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Research Article

# ANTI-ULCER ACTIVITY OF DIFFERENT LEAF EXTRACTS OF *TECOMARIA CAPENSIS*

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**ABSTRACT**

*Tecomaria capensis* is being used as a traditional medicine for the treatment of various diseases. Considering the above claims, the present work was undertaken to validate the anti-ulcer potential of the ethanolic and ethylacetate extracts leaves of *Tecomaria capensis* against in vivo Aspirin induced method. The extracts (100 and 200 mg/kg) significantly reduced the ulcer index. The extracts also significantly increased the pH of gastric acid while at the same time reduced the volume of gastric juice and total acidities. In conclusion, the present study provide preliminary data on the antiulcer potential of *Tecomaria capensis* leaves and support the traditional uses of the plant for the treatment of gastric ulcer.

**Keywords:** Anti-ulcer activity, *Tecomaria capensis.*

## INTRODUCTION

The exact pathogenesis of ulcer continues to elude scientists and medical researchers, but a common ground has been proposed. Ulcers are produced when any factor causes an imbalance between the protective factors (mucus and bicarbonate) and aggressive factors (acid and pepsin) in the stomach[1] Such factors could range from natural causes (gastric cancer), infections (H. pylori), lifestyle (drugs - non steriodal anti-inflammatory agents, alcohol, stress and cigarette smoking) [2,3]. Current treatment of ulcers in developing countries has been largely suppression of pain, with little or no strategy aimed at a cure. Herbal medicine is fast emerging as an alternative treatment to available synthetic drugs for treatment of ulcer possibly due to lower costs, availability, fewer adverse effects and perceived effectiveness. Many tropical herbs have been scientifically reported to possess potent antiulcer activity [4,5,6,7] so the present study has been focused on anti ulcer activity. *Tecomaria capensis* (family:Bignoniaceae) also known as Cape-honeysuckle is a fast growing, scrambling shrub which may grow up to 2-3m high and spread more than 2.5m. *Tecomaria capensis* is an evergreen plant in warm climate areas but loses its leaves in colder areas. It has pinnately compound leaves that have oval leaflets with blunt teeth. Flowering time for this shrub is very erratic and often it flowers all year round. Flowers are orange in color. Plant is used as a traditional medicine to relieve pain and sleeplessness. Dried powdered bark infusions are taken for sleeplessness [8], reported to induce sleep [9]. It is included in the list of African plants evaluated for in vitro antiplasmodial activity[10]

## MATERIALS AND METHODS

### Plant materials and Preparation of Extracts:

The leaves of *Tecomaria capensis* were collected from Guntur, Andhra Pradesh. It was authenticated by professor Dr.S.M.Khasim, Department of Botony and Microbiology, Acharya Nagarjuna University, Nagarjuna nagar, Guntur. The leaf part of *Tecomaria capensis* was dried at room temperature and grounded into powder and passed through 60# sieve. The powder (500gm) was extracted successively in soxhlet by ethanol and ethyl acetate. The sediments were filtered and the filtrate was dried at 40°C in an oven to get dried product. The different fractions obtained were used for further study.

### Phytochemical screening

The ethanolic extract and ethyl acetate extract was tested for the presence or absence of secondary metabolites using standard phytochemical procedures and tests [11].

### Acute oral toxicity study and selection of doses

A safe oral dose of TC was determined through the acute oral toxic test in rats as described by the Organization of Economic Co-Operation and Development (OECD) as per 423 guidelines (OECD Guidelines for the Testing of Chemicals, 2010). The TC, at different doses up to 2000 mg/kg, was prepared by dissolving the extract in distilled water and the concentration was adjusted in such a way that it did not exceed 1 ml/100 g of the rat. The extract was then administered (p.o.) and animals were observed for behavioral changes, any toxicity and mortality up to 48 h. Two different doses (100 and 200 mg/kg, p.o) of TC were later chosen for this study based on the acute toxicity testing.

