

Table 5: Heavy metal analysis of methanol extract of *Commiphora berryi* stembark

Elements	Units in ppm
Fe	3.0500
Cu	2.0200
Mn	0.2588
Zn	1.5052
Cd	0.0424
Pb	1.3566
Mg	3.0400
Hg	0.0071
As	0.0244

Preliminary Phytochemical Studies

Table 6: The preliminary phytochemical studies on methanol extract of *Commiphora berryi* stem bark

S. No	Test	Observation	Result
01	**Carbohydrates**		**Present**
	a) Molisch's Test	Purple ring between two layers	
	b) Fehling's Test	Red precipitate formed	
	c) Benedict 's Test	Red precipitate formed	
02	**Glycosides**		**Absent**
	a) Legal's Test	No Pink to red colour appeared	
	b) Borntrager's Test	No red colour appeared	
03	**Proteins and**		**Absent**
	Amino Acids		
	a) Millon's Test	No pink to red colour appeared	
	b) Ninhydrin Test	No purple colour appeared	
	c) Biuret Test	No violet colour appeared	
04	**Fixed Oils and Fats**		**Absent**
	a) Spot Test	No oil stain producedNo soap formation	
	b) Saponification Test		
05	**Gums and Mucilage**		**Present**
	a) Ruthenium Red Test	Pink colour produced	
06	**Alkaloids**		**Absent**
	a) Mayer's Test	No cream precipitate	
	b) Dragendorff's Test	No orange brown precipitate	
	c) Hager's Test	No yellow precipitate	
	d) Wagner's Test	No reddish brown precipitate	
07	**Phytosterols**		**Present**
	a) Libermann Burchard Test	Bluish green colour produced	
	b) Salkowski Test	Brown ring produced	
08	**Flavonoids**		**Absent**
	a) Shibata's Test	No orange pink colour	
09	**Tannins and**		**Present**

	Phenolic Compounds		
	a) Ferric Chloride Test	Violet colour precipitate	
	b) Lead Acetate Test	White colour precipitate	
	c) Gelatin Test	White colour precipitate	
10	**Saponins**		**Absent**
	a) Foam Test	No foam produced	
	b) Haemolysis Test	No clear red liquid formed	
11	**Triterpenoids**	Red colour produced	**Present**

Thin Layer Chromatography of Methanol Extract of *Commiphora berryi*

Table 7: Thin layer chromatography of methanol extract of *Commiphora berryi* stem bark

S. No	Rf Values of methanolextract	Colour of the spots afterspraying
01	0.1290	Violet
02	0.2903	Violet
03	0.5161	Violet
04	0.6129	Violet
05	0.8387	Violet
06	0.8903	Green
07	0.9677	Violet

Column Chromatography of Methanol Extract of *Commiphora berryi* Stem Bark

Table 8: Column chromatography of methanol extract of *Commiphora berryi* stem bark

S. No	Eluent	Fraction	Phytoconstituents
01	Hexane: Ethylacetate 100:0	1-2	No residue
02	Hexane: Ethylacetate 95:5	3-6	No residue
03	Hexane: Ethylacetate 90:10	7-15	No residue
04	**Hexane: Ethylacetate 85:15**	**16-24**	**Yellow residue**
05	Hexane: Ethylacetate 80:20	25-34	No residue
06	Hexane: Ethylacetate 50:50	35-50	No residue
07	Ethylacetate : Methanol 100:0	51-75	No residue
08	Ethylacetate : Methanol 90:10	76-85	No residue
09	Ethylacetate : Methanol 80:20	86-95	No residue
10	Ethylacetate : Methanol 60:40	96-105	No residue
11	**Ethylacetate : Methanol 50:50**	**106-130**	**Brown solid mass**
12	Ethylacetate : Methanol 0:100	131-140	No residue

Table 9: Effect of methanol extract of *Commiphora berryi* stem bark on ulcer score, gastric volume and total acidity in aspirin plus pylorus ligation ulcer rat model

