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Research Article

EVALUATION OF GASTRIC ANTISECRETORY ANTIULCER ACTIVITY OF *JAMBIRA* (*CITRUS LIMON* LINN.): AN EXPERIMENTAL STUDY

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ABSTRACT

Acid peptic disorders, especially hyperacidity is not uncommon in the current era because of altered life style of human being. In India prevalence of H. Pyloric infection in young age is 83.8%. Peptic ulcer occurs at young age with highest incidence between 20-40 years, men are affected more than women. If these Acid peptic disorders are not treated in time, it may lead to peptic ulcer, haematemasis, malena and perforation of duodenal ulcer which are common now a day with 50% mortality.

Generally it is accepted that gastric ulcers result from an imbalance between aggressive factors and the maintenance of the mucosal integrity through endogenous defense mechanisms. Use of synthetic antiulcer drugs may damage to the cell membrane of mucosal, parietal and endothelial cells. To avoid such hazards, it is essential to find out some antiulcer agents from *Ayurvedic* treasure of therapeutics.

Ancient sages have explained many herbal preparations which are beneficial in pain in abdomen (*Shoola*) and/or hyperacidity (*Amlapitta*) etc. *Jambira* (*Citrus limon* Linn.), mentioned as *Shoola-hara* (pain relieving) drug in *Ayurvedic* classics, is abundantly available and cost effective drug and may satisfy the need of present day situation by acting as potent herbal antacid drug. With this perspective, the study was taken for the critical assessment of gastric anti-secretory and anti-ulcer activity of *Jambira* (*Citrus limon* Linn.) as an experimental study but the results of experimental study did not support that *Jambira* (*Citrus limon* Linn.) fruit juice is a potent antisecretory and antiulcer natural source compared to control in pylorus ligation rat model.

KEYWORDS: *Jambira*, Anti-ulcer activity, Anti-secretory activity, *Citrus limon* Linn.

INTRODUCTION

Citrus lemon Linn., a small evergreen tree belonging to the family Rutaceae, grows as a small evergreen tree and is native of south Asia primarily North Eastern India and cultivated throughout India, common in Kumaon and Northern India[1] and other tropical regions of the world. It is used as digestive, carminative, anthelminthic, anti-allergic, blood purifier, anti-inflammatory, antipyretic, antibacterial, antifungal, anticancer, hypoglycaemic, and antioxidant.[2] The juice contains Citric Acid 3.7%, and a pale yellow volatile oil derived from the fresh outer part of the pericarp or finely grated rind of the fruit.[3] In addition to vitamin-C, *C. lemon* contains special compounds called Flavonoids (Limonoids such as Limonin Glucoside) which have anti oxidant, anti carcinogenic, anti-biotic and detoxifying properties which help healing of peptic and oral ulcers.[4]

Generally it is accepted that gastric ulcers result from an imbalance between aggressive factors and the maintenance of the mucosal integrity through endogenous defense mechanisms.[5] The excess gastric acid formation by prostaglandin includes both, increase in mucosal resistance as well as a decrease in aggressive factors, mainly acid and pepsin.[6] Inhibitions of prostaglandin synthesis by aspirin coincide with the earlier stages of damage to the cell membrane of mucosal, parietal and endothelial cells.[7]

The study assumes significance in the context that prolonged use of synthetic anti-ulcer drugs leads to adverse drug reactions and a search for new anti-ulcer agents that retain therapeutic efficacy and are devoid of adverse drug reaction is warranted. A study of the efficacy of juice of *C. lemon* in gastric ulcer with pylorus ligation induced ulcers was undertaken in a rat model.

MATERIAL AND METHODS

Fruits of *Jambira* (*C. lemon* Linn.) were purchased from market of Gadag, Karnataka and their identification was confirmed by botanist. The fruits were squeezed and juice was collected in a glass vessel.