### Animal Model

Healthy albino Wister rats of 150-165 gm were used throughout the study. They were maintained in a controlled environmental condition of temperature and humidity on alternatively. All animals were fed with standard pellet diet and water ad libitum. Animal experimental studies were conducted according to the guidelines of institutional animal ethical committee. All the animals were grouped into seven groups and each group had 5 animals. Group-1 was control (without any treatment fed with normal saline), Group-2 Negative control treated with NSAID, Group-3: Standard control pretreated with Ranitidine and then treated with NSAID, Group-4 Pretreated animals with Ethyl acetate low dose and then treated with NSAID, Group-5 pretreated animals with Ethyl acetate high dose and then treated with NSAID, Group-6 Pretreated animals with Ethanol low dose and then treated with NSAID, Group-7: Pretreated animals with Ethanol high dose and then treated with NSAID [12].

### In vivo Protocol

All the groups of animal were kept for overnight fasting fed only with the tap Water. The animals of group 4, 5, 6 and 7 were treated with the test extract of different doses. This treatment was given thrice at the 12 hours interval. Animals of group 3 were treated with Ranitidine simultaneously. After one hour of last administration of sample extract the NSAID was given by Oral gavages to group 2 to group 7 animals. After 6 hours of NSAID administration, the animals were sacrificed by cervical dislocation [13]. The animals were dissected and the stomach was taken out. Finally the ulcers were observed macroscopically. The observation was made for any bulging or inflammation in the stomach. The Stomachs were opened along the greater curvature and the mucosa was exposing for evaluation. The ulcer scores (US) were calculated as the arithmetic mean for each treatment.

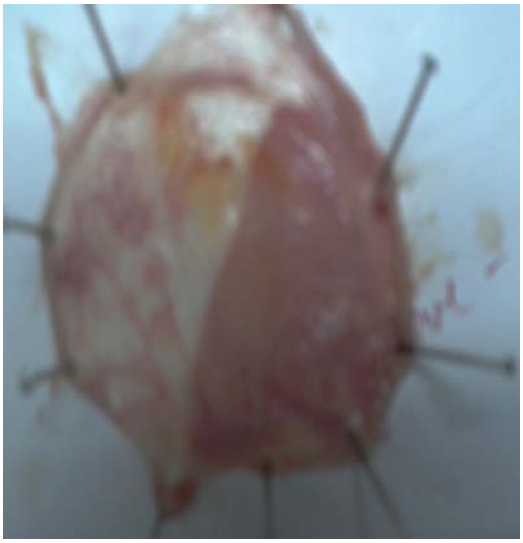
### Histopathological evaluation

The gastric tissue samples were fixed in neutral buffered formalin for 24 h. Sections of tissue from stomachs were examined histopathologically to study the ulcerogenic or anti-ulcerogenic activity of *Tecomaria capensis*. The tissues were fixed in 10% buffered formalin and were processed using a tissue processor. The processed tissues were embedded in paraffin blocks and about 5-µm

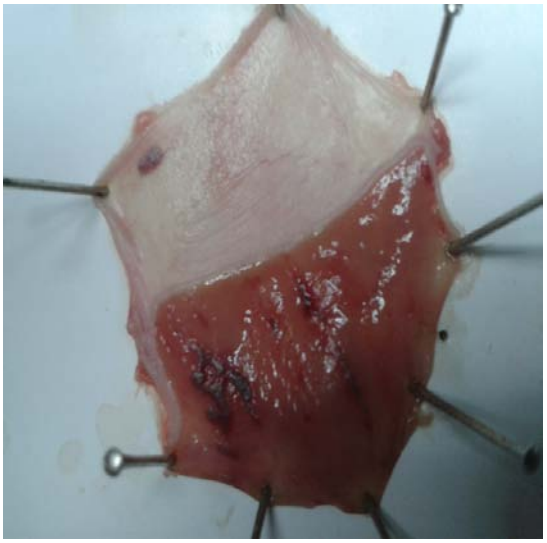
thick sections were cut using a rotary microtome. These sections were stained with hematoxylin and eosin using routine procedures. The slides were examined microscopically for Pathomorphological changes such as congestion, haemorrhage, oedema and erosions using an arbitrary scale for the assessment of severity of these changes.