Group	Treatment	Dose (mg/kg)	Volume ofgastric content (mL)	Total acidity (meq./L/100 g)	Ulcer score
I	**Controlvehicle**	**3 mL**	8.75□0.20	75.10□ 0.90	2.98□ 0.24
II	**MECB**	**250**	7.00□0.10^{+}	64.00□ 1.00^{++}	1.80□0.11^{+++}
III	**MECB**	**500**	6.08□0.16*	60.25□0.65**	1.50□0.13***
IV	**MECB**	**750**	5.40□0.10^{x}	58.40□1.40^{xx}	1.26□0.16^{xxx}
V	**Ranitidine**	**20**	5.80□ 0.12	60.10□ 0.65	1.14□ 0.11

Values are mean □ SEM ; n = 6 in each group, $^{+}P< 0.001$, $^{++}p < 0.001$, $^{+++}p < 0.001$,
$^{*}p< 0.001$, $^{**}p < 0.001$, $^{***}p < 0.001$, $^{x}p < 0.001$, $^{xx}p < 0.001$, $^{xxx}p < 0.001$,when compared with control group.
$^{+}P< 0.001$, $^{++}p < 0.001$, $^{+++}p < 0.001$, $^{*}p< 0.05$, $^{**}p > 0.05$, $^{***}p < 0.01$, $^{x}p < 0.001$,
$^{xx}p < 0.05$, $^{xxx}p> 0.05$, when compared with ranitidine group.

Table 10: Effect of methanol extract of *Commiphora berryi* stem bark on stressinduced ulcer model in rats

Group	Treatment	Ulcer score
I	Control vehicle (3 mL)	4.52±0.27
II	MECB 250 mg/kg	2.09±0.10^{+}
III	MECB 500 mg/kg	1.55±0.25^{+}
IV	MECB 750 mg/kg	0.83±0.15^{++}
V	Ranitidine 20 mg/kg	1.00±0.15

Values are mean □ SEM; n = 6 in each group
$^{+}p<0.001$, $^{++}p<0.001$ when compared with control group.
$^{+}p<0.001$, $^{++}p>0.05$ when compared with ranitidine group.

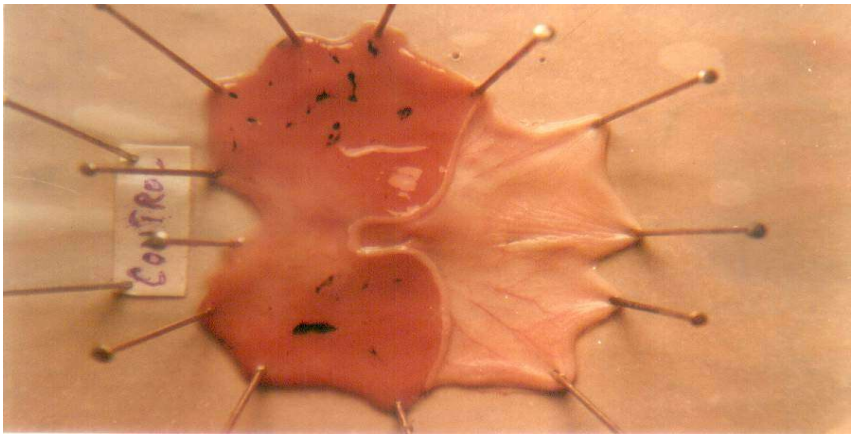

Fig 1: Aspirin plus pylorus ligation model- Stomach of control animal - 0.5 % C.M.C. solution

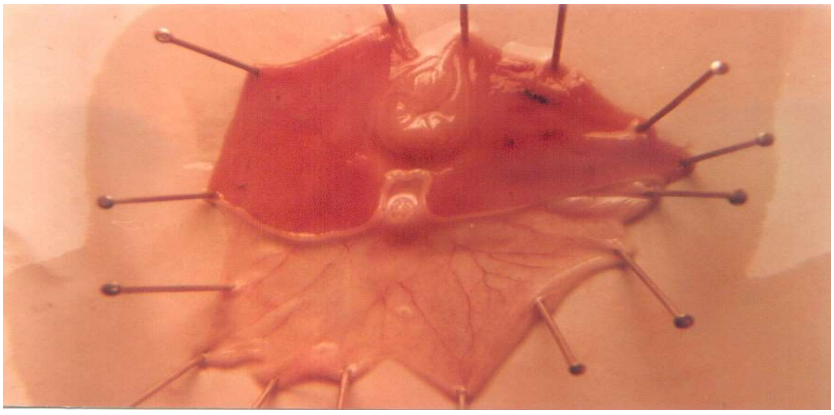

Fig 2: Aspirin plus pylorus ligation model- Stomach of treated animal - 250 mg/kg of methanol extract of *Commiphora berryi* stem bark