Male albino rats weighing between 150 to 200 gm were selected for pyloric ligation ulcer model.[8] Rats were divided into three groups, each group consisting of six animals. Animals were fasted for 24 hours. Group I (G1, Control) received gum acacia solution (0.5 ml/kg, 0.9% w/v), Group II (G2, Standard) was treated with 20 mg/kg of ranitidine kg by oral route used (as the reference drug), while Group III (G3, Test) was treated orally with the *Swarasa* (juice) (1.8 ml/kg) 30 min prior to pyloric ligation. Animals were sacrificed 14 hour later and the stomach was opened to collect the gastric contents. The total volume of gastric content was measured.

After juice collection, the stomach was opened along the greater curvature, washed under running tap water & the inner surface was carefully observed with a magnifying lens. Number of ulcers in glandular areas as well as in rumen (if any) and severity of ulceration was noted. Ulcer index was calculated by Kulkarni[9] method.

The total and free acid (Varley's method, 1962), total carbohydrate (Nair's method, 1976), total protein (Lowry's method, 1951), and peptic activity (Sanyal and Mitra, 1976) in the gastric juice were estimated.

RESULTS AND DISCUSSION

Plants have a great potential for producing new drugs for human benefit. The increased interest in plant derived drugs is mainly because of the wide spread belief that 'herbal medicine' is safer than synthetic drugs having no side effects.

Preliminary phytochemical screening was helpful in prediction of nature of drugs and also useful for the detection of different polarity solvent. As shown in Table 1, preliminary phytochemical analysis revealed the presence of carbohydrate, steroid, alkaloids and tannin. The result of the phytochemical analysis revealed the presence of medicinally active constituents, upon which, the action of any drug depends.

Table No.1: Result of Preliminary Phytochemical Screening of *Jambira* (*Citrus limon* Linn.) Fruit: Organic Compounds[10]

Test	Results
Carbohydrates	Positive
Reducing sugars	Negative
Monosaccharides	Negative
Pentose sugars	Negative
Hexose sugars	Negative
Proteins	Negative
Steroids	Positive
Alkaloids	Positive
Tannins	Positive

The effect of juice of *Jambir* (*Citrus limon* Linn.) on volume of gastric juice in pylorus ligated rat ulcer models is presented in Tables 2. It indicate that the *Jambir* (*Citrus limon* Linn.) fruit juice increased the volume of gastric juice collected from pyloric ligated rat, however the results were not significant compared to control and standard group.

Table 2: Effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on Volume of Gastric Juice

Group	Dose of treatment	Volume of the Gastric content in ml.	
		Absolute	Relative/Ml/100g body weight
Control group (gum acacia solution)	0.5 ml/kg, 0.9% w/v	13.29 ± 2.48	7.34 ±0.99
Standard group (Ranitidine)	20 mg/kg	14.48 ±1.48	7.38 ± 0.78
Test group (*Jambira* fruit juice)	1.8 ml/kg	19.60 ± 2.70	9.56 ± 1.68

Table 3 presents the effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on Free acidity and Total acidity in Pylorous ligated rats. The trial drug showed moderate increase in both Free and Total acidity was observed. However, the observed changes were found to be statistically non-significant.

Table 3: Effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on Free acidity and Total acidity

Group	Dose of treatment	Free acidity (Meq/litre)	Total acidity (Meq / litre)
Control group	0.5 ml/kg, 0.9% w/v	45.78± 06.89	110.68 ± 20.43
Standard group	20 mg/kg	48.32 ± 05.74	99.54 ± 45.23
Test group	1.8 ml/kg	59.23 ± 09.34	124.41 ± 63.23

Table 4 is showing effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on Ulcer index in Pylorous ligated rats after 14hrs. The presented data shows an apparent increase in Ulcer index in both Test and standard group in comparison to Control group, but the observed increase was found to be statistically non-significant.

Table 4: Effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on Ulcer index (14hrs.)