**RESULT**

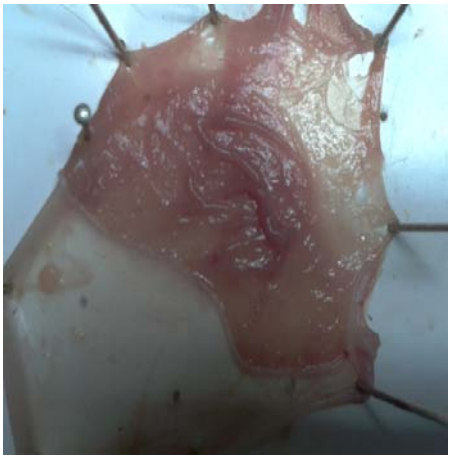
Acute toxicity studies were carried out on TC upto the dose of 2000 mg/kg which demonstrated that the extract did not show any sign of toxicity and mortality. However, there was a decrease in physical activity, which was observed only at the dose of 2000 mg/kg. Thus, the present doses regime (100 and 200 mg/kg) was chosen for further studies. The results of anti ulcer activities of crude ethyl acetate and ethanolic extracts of this plant at a dose of 100 mg/kg and 200mg/kg on rats intoxicated with Aspirin were illustrated in the table 1, fig-1and 2. The tables also showed the comparison of effects among the untreated (control) and Aspirin treated (negative control) group with the drug treated group of rats. The results were represented as Mean ± Standard Error of Mean (M±SEM). Aspirin (G2) group significantly increased ulcer index (0.17±0.17), Gastric juice (0.25±0.171), pH (3.54±0.167), Total Acidity (50±0.86).