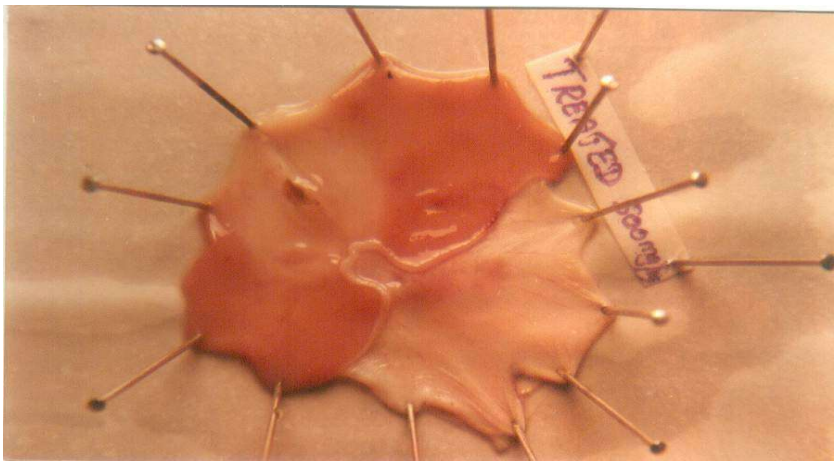

Fig 3: Aspirin plus pylorus ligation model- Stomach of treated animal - 500 mg/kg of methanol extract of *Commiphora berryi* stem bark

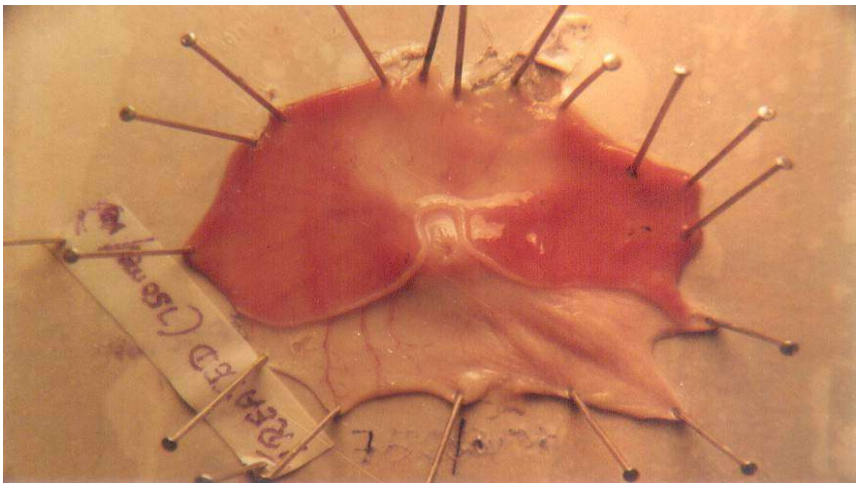

Fig 4: Aspirin plus pylorus ligation model- Stomach of treated animal - 750 mg/kg of methanol extract of *Commiphora berryi* stem bark

