International Journal of
Medicinal Chemistry & Analysis
www.ijmca.com
e ISSN 2249 - 7587
Print ISSN 2249 - 7595

EVALUATION OF ANTIPYRETIC ACTIVITY OF METHANOL EXTRACT OF *HYPNEA MUSCIFORMIS* (WULF.) LAMOUROUX (RED SEAWEED) IN MANAPAD COAST, TAMIL NADU, INDIA

***John Peter Paul J[1]. and Shri Devi SDK[2].**

[1]Research Department of Botany, St. Xavier's College (Autonomous), Palayamkottai – 627 002, Tamil Nadu, India.
[2]Department of Botany, Sri Sarada College for Women (Autonomous),Salem – 636 016, Tamil Nadu, India

ABSTRACT
The present study was intended to screen the antipyretic activity of the methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux collected from Manapad coast, Tamil Nadu, India on albino mice. Paracetamol (10mg/kg) was used as standard drug. The antipyretic activity of *Hypnea musciformis* (Wulf.) Lamouroux was determined 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 *Hypnea musciformis* (Wulf.) Lamouroux showed 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 the study it was concluded that the methanol crude extract of *Hypnea musciformis* (Wulf.) Lamouroux can be used for antipyretic activity.

Keywords: Red seaweed, *Hypnea musciformis*, Methanol extract, Antipyretic.

INTRODUCTION

Medicinal plants are greater importance in the primary health care of many developing countries. Indian medicinal plants and their derivatives have been an invaluable source of therapeutic agents to treat various disorders. In 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]. Seaweeds have recently received much attention as the potential medicinal plant to possess various secondary metabolites. Most of the metabolites isolated from seaweeds have bioactive effects [2-3]. Seaweeds have a lot of phytoconstituents with functional properties including anticancer, hypocholesterolemic, anithelminthic [4]. Seaweeds are considered to produce agreat variety of secondary metabolites characterized by a broad spectrum of biological activities. Compounds with cytostatic, antiviral, antihelminthic and antifungal activities have been detected in red algae [5-6].

Pyrexia or Fever is defined as an elevation of body temperature. It is a response due to tissue damage, inflammation, malignancy or graft rejection. Cytokines, interleukin, interferon and Tumor Necrosis Factor α (TNF-α) are formed in large amount under this condition which increases PGE2 which in turn triggers hypothalamus to elevate body temperature [7]. Fever is associated with symptoms of sickness behavior which consist of lethargy, depression, anorexia, sleepiness ad 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 person's comfort [8]. Antipyretics are drugs which can reduce elevated body temperature. Regulation of body temperature requires a delicate balance between production and loss of heat and the hypothalamus which regulate the set point of body

Corresponding Author: - **John Peter Paul, J Email:-** johnarock2008@yahoo.com

temperature. Drugs like paracetamol do not influence body temperature whenelevated by factors such as exercise or increase in ambient temperature [9]. The previous reports showed that red seaweeds such as *Gracilaria corticata* [10], *Gracilaria dura* [11] decreased the body temperature. It will be a cost effective alternative approach to study the development of an effective antipyretic agent. A detailed literature reviews indicated that the antipyretic activity of *Hypnea musciformis* (Wulf.) Lamouroux has not been clinically evaluated so for. Hence the present study has been carried out to evaluate the antipyretic activity of the methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux.

MATERIALS AND METHODS

Collection of Sample

Hypnea musciformis (Wulf.) Lamouroux (Figure 1) is red seaweed belonging to Rhodophyceae member shows much attention in the present study for antipyretic activity. *Hypnea musciformis* (Wulf.) Lamouroux were collected from Manapad 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 once again washed in freshwater and stored in refrigerator for further analysis [12].

Preparation of methanol extract

For the preparation of methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux, 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 [13].

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 [14]. 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: Animals were treated with Paracetamol (10mg/kg) p.o.

Group III: Animals were administered with 200mg/kg methanol extract p.o.

Group IV: Animals were administered with 400mg/kg methanol extract p.o.

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 [15-16].

RESULTS

Screening of antipyretic activity of methanol crude extract of *Hypnea musciformis* (Wulf.) Lamouroux was studied by determining the effect on yeast-induced pyrexia in albino rats. The methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux showed the highest noticeable antipyretic activities which was also dose dependent on albino rats. The result expressed that methanol extract of different doses caused lowering of the body temperature up to 4h following its administration. The effect of methanol extract on yeast-induced pyrexia showed that the rectal temperature was markedly elevated to 41.2°C, after 18h the subcutaneous injection