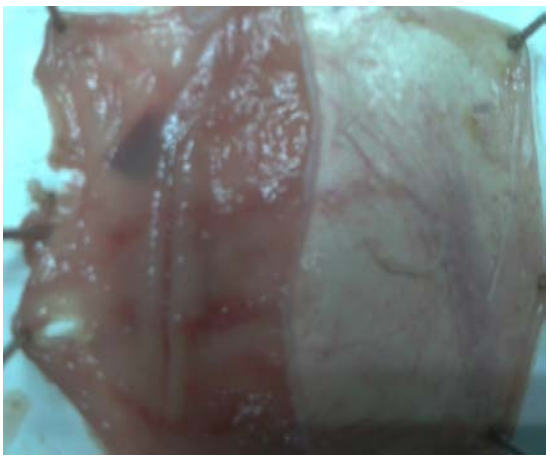
**Control group**



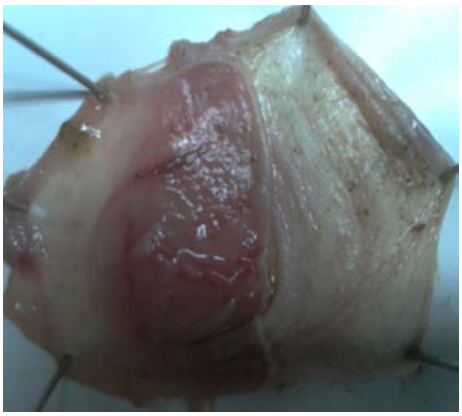
**Negative control**



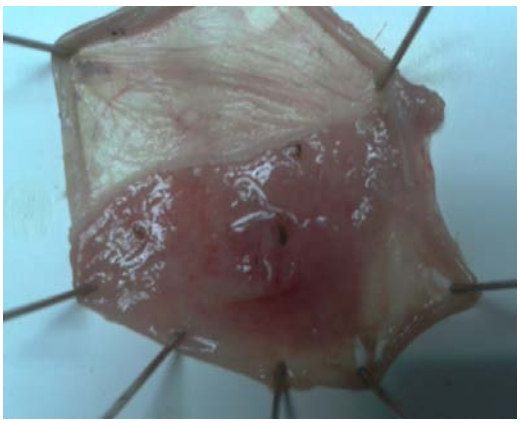
**Positive control**



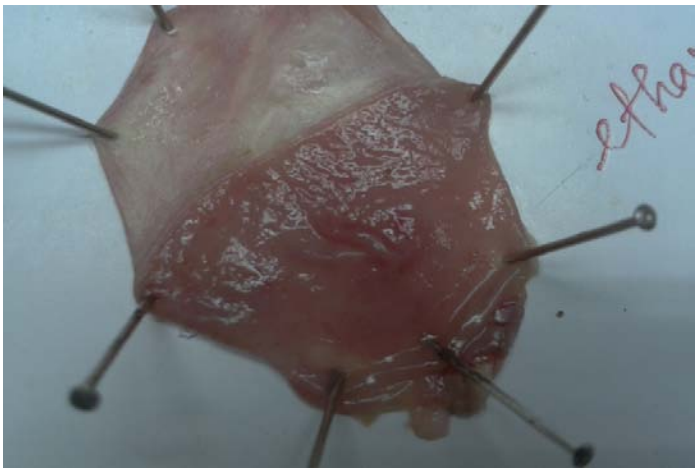
**Ethyl Acetate low dose**



**Ethyl acetate high dose**



**Ethanol low dose**



**Ethanol high dose**

**Fig. 1: Macroscopical study**

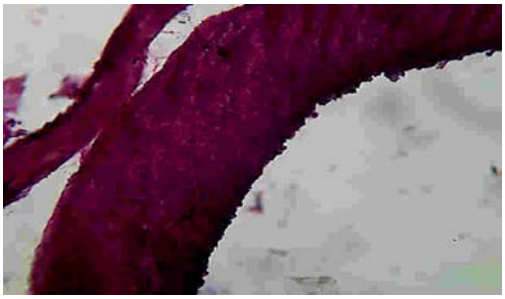
**Table 1: Effects of ethyl acetate and ethanolic extracts of *Tecomaria capensis***

| | Control | Negtive control | Positive Control | Ethyl Acetate Low Dose | Ethyl Acetate High Dose | Ethanol Low Dose | Ethanol High Dose |
|---|---|---|---|---|---|---|---|
| Ulcer index | 0.17±0.17 | 11.17±0.31* | 3.33±0.21* | 11±0.37* | 7.50±0.22* | 6±0.26* | 2.5±0.22* |
| Gastric juice | 0.25±0.171 | 0.8±0.026** | 0.4±0.052 | 0.7±0.037*** | 0.6±0.037*** | 0.5±0.026 | 0.4±0.037 |
| pH | 3.54±0.167 | 2.014±0.110* | 4.48±0.199** | 3.5±0.335 | 3.85±0.325 | 3.6±0.342 | 4.1±0.221*** |
| Total acidity | 50±0.86 | 102.83±1.70* | 55.17±1.19** | 72±1.83* | 66±0.58* | 60±1.88** | 54±0.58** |
| % Protection | 100.00% | 35.29% | 81.00% | 36.29% | 56.00% | 65.70% | 86.29% |

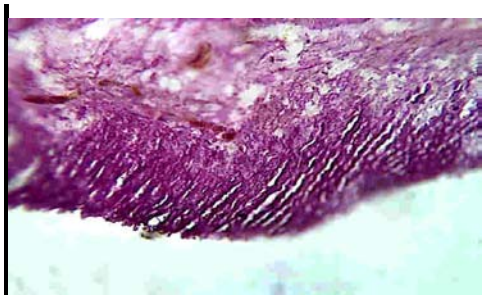