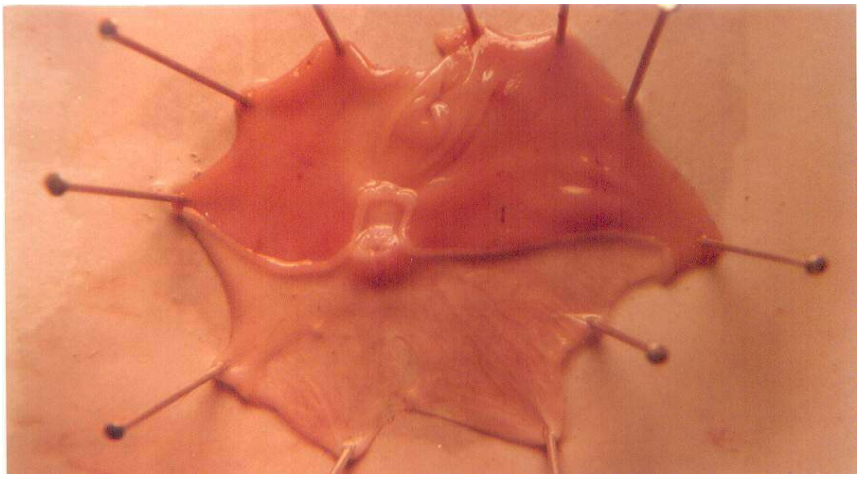

Fig 5: Aspirin plus pylorus ligation model- Stomach of positive control animal - 20 mg/kg of ranitidine

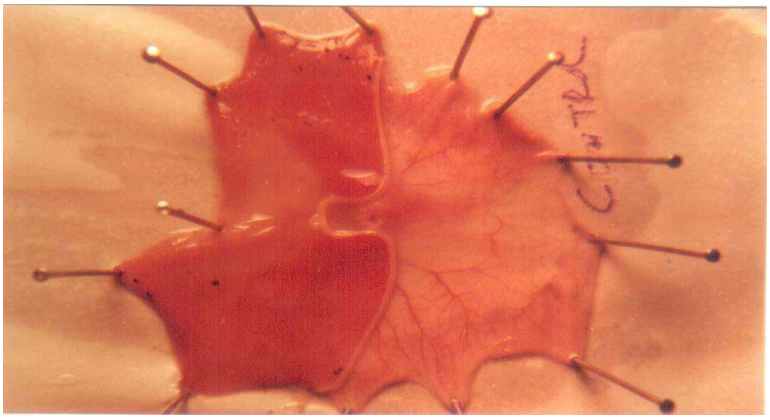

Fig 6: Stress induced ulcer model - Stomach of control animal - 0.5 % C.M.C. solution

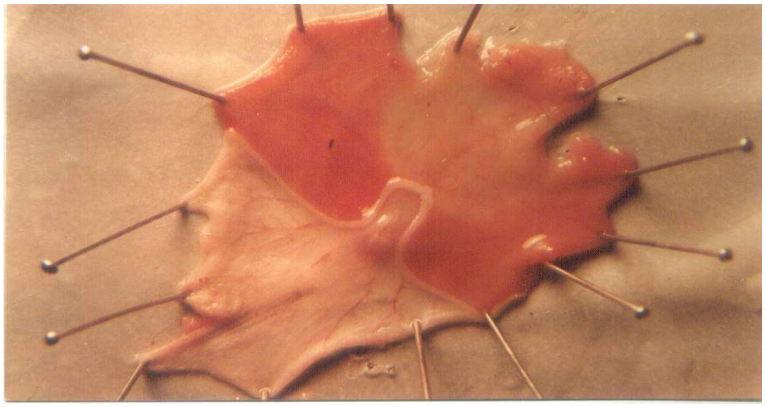

Fig 7: Stress induced ulcer model- Stomach of treated animal - 250 mg/kg of methanol extract of *Commiphora berryi* stem bark

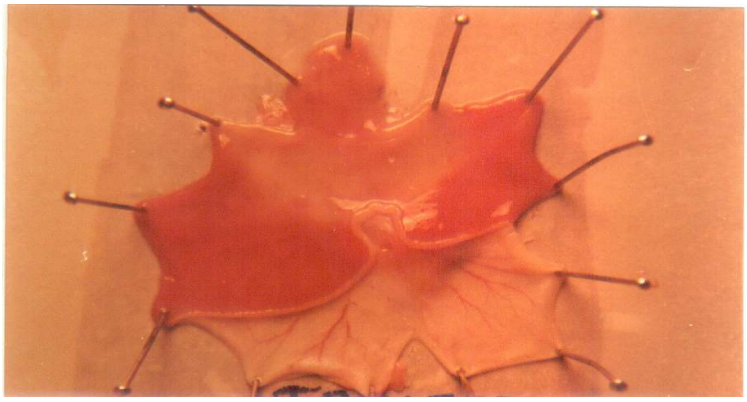

Fig 8: Stress induced ulcer model- Stomach of treated animal - 500 mg/kg of methanol extract of *Commiphora berryi* stem bark

