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ANTIPYRETIC ACTIVITY OF METHANOL EXTRACT OF *CHAETOMORPHA LITOREA* HARVEY IN YEAST INDUCED PYREXIA

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ABSTRACT

The present study was aimed to study the antipyretic activity of the methanol extract of *Chaetomorpha litorea* Harvey collected from Koothankuzhi coast, Tamil Nadu, India on albino mice. Paracetamol (10mg/kg) was used as standard drug. The antipyretic activity of *Chaetomorpha litorea* Harvey was estimated by Brewer's yeast induced pyrexia on albino mice. The various methanol extract doses used were 200mg/kg and 400mg/kg body weight of mice. 400mg/kg methanol extract of *Chaetomorpha litorea* Harvey was found to be more significant decrease in body temperature while 200mg/kg methanol extract showed less effect. 400mg/kg methanol extract exhibited closely significant ($p<0.05$) decrease in elevated body temperature as compared to standard drug. From this study, it was known that the methanol crude extract of *Chaetomorpha litorea* Harvey can be used as antipyretic agent.

Key words: Green seaweed, *Chaetomorpha litorea*, Methanol extract, Antipyretic.

INTRODUCTION

Seaweeds are assuming greater importance in the primary health care of individuals and communities in many developing countries. Indian seaweeds and their derivatives have been an invaluable source of therapeutic agents to treat various disorders. Herbal products are often perceived as safe because they are natural. In the recent years, herbal medicine is a major component in all traditional medicine systems and a common element in Siddha, Ayurvedic, Homeopathic, Naturopathic, Traditional Chinese medicine and Native American medicine. Considerable efforts have been directed towards the development of natural products from various plant sources [1]. A number of drugs were derived from seaweeds which are active against a number of diseases. The majority of them involve the isolation of the active compounds present in the particular seaweed and its subsequent modification. In the developed countries, 25% of the medical drugs are based on plants and their derivatives and the use of plants is well known among the indigenous people in rural areas of many developing countries [2].

Pyrexia is defined as an elevation of body temperature which is a response due to tissue damage, inflammation, malignancy or graft rejection. Cytokines, interleukin, interferon and Tumor Necrosis Factor α are formed in large amount under this condition which in turn triggers hypothalamus to elevate body temperature [3]. Fever is associated with symptoms of sickness behavior which consist of lethargy, depression, anorexia, sleepiness and inability to concentrate. This increase in set point triggers increased muscle tone and shivering. However antipyretic medication can be effective at lowering the temperature which may include the affected persons comfort [4]. According to Ayurveda, pyrexia originates from a combination of indigestion, seasonal variations and significant alterations in daily routine [5]. Due to poor hygiene practices and malnutrition, children in developing countries frequently suffer from various forms of infections which present as fevers. These fevers are often accompanied by aches and pains which all lead to morbidity and mortality [6]. Antipyretics are the drugs which can be useful in reduction of body temperature.

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Regulation of body temperature requires a delicate balance between production and loss of heat and the hypothalamus which regulate the set point of body temperature [7]. As *Chaetomorpha litorea* Harvey is the green seaweed used in diuretic activity [8], it was the cost effective alternative approach to study the methanol extract of this plant for the development of an effective antipyretic agent also. Hence, the present study has been carried out to evaluate the antipyretic activity of the methanol extract by yeast induced pyrexia method.

MATERIALS AND METHODS

Collection of Sample

Chaetomorpha litorea Harvey (Figure 1) is green seaweed belonging to Chlorophyceae member shows much attention in the present study for antipyretic activity. *Chaetomorpha litorea* Harvey were collected from Koothankuzhi coast in the south east coast of Tamil Nadu, India during the month of January 2014. The collected plant samples were rinsed with marine water to remove debris and epiphytes. The entire epiphytes were removed using soft brush. The plants were brought to the laboratory. In the laboratory, the plants were again washed in freshwater and stored in refrigerator for further analysis [9].

Preparation of methanol extract

For the preparation of methanol extract, the collected plant specimens were washed thoroughly and placed on blotting paper and spread out at room temperature in the shade condition for drying. The shade dried samples were grounded to fine powder using a tissue blender. The powdered samples were then stored in the refrigerator for further use. 3g powdered sample was packed in Soxhlet apparatus and extracted with methanol for 8h separately. The excess amount of methanol was evaporated and fine methanol crude powder was prepared and stored in the refrigerator for the antipyretic activity [10].