Group	Ulcer Index (Mean + SEM)
Control group	09.01 ± 2.31
Standard group	10.13 ± 2.11
Test group	09.5 ± 3.30

In Table 5, effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on total carbohydrate (TC) content and total protein (TP) content and TC:TP ratio in Pyloric ligated rats (14 hrs.) presented. It can be seen that trial drug showed marked decrease in TC content and TP content which is found to be statistically significant.

Table 5: Effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on total Carbohydrate content and Protein content and TC:TP ratio

Group	Total Carbohydrate (mg/dl)	Total Protein (mg/dl)	TC: TP Ratio
Control group	323.23 ±58.11	334.67 ± 63.15	1.33 ± 0.23
Standard group	355.67 ± 36.42	455.76 ± 7.98	0.84 ± 0.09
Test group	0122.45 ± 45.33**	105.12 ± 11.56**	1.24 ± 0.57

** P<0.01

Table 6 shows marginal and statistically non-significant increase in Peptic activity in standard treated group. In test group moderate decrease was found but this effect was also statistically non-significant.

Table 6: Effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice on Peptic activity

Group	Peptic activity (µ mole tyrosine released / ml)	Percentage change
Control group	24.58 ± 4.43	-
Standard group	27.15 ± 5.12	5.07
Test group	18.35 ± 5.93	34.68

Table no. 7 shows the effect of trial drug on lipid peroxidase in gastric tissue homogenate. Marginal but statistically non-significant increase was observed in both the groups.

Table 7: Effect of *Jambira* (*Citrus limon* Linn.) Fruit Juice in gastric tissue homogenate

Group	Lipid Peroxidase OD Unit / min / g. tissue
Control group	0.03 ± 00
Standard group	0.06 ± 0.01
Test group	0.06 ± 0.02

The results of preliminary phytochemical studies revealed the presence of medicinally active constituents i.e. carbohydrates, steroids, alkaloids, flavonoids and tannins in *Jambira* (*Citrus limon* Linn.). Various flavonoids have been reported for its anti-ulcerogenic activity with good level of gastric protection.[11,12] Since flavonoids are found in Rutaceae family, there may be possibility of antiulcer action shown by *Jambira* (*Citrus limon* Linn.) due to flavonoid content.

As per classical *Ayurvedic* texts, the action of any drug is may be explained on the basis of *Rasa* (taste), *Guna* (properties), *Virya* (potency), *Vipaka* (post digestive taste) and *Prabhava* (specific effect). While some of the actions are attributed to *Rasa* (taste), some to *Guna* (properties), some to *Virya* (potency), some to *Vipaka* (post digestive taste) and some to *Prabhava* (specific effect).[13]

Jambira is said to be *Guru* (heavy) in *Guna* (property), *Amla* (sour) in *Rasa* (taste), *Ushna* (hot) in *Virya* (potency) and *Amla* (sour) in *Vipaka* (post digestive taste).[14] By its hot potency, *Jambira* acts as *Kapha* and *Vata* pacifier.[15] By sour taste and pungent post digestive taste, it pacifies *Vata*. Thus all these properties combined help in the inhibition of *Shoola* (pain in abdomen).

At the dose studied, the expected decrease in gastric secretion or in ulcer index or in free and total

acidity of gastric secretion was not observed. Instead a moderate increase in acidity and ulcer index was observed. The control animals had ulcers and haemorrhagic streaks, whereas in animals administered with the juice of *Jambir* (*Citrus limon* Linn.) fruit, there was an apparent increase in Ulcer index in both test and standard group in comparison to Control group, but the observed increase was found to be statistically non-significant.

CONCLUSION

The results of experimental study did not show significant antisecretory and antiulcer action compared to control in pylorus ligation rat model. Thus the present study does not support the drug *Jambira* (*Citrus limon* Linn.) fruit juice is a potent antisecretory and antiulcer natural source. Further studies in in-vivo models and to isolate active constituents from fruit are required to carried out and establish the effectiveness and pharmacological rationale for use of *Jambira* fruit juice as anti-secretory and antiulcer drug.

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