

## EVALUATION OF ANTI-EMETIC ACTIVITY OF *CYMBOPOGON CITRATUS* (DC.) STAPF

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### ABSTRACT

Anti-emetic activity of ethanolic extract of *Cymbopogon citratus* leaves was investigated by anti-emetic assay at 300 and 500mg/kg doses in young male chicks. Acute oral toxicity test was also performed to confirm the safety of the test drug. The results showed that crude extract is safe up to the dose of 7.5g/kg body weight of animals. *C. citratus* extract at 500mg/kg dose possesses significant activity just equal to the standard drug while at 300mg/kg dose the drug showed only mild activity. The results were compared with that of standard and control groups. Domperidone in recommended dose i.e. 0.15mg/kg body weight was used as standard anti-emetic drug, while control group was treated with distilled water. Phytochemical analysis was also carried out which showed the presence of certain phytoconstituents in test drug that are responsible for anti-emetic activity.

**Key words:** *C. citratus* leaves, acute oral toxicity, anti-emetic activity, chicks and mice

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### INTRODUCTION

Nausea and vomiting are defense mechanisms of human body to remove the ingested toxic or harmful substance from the body (Mitchelson, 1992). Sometimes emetic stimuli emerge as a result of motion, surgery, pregnancy, various drugs and radiation. Disgusting smells and sights can also cause nausea and vomiting. What ever the cause of nausea and vomiting, these are stressful to the patient.

Emesis is a common problem especially in females during pregnancy (motion sickness). Allopathic drugs are costly and a number of adverse effects are reported for them. It was, therefore, considered worth while to look for some cheap herbal medicine, capable of preventing or inhibiting emesis and may be easily procurable in both rural and urban areas of Pakistan. Keeping this objective in view, *Cymbopogon citraus* leaves were selected to evaluate their anti-emetic action. The herb is indigenous, cost effective and safe for use. After literature search it was found that a number of pharmacological activities are reported on *C. citratus* oil and no work is carried out on its ethanol extract.

*Cymbopogon citralus* (DC.) Stapf or lemon grass (family Poaceae) is a perennial fast-growing grass with aromatic odor, growing to approximately 1meter high having long and thin leaves. It produces a network of root and rootlets. It is found abundantly in Pakistan and is commonly used in tea, soup, and curry preparation.

Lemon grass oil is used as a pesticide and preservative. The main chemical components of lemongrass are myrcene, citronellal, geranylacetate, nerol, geraniol and traces of limonene and citral. The therapeutic properties of lemongrass oil are analgesic, anti-depressant, antimicrobial, antipyretic, antiseptic, astringent, bactericidal, carminative, deodorant, diuretic febrifuge, fungicidal, galactagogue, insecticidal, sedative and tonic (Dudai *et al.*, 2005; Nadkarni, 1976; Chopra *et al.*, 1958).

### MATERIALS AND METHODS

#### Plant material:

*C. citratus* leaves were purchased from local market. The plant material was identified Dr. Beena Naqvi, Plant taxonomist, Food and Marine Research Center, PCSIR Labs Complex, Karachi. Plant specimen was submitted in Herbarium bearing voucher no. LGK- 089-2010. The extract was prepared by classical method.

#### Chemicals and drugs:

The chemicals used for this study include copper sulfate, ethanol, Sodium chloride (Merck, Germany), Domperidone by the trade name of Motilium (Johnson & Johnson, Pakistan).

**Phytochemical screening:**

The ethanol extract of *C. citratus* leaves was subjected for preliminary phyto-chemical analysis as reported by Venkatesan *et al.* (2009).

**Animal selection:**

Before proceeding for toxicity and anti-emetic studies animals i.e. Swiss albino mice (20-30g) and young male chicks (50-75g) reared at animal house of PCSIR Labs Complex Karachi, were selected and housed separately and kept under strict observation with free access to food and water. Any animal showing sluggish movement or any sign of illness was rejected. Principles of laboratory animal care guidelines were followed and prior permission was sought from the Ethical Committee PCSIR for conducting the study.

**Acute oral toxicity:**

The acute oral toxicity of extract of *C. citratus* leaves was determined in mice (20-30g). Extract was dissolved in physiological saline and administered in a single dose by means of a gavage in graded doses (5 and 7.5 g/kg body weight) to different animal groups while control group received normal saline only in the same quantity to each group of animals (n=10). Observations with reference to physico-behavioral changes and mortality rate within 24 hours noted. Animals were further observed for a period of 72 hours and thereafter up to 14 days for behavioral, neurological, and autonomic profiles, and for any lethality, moribund state, or death (Loomis, 1978).