Experimental animals

Swiss albino rats were weighing (150-240 gm) and male albino rats (15-18 gm) were procured from Venkateswara Enterprises, Bangalore, Karnataka, India. The animals were housed in the departmental animal house under standard conditions (26±2°C and relative humidity 30-35%) in 12 hours light and 12 hours dark cycle respectively for 1 week before and during the experiments. Animals were provided with standard rodent pellet diet and had free excess to water. The composition of diet is 10% protein, 4% *Arachis* oil, 1% fibers, 1% calcium, 1000 IU/gm vitamin A and 500 IU/gm vitamin D. All the animals were acclimatized to the laboratory conditions prior to experimentation. All the experiments were conduct between 10.00 and 17.00h and were in accordance with the ethical guidelines of the International Association for Study of Pain [11]. All experiments were carried out according to the guidelines for care and use of experimental animals and approved by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

EXPERIMENTAL PROTOCOLS

The experimental treatment was carried out as;

Group I: Control group animals Normal saline 5ml/kg
Group II : Paracetamol (10mg/kg) p.o.
Group III : 200mg/kg methanol extract p.o.
Group IV : 400mg/kg methanol extract p.o.

Acute toxicity test

Acute oral toxicity study was performed as per OECD-423 guidelines [12]. Albino mice (n=6) of either sex selected through random sampling technique was used for acute toxicity study. The animals were kept fasting for overnight providing only water, after which the extract (50% methanolic extract) was administered orally at the dose level of 5 mg/Kg body weight by gastric intubation and observed for 14 days. If mortality is observed in 2 out of 3 animals, then the dose administered would be assigned as toxic dose. If mortality is observed in 1 animal, then the same dose would be repeated again to confirm the toxic dose. If mortality is not observed, the procedure would be repeated for further higher doses such as 50, 300 and 2000 mg/Kg body weight. According to the results of acute toxicity test, the doses were chosen for experiments.

ANTIPYRETIC ACTIVITY

Yeast induced pyrexia method

A suspension of Brewer's yeast (15%) in saline (0.9%) was prepared. Four groups each containing 6 rats of either sex were taken. The thermocouple was inserted 2cm deep into the rectum and the rectal temperatures were recorded. The animals were fevered by injection of brewer's yeast suspension (10mg/kg) subcutaneously in the back below the nape of the neck. The sight of injection was massaged in order to spread the suspension beneath the skin. The room temperature was kept at 22-24°C. Immediately after yeast administration, food was withdrawn and the rise in rectal temperature was recorded. The measurement was repeated after 30 minutes. The dose of the test compound and standard drug was given orally. The rectal temperature was recorded again after 1, 2 and 4 hours. Paracetamol (10mg/kg) was selected as a standard drug. The various methanol extracts were dissolved in saline with the help of 2% w/v Gum acacia. The data were analyzed for significance using the unpaired two-tailed student's t-test [13, 14].

RESULTS AND DISCUSSION

Antipyretic activity of methanol crude extract of *Chaetomorpha litorea* Harvey was measured by determining its effect on yeast-induced pyrexia in albino rats. Acute toxicity studies showed that the methanolic extracts did not cause any mortality up to 2000 mg/Kg and

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were considered as safe. The methanol extract of *Chaetomorpha litorea* Harvey was found to be the highest noticeable antipyretic activities which was also dose dependent on albino mice. The result expressed that the different doses of methanol extract caused lowering the body temperature of mice up to 4h following its administration. The effect of methanol extract on yeast-induced pyrexia showed that the rectal temperature was remarkably elevated to 41.37°C, after 18h the subcutaneous injection of yeast suspension decreased to 38.37°C within 1h of 200mg/kg methanol extract of *Chaetomorpha litorea* Harvey treatment and reduced till 4h showing a considerable decrease and was comparable to paracetamol.