**Treatment Groups**

Positive control (Ranitidine) Groups (G3) There was significant decrease in ulcer index (3.33±0.21), accompanied by significant decrease in level of Gastric Juice (0.4±0.052), Total Acidity (55.17±1.19) and also significant increase in pH (4.48±0.199) as compared to the negative control. Ethyl acetate low dose Groups (G4) There was significant decrease in ulcer index (11±0.37), accompanied by significant decrease in level of Gastric Juice (0.7±0.037), Total Acidity (72±1.83) and also significant increase in pH (3.5±0.335) as compared to the negative control. Ethyl acetate high dose (G5) There was significant decrease in ulcer index (7.50±0.22), accompanied by significant decrease in level of Gastric Juice (0.6±0.037), Total Acidity (66±0.58) and also significant increase in pH (3.85±0.325) as compared to the negative control. Ethanol low dose (G6) There was significant decrease in ulcer index (6±0.26), accompanied by significant decrease in level of Gastric Juice (0.5±0.026), Total Acidity (60±1.88) and also significant increase in acid pH (3.6±0.342) as compared to the negative control.

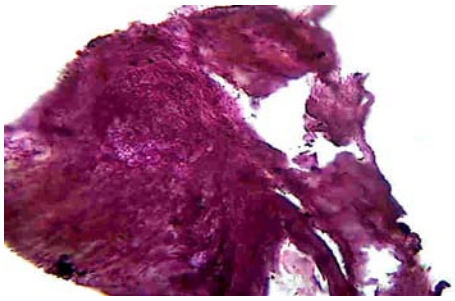
Ethanol high dose (G7) There was significant decrease in ulcer index (2.5±0.22), accompanied by significant decrease in level of Gastric Juice (0.4±0.037) and also, Total Acidity (54±0.58) significant increase in acid pH (4.1±0.221) as compared to the negative control.