**Anti-emetic Assay:**

Young male chicks of 20-25g were used to assess antiemetic activity by the reported method (Shin *et al.*, 2002). Animals were divided into 05 groups (n=6). Group-I and Group-II were given lyophilized *Cymbopogon citratus* at 300 and 500mg/kg dose Group III was given Motilium as standard drug while Group IV was given normal saline as control. The chicks were kept in large beakers at room temperature and were rested for ten minutes to stabilize. The test and standard drugs were administered intraperitoneally. After 10 minutes, emesis producing agent i.e. Copper sulfate anhydride was administered orally at a dose of 50mg/kg body weight. Then the number of writhing (an emetic action without concomitant vomiting) was recorded during the next ten minutes. The inhibition % was calculated as follows:

$$\text{Inhibition \%} = [(A-B)/A] \times 100$$

Where A is the frequency of retching in control group, and B is the frequency of writhing in treated group.

**Statistical analysis:**

The data was analyzed by Student *t* test. A value of  $P < 0.01$  was considered significant in all the cases.

**RESULTS**

The phytochemical screening reveals that the alcoholic extract of *Cymbopogon citratus* leaves contains alkaloids, tannins, saponins, flavonoids, sterols, protein and carbohydrates (Table 1). The extract did not show any untoward effect up to the dose of 7.5g/kg body weight, no mortality was observed during the claimed 72 hours observation period (Table 2). The results of anti-emetic assay revealed that *C. citratus* possesses non-significant anti-emetic activity at dose of 300mg/kg and significant anti-emetic activity at 500mg/kg dose (Table 3).

Table 1. Chemical constituents of *Cymbopogon citratus*.

S. No	Chemical Constituents	<i>C. citratus</i>
1	Triterpenes	–
2	Tannins	+
3	Saponins	+
4	Alkaloids	+
5	Carbohydrates	+
6	Proteins	–
7	Sterols	+
8	Flavonoids	+

Table 2. Acute Oral Toxicity Test of *C. citratus*.

S. No	Groups	No. of animals	Dose mg/kg	No. of animals survived	No. of animals dead	% Mortality	% Survival
1	Control group	10	N/saline	10	Nil	0%	100%
2	Group II ( <i>C. citratus</i> )	10	5.0g/kg	10	Nil	0%	100%
3	Group III ( <i>C. citratus</i> )	10	7.5g/kg	10	Nil	0%	100%

Table 3. Showing Anti-emetic activity of extracts *C. citratus*.

S.No.	Group	Avg. weight	Dose	No. of Wretching Reflex	% Inhibition
1	<i>C. citratus</i>	60.66 ± 2.422	500mg/kg	63.00 ± 4.122	26.4 %
2	<i>C. citratus</i>	70.13 ± 4.471	300mg/kg	44.00 ± 5.688	48.63 %
3	Motilium	113.83 ± 9.621	0.15mg/kg	32.16 ± 2.267	62.45 %
4	Distilled Water	82.50 ± 9.0719	1 ml	85.66 ± 2.961	0 %

## DISCUSSION

Many research studies confirm the historical use of plants in treatment of different diseases. Plant had vast pharmacological activities because of the presence of certain phytochemical constituents. On phytochemical analysis it was observed that *C. citraus* possesses most important vital chemical constituents which are accountable for various pharmacological actions. The literature search also confirms the presence of these chemical constituents (Vaqar-ul-Hassan *et al.*, 2007). According to acute oral toxicity test results the test drug *C. citratus* was found safe up to the dose of 7.5g/kg body weight. Autopsy was carried out after observation period showed no effect of drug on of the vital organs it can also be confirmed by studies reported the use of *C. citraus* in daily life in various form. A wide variety of receptor types and neurotransmitters are found in areas of the brain thought to play a role in emesis and its control. In the gastrointestinal tract there are peripheral receptors which are also involved in emesis. The neurotransmitters involved in emesis are histamine, acetylcholine, dopamine, nor adrenaline and 5-Hydroxytryptamine. The antagonists of receptors for these transmitters have anti-emetic effect (Leslie and Gwynn, 1984; Koch, 1995; Quingley *et al.*, 2001).

Anti-emetic activity of *P. domestica* is reported earlier (Qureshi *et al.*, 1988). Many chemical constituents of *P. domestica* and *C. citratus* are same including flavonoids and sterols. It has been reported that flavonoids and sterols act as anti-emetic principles (Shin *et al.*, 2002). Most probably these compounds serve as antagonist of any of the above mentioned receptors, as a result of which this plant shows anti-emetic activity. But further research study is needed to isolate specific flavonoid or sterols having anti-emetic property.

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