Likewise, 400mg/kg methanol extract also showed the decreased temperature from 41.20°C to 38.20°C. When the time was increased up to 4h, the results were observed significant reduced temperature. Both 200 and 400mg/kg remarkable anti-pyretic activity detected which were significantly different than the controls ($p<0.05$). Generally, for all concentration of methanol extract of *Chaetomorpha litorea* Harvey showed marked anti-pyretic activities, hence, 400mg/kg methanol extract was more effective than 200mg/kg. This result revealed that methanol extract of *Chaetomorpha litorea* Harvey has noticeable antipyretic activity as compare with standard paracetamol**.**

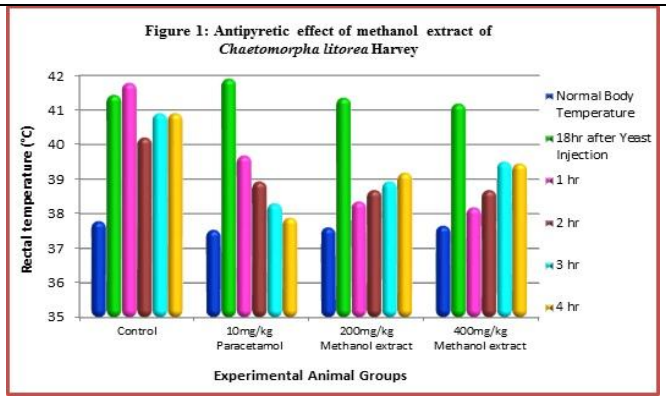
Herbal products obtained from the plant extracts have been increasingly utilized to treat a variety of clinical diseases with little knowledge about the mode of action available [15]. For the field of modern medical science, the herbal medicines are subjected for several processes such as identifications, isolation, purification, characterization, structural elucidation and therapeutic evaluation. Fever is a complex physiologic response triggered by infections or aseptic stimuli. Elevation in body temperature occurs when the concentration of prostaglandin E_2 (PGE_2) increases within parts of the brain. Such an elevation contributes to a considerable alteration in the firing rate of neurons that control the thermoregulation process in the hypothalamus. It is now evident that most of the antipyretic drugs exert their action by inhibiting the enzymatic activity of cyclooxygenase and consequently reducing the levels of PGE_2 within the hypothalamic region. A natural antipyretic agent with reduced or no toxicity is therefore, essential [16]. Since antipyretic activity is commonly mentioned as a characteristic of drugs or compounds which have an inhibitory activity on prostaglandins biosynthesis, the yeast induced hyperpyrexia in rat model was employed to investigate the antipyretic activity of the extract. Yeast induced pyrexia is called pathogenic fever which is due to the production of prostaglandins (PGE_2) which set the thermoregulatory center at a higher temperature [17]. The methanol extract showed more marked effect in lowering the hyperthermia and found to have similar effect as the standard drug paracetamol at 1h of administration. The extracts are likely to reduce pyrexia by reducing brain concentration of prostaglandin E_2 especially in the hypothalamus through its action on COX-3 or by enhancement of the production of the body's own antipyretic substances like vasopressin and arginine [18]. The data presented here suggested that the methanol extract of *Chaetomorpha litorea* Harvey possessed antipyretic activities.

Table 1: Antipyretic effect of methanol extract of *Chaetomorpha litorea* Harvey

Groups	Rectal temperature (°C)		Time after administration			
	Normal Body Temperature	18hr after Yeast injection	Initial 0hr	1hr	2hr	4hr
Control	37.80±0.54	39.45±0.40	39.80±0.44	40.22±0.30	40.92±0.21	40.92±0.24
Paracetamol	37.55±0.16	39.92±0.39	39.70±0.24	38.95±0.37	38.32±0.34	37.90±0.07
200mg/kg extract	37.62±0.14	41.37±0.21	38.37±0.21	38.70±0.15	38.95±0.21	39.20±0.12
400mg/kg extract	37.67±0.10	41.20±0.07	38.20±0.07	38.70±0.15	39.52±0.26	39.47±0.14

Significantly different from the control at $P<0.05$, Standard drug – Paracetamol

Figure 1: Natural Habit of *Chaetomorpha litorea* Harvey



CONCLUSION

The results obtained in the study indicated the methanol extract of *Chaetomorpha litorea* Harvey possesses potent antipyretic properties. In conclusion, the present study provides evidences for the antipyretic activity of *Chaetomorpha litorea* Harvey which can partly contribute to its pharmaceutical use. However, further investigation is required to isolate the active constituents responsible for these activities and to elucidate the exact mechanisms of action.

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