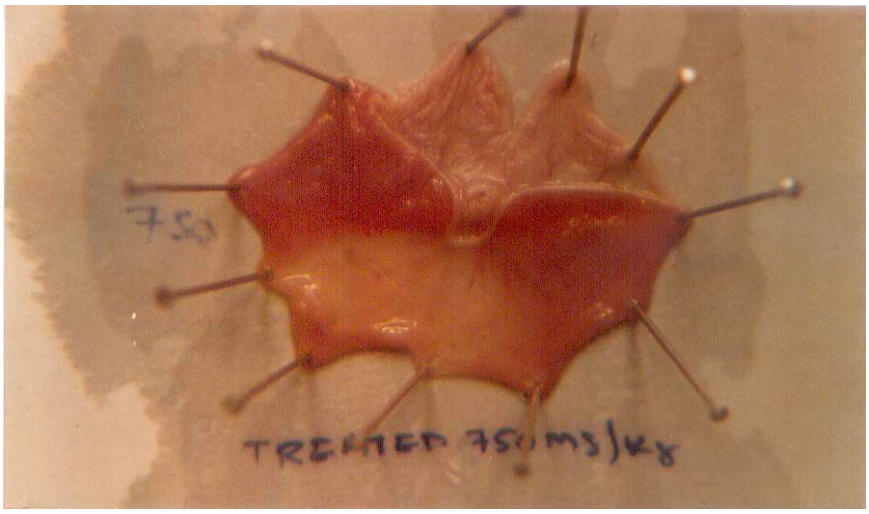

Fig 9: Stress induced ulcer model- Stomach of treated animal - 750 mg/kg of methanol extract of *Commiphora berryi* stem bark

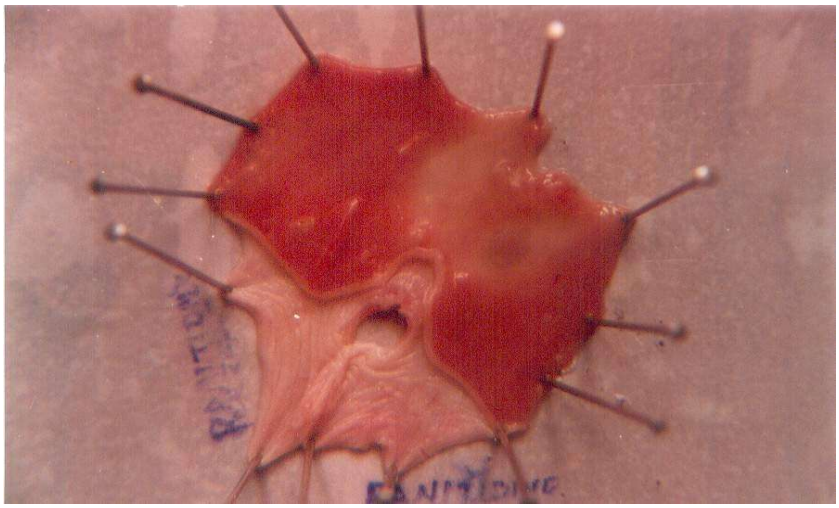

Fig 10: Stress induced ulcer model- Stomach of positive control animal - 20 mg/kg of ranitidine

SUMMARY AND CONCLUSION

The present thesis entitled "Pharmacognostical and Pharmacological Evaluation of Stem Bark of *Commiphora berryi* (Arn) Engl" deals with the exploration of pharmacognostical, phytochemical and pharmacological activities.

Commiphora berryi (Arn) Engl belongs to the family Burseraceae called Indian balm of gilead in English and mudgiluvai in Tamil. It is a shrub or small tree, branched with several spines. It is widely distributed in dry forest of Andhra Pradesh, Tamil Nadu and Karnataka. The plant yields fragrant gumresin. Traditionally the bark of the plant is used for peptic ulcer. The stem barkwas collected from Namakkal district of Tamil Nadu state, India and authenticated at Botanical Survey of India, Southern Circle, Coimbatore District, Tamil Nadu, India.