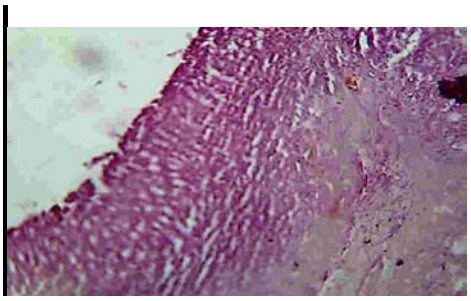
**Normal**



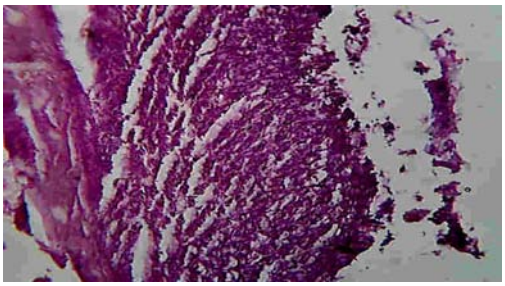
**Negative Control**



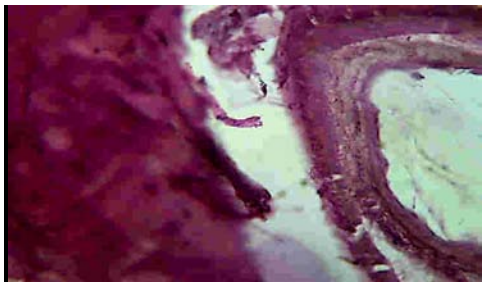
**Positive Control**



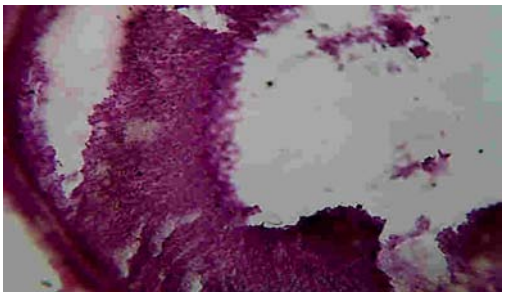
**Ethyl Acetate Low Dose**



Ethyl Acetate High Dose



Ethanol Low Dose



Ethanol High Dose

**Fig. 2: Histopathological studies**

## DISCUSSION

Peptic ulcer and gastritis have been associated with multi pathogenic factors and could be due to disturbances in natural balances between the aggressive factors (e.g. of acid, bicarbonate, pepsin) and maintenance of the mucosal integrity through the endogenous defense mechanism (e.g. of defensive mechanisms of mucus, mucosal turnover and blood supply (mucosal barrier) [14,15]. Generally various non-specific methods are used to restore these imbalances including regular food intake, adequate rest and avoidance of ulcerogenic agents (e.g. Tobacco, Alcohol and Coffee). Their aims are to attenuate and possibly block the gastric acid secretion or to enhance the mucosal defense mechanisms [16]. The latter can be achieved through increasing mucus production, stabilizing the surface epithelial cells, or interfering with the prostaglandin synthesis. In addition, there are also drugs, such as proton pump inhibitors, histamine (H2)-antagonists, anti-cholinergic and antacids, used in the treatment of ulcer [17]. Despite the availability of many pharmaceutical products for the treatment of gastric ulcers in the market as mentioned above, their successes were limited by presence of several adverse effects (e.g. Anaphylaxis reactions, Gynecomastia, Hematopoietic changes, Thrombocytopenia, Acute interstitial nephritis, Nephrotoxicity and Hepatotoxicity) [18,19]. Due to the reported side effects of available antiulcer drugs, focused have been shifted towards natural products as the new sources of antiulcer agents. With the increasingly growing interest in natural medicine, various plants have been studied based on the traditional knowledge of their pharmacological properties and confirmed to be useful in treating and managing ulcer. Furthermore, medicinal plants have been known to be amongst the most attractive sources of new drugs, and have been shown to give promising results in treatment of various diseases including gastric and duodenal ulcers [20,21]. *T.capensis* has been reported to exert several pharmacological properties such as a traditional medicine to relieve pain and sleeplessness. Dried powdered bark infusions are taken for sleeplessness, reported to induce sleep. It is included in the list of African plants evaluated for in vitro anti-plasmodial activity. This plant has so far not been screened for anti-ulcer Activity. Thus, we take this opportunity to report the preliminary findings on anti-ulcer potential of *T. Capensis* leaf ethanolic and ethylacetate extracts for the first time here. The present study demonstrated the potential of ethanolic and ethyl acetate extracts significantly reduced gastric ulceration as indicated by the reduction in ulcer index in the aspirin induced method. Chronic use of anti-inflammatory drugs and stress are some of the main causes of gastric ulcers [22], and since ethanol and ethyl acetate extracts exerted significant antiulcer activity under experimental models that mimic those conditions. These results suggested that ethanol and ethyl acetate extracts possesses anti-secretory potency as well as acid neutralizing effect. Furthermore, based on findings by Ubaka et al. [23] the anti-secretory effect is suggested to be one of the mechanism through which the extracts was able to protect the stomach mucosa from NSAIDs (aspirin) induced damage. It is well known that inhibition of prostaglandin synthesis, which is essential for mucosal integrity and regeneration, will trigger the mucosal lining damage. It is also believed that the extracts exert its antiulcer activity by increasing the synthesis of endogenous prostaglandins, which in turn promotes mucus secretion and enhances the mucosal barrier against the actions of various damaging agents[24]. Other than that, leukotrienes antagonist and 5- lipoxygenase inhibitors have been demonstrated to inhibit NSAIDs-induced gastric ulceration in rats. Hence, the observed antiulcer activity of *T.Capensis* could also be suggested to be due to inhibition of 5-lipoxygenase pathway or to leukotriene's antagonistic activity. In recent experiments, it has been found that heat shock proteins (HSPs), specifically HSP70 and HSP47 are involved in the gastric protection. The HSC70 (a constitutive form of HSP70) is co precipitated with COX-1 and the neuronal form of nitric oxide synthase after treatment with a mild irritant (20% ethanol). A positive relationship between enhanced interaction of HSC70 with either Cyclooxygenase-1 or nitric oxide synthase and mucosal defense mechanisms and ulcer healing, most probably through protecting key enzymes related to cytoprotection [25].

In conclusion, the present study provided preliminary data for the first time that the leaves of *T.Capensis* possesses significant anti-ulcer activity in animal models. It has gastric anti-secretory and acid neutralizing effects that are comparable to reference drug Ranitidine. The anti-ulcer activity is probably due to the presence of bioactive compounds like flavanoids and tannins. Further studies are required to confirm the exact mechanism underlining the ulcer healing and protecting property of the extracts and to identify the chemical constituents responsible for it.

## REFERENCE

1. Ojewole E.B: Peptic Ulcer Disease. In: Aguwa C.N, editors. Therapeutic Basis of Clinical Pharmacy in the Tropics. 3rd ed. Enugu: SNAAP Press; 2004. p. 541-564.