Earlier studies carried out have proved its diuretic, anti-bacterial activities ofthe bark. Except these studies, so far no pharmacognostical and pharmacological investigations have been carried out on the stem bark.

The thesis is organized into six Chapters. Chapter 1 deals with introduction, Chapter 2 deals with plant profile and literature survey, Chapter 3 deals with plan of work, Chapter 4 deals with materials and methods, Chapter 5 deals with results and discussion, Chapter 6 deals with summary and conclusion.

In Pharmacognostical studies, macroscopical characters such as colour, odour,taste, shape, fracture, and surface were studied. Microscopical studies such as transverse section of stem bark and powder

microscopy were carried out. Analytical parameters such as ash value, extractive value, microchemical tests and heavy metal analysis were examined. These parameters can be used for the standardization of *Commiphora berryi* stem bark.

The preliminary phytochemical analysis revealed that the *Commiphora berryi*stem bark contains carbohydrates, gums, mucilages, phytosterols, tannins, phenolic compounds and triterpenoids.

The methanol extract of *Commiphora berryi* stem bark was fractioned in to two residues by using column chromatography containing silica gel G as adsorbent. One fraction got eluted in hexane: ethyl acetate (85:15) and anotherfraction in ethyl acetate: methanol (50:50). GC-MS study of two residues showed the presence of phenol 2,4-bis(1,1-dimethylethyl)- (phenolic compound), dodecanoic acid (lauric acid), n-hexadecanoic acid (palmitic acid), 9,12-octadecadienoic acid (Z,Z)- (linoleic acid) and 1,2-benzene dicarboxylic acid (mono 2-ethylhexyl ester).

The biological activities of the above mentioned compounds are reported in Dr.Duke's Phytochemical and Ethnobotanical Databases as

- Phenol 2, 4-*bis* (1, 1-dimethylethyl) shows analgesic, antioxidant and cancer preventive.
- Dodecanoic acid has antioxidant, COX-1 and COX-2 inhibitor.
- n-Hexadecanoic acid exhibits antioxidant property.
- 9, 12-Octadecadienoic acid shows hepatoprotective, antihistaminic activity, antiarthritic, anti-inflammatory and cancer preventive.
- 1, 2-Benzene dicarboxylic acid (mono 2-ethylhexyl ester) has anti- inflammatory activity.

Hence in this study antiulcer, anti-inflammatory, analgesic, antipyretic, anti- tumor, hepatoprotective and antioxidant activities of *Commiphora berryi* barkhave been investigated.

The total methanol extract was used instead of isolated compounds, since in Ayurvedic or Herbal medicine practice, the total extract is used as therapeuticagent instead of isolated compounds on the scientific approach that certain components in the extract nullify the side effects of other components.

Toxicity studies were conducted as per OECD-423 guidelines. The methanolextract of the stem bark of *Commiphora berryi* showed no mortality or acute toxicity up to 3 g/kg, b. wt.

Antiulcer activity of MECB was studied by aspirin plus pylorus ligation and stress induced ulcer models in rats. In aspirin plus pylorus ligation model, when compared with ranitidine treated group, the group treated with 500 mg/kg extract showed a marginal activity and the group treated with750 mg/kg extract showed a significant activity which was higher than that ofthe ranitidine treated group. In stress induced ulcer model, when compared with ranitidine treated group, the groups treated with 500 mg/kg and 750 mg/kg extract showed significant activity which was equal to that of ranitidine treated group, which correlates well with the traditional use of the plant for peptic ulcer treatment.

The anti-inflammatory, analgesic and antipyretic potential of MECB was studied. Acute, sub-acute and sub-chronic models of inflammation were evaluated by carrageenan induced hind paw edema, formaldehyde induced hind paw inflammation and cotton pellet induced granuloma method in rats respectively. The effect of MECB in edema reduction was compared with standard drug indomethacin at 10 mg/kg, b.wt. In acute models of inflammation, oral administration of the MECB suppressed the edematous response 2 h after carrageenan injection and this effect continued up to 6 h. The observed effect was similar to that of indomethacin. In fact, MECB caused a statistically significant reduction in induced edema at all doses tested.The inhibitory effect was comparable in magnitude with the inhibitory actionof indomethacin. In sub-acute model of inflammation, MECB producedmaximum inhibition of 33.33 %, 40.00 % and 53.33 % for formaldehyde induced hind paw inflammation at the dose of 250 mg/kg, 500 mg/kg and750 mg/kg, b.wt. respectively, when compared to standard indomethacin (66.67 %). In sub-chronic model of inflammation, oral administration of MECB produced maximum inhibition of 34.11 %, 41.78 % and 48.58 % for cotton pellet induced granuloma at the dose of 250 mg/kg, 500 mg/kg and 750 mg/kg, b.wt., respectively when compared to standard indomethacin (56.82 %). In acetic acid induced writhing response in mice model, the administration of MECB produced maximum inhibition of 29.10 %, 36.91 %and 40.33 % at the dose of 250 mg/kg, 500 mg/kg and 750 mg/kg b. wt., respectively, when compared to aspirin (51.96 %). The formalin test in mice,MECB at 750 mg/kg was able to block both phases of formalin response but the effect was more pronounced in the second phase. In the tail immersion testmethod, the pentazocine was used as reference analgesic drug. The MECB in adose of 750 mg/kg showed very less antinociceptive activity than pentazocine at 2 hour. This result concludes that the MECB does not possess any steroidalanti-inflammatory activity to act centrally. In antipyretic study, MECB showed a significant reduction in pyrexia induced by Brewer's yeast in rats.

The antitumor activity of MECB was investigated at the dose levels of 500 mg/kg and 750 mg/kg against Ehrlich ascites carcinoma (EAC) cells bearing mice. The effect of MECB and 5- fluorouracil on haematological, biochemical parameters and antioxidant enzyme levels were estimated. The tumor volume, packed cell volume and viable tumor cell count was significantly decreased in MECB treated mice,

when compared with EAC control group. The mean survival time increased in MECB (57.92 %) and 5-fluorouracil (131.58 %), when compared with diseased control, but when compared with 5-fluorouracil, MECB showed less activity. After the administration of MECB, it was noted that hemoglobin and RBC increased and total WBC count decreased. In differential count of WBC, the percentageof neutrophills decreased, at the same time the lymphocyte count increased. The LPO level significantly increased, and GSH, SOD, CAT levels decreasedin EAC treated mice. After the administration of MECB, the lowering of lipid peroxidation level and increase in the levels of GSH, SOD and CAT were observed. From the results, it indicates that MECB has a remarkable capacityfor the inhibition of tumor growth induced by EAC cell line, by altering the LPO and antioxidant system in EAC treated mice. It can be concluded that theantitumor activity exhibited by MECB might be due to the antioxidant potential of the plants.

The hepatoprotective activity of MECB was evaluated by carbon tetrachlorideinduced hepatotoxicity in rats. MECB at the dose of 100 mg/kg, 200 mg/kg, b.wt. and silymarin at 25 mg/kg, b.wt. were administered to the different groups of animals. The potential of MECB and silymarin on liver markers and antioxidant liver enzymes were estimated. The MECB and silymarin showed significant hepatoprotective effect by reducing the amountof serum enzymes and bilirubin.

In antioxidant system, the liver enzyme level of SOD, CAT and glutathione peroxidase increased in a dose dependent manner. The animals treated orallywith MECB at the dose 100 mg/kg and 200 mg/kg, b.wt. showed significant increase in the level of these enzymes, when compared with diseased control.The group treated with MECB 200 mg/kg. b. wt. showed non-significant activity, when compared with standard drug, silymarin. The above results show that the hepatoprotective effect of MECB may be due to its free radical scavenging property.

It can be concluded that the methanol extract of *Commiphora berryi* stem barkpossess antiulcer, anti-inflammatory, analgesic, antipyretic, antitumor hepatoprotective and antioxidant properties.

Scope for Further Research

Clinical evaluation in human beings may be carried out for the above promising pharmacological activities.

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