2. Berardi R.R, S. Welage: Peptic Ulcer Disease. In: Dipiro T.J., R.L. Talbert, G. Yes, G. Matzke, G.Wells and M.Posey, editors. Pharmacotherapy: A Pathophysiologic Approach. 6th ed. McGraw-Hill; 2005.p. 629-648.
3. Suerbaum, S. and P. Michetti: Helicobacter pylori infection. N Engl. J. Med 2002; 347: 1175-1186.
4. Vela, S.M., C. Souccar, M. Lima-Landman and A. Lapa: Inhibition of gastric acid secretion by the aqueous extract and purified extract of Stachytarpheta cayennensis. Plant Med. 1997; 63 (1): 36.
5. Goulart, Y.C.F., V. Sela: Evalaution of gastric antiulcer activity in a hydro-ethanolic extract from Kielmeyera coriacea. Braz. Arch. Bio Tech., 2005; 48(1): 211-216. Goulart, Y.C.F., V. Sela, S.Obici, J.Vanessa, C.Martins, F.Otorbone, et al.
6. Singh, R., J. Madan and S. Rao: Antiulcer activity of black pepper against absolute ethanol induced gastric mucosal damage in mice. Pharmacog mag 2008; 4(15): 232-235.
7. Aguwa, C.N. and C. Ukwe: Gastrointestinal activities of Sterculia tragacantha leaf extracts. Fitoterapia 1997 68(2): 127-131.
8. Roberts.M.: Indigenous Healing Plants. Halfway House. Southern Book Publishers, 1990.
9. Hutchings, A., Scott, A.H., Lewis, G., Cunningham, A.B. Zulu Medicinal Plants: An Inventory. Pietermaritzburg: University of Natal Press; 1996.
10. P. Pillaya, V.J. Maharaj, P.J. Smith: Journal of Ethnopharmacology, vol 119, 2008, p.438–454.
11. Harbourne, J.B., S Phytochemical Methods-A Guide to Modern Technique of Plant Analysis. 2nd ed., New York: Chapman and Hall; 1984, p. 120.
12. Berenguer, B., L.M. Sanchez: Protective and antioxidant effects of Rhizophora mangle L. Aginst NSAID-induced gastric ulcers. J. Ethanopharmacol., 2006, 77: 1-3
13. Sanchez, S., M.J. Martiln: Effect of dipyrone on inflammatory infiltration and oxidative metabolism in gastric mucosa. Comparison with acetaminophen and diclofenac. Digestive diseases and sciences, 2002, 47: 1389-1398
14. Shetty BV, Arjuman A.: Effect of extract of Benincasa hispida on oxidative stress in rats with Indomethacin-induced gastric ulcers. Indian J. Physiol. Pharmacol., 2008;52(2): 178-182.
15. Abdulla MA, AL-Bayaty FH, Younis LT, Abu Hassan MI: Anti-ulcer activity of Centella asiatica leaf extract against ethanol-induced gastric mucosal injury in rats. J. Med. Plant. Res., 2010; 4(13) : 1253-1259.
16. Muralidharan P, Srikanth J: Antiulcer activity of Morinda Citrifolia Linn fruit extract. J. Sci. Res 2009;1(2): 345-352.
17. Gregory M, Vithalrao KP, Franklin G, Kalaichelavan V: Anti-ulcer (ulcer-preventive) activity of Ficus arnottiana Miq. (Moraceae) leaf methanolic extract. Am. J. Pharmacol. Toxicol 2009; 4(3): 89-93.
18. Anoop A, Jegadeesan M: Biochemical studies on the anti-ulcerogenic potential of Hemidesmus indicus R. Br. Var. indicus. J. Ethnopharmacol.,2003;84: 149-156
19. Dharmani P, Mishra PK, Maurya R, Chauhan VS, Palit G: Allophylus serratus A plant with potential anti-ulcerogenic activity. J. Ethnopharmacol., 2005; 99 : 361-366.
20. Borrelli F, Izzo AA: The plant kingdom as a source of anti-ulcer remedies. Phytother. Res., 2000; 14: 581-591.
21. Dharmani P, Palit G: Exploring Indian medicinal plants for antiulcer activity. Indian J. Pharmacol., 2006; 35: 95-99.
22. Bighetti AE, Antonio MA: Antiulcerogenic activity of a crude hydroalcoholic extract and coumarin isolated from Mikania laevigata Schultz Bip. Phytomed.; 2005, 12: 72-77. Bighetti AE, Antonio MA Kohn LK, Rehder VLG, Foglio MA, Possenti A et al
23. Ubaka MC, Ukwe VC, Okoye CT, Adibe OM: Investigation into the anti-ulcer activity of the aqueous leaf extract of Aspilia africana C.D. Adams. Asian J. Med. Sci., 2010; 2(2): 40-43.
24. Jain NK, Kulkarni SK, Singh A.: Modulation of NSAID-induced antinociceptive and anti-inflammatory effects by α2-adrenoceptor agonists with gastro protective effects. Life Sci., 2002;70: 2857-2869.
25. Yoshikawa, T., Y. Naito, A. Kishi, T. Kaneko, S. Linuma, H. Ichikawa, M. Yasuda, S. Takahashi and M. Kondo: Role of active oxygen, lipid peroxidation and antioxidants in the pathogenesis of gastric mucosal injury induced by indomethacin in rats. Gut, 1993; 34: 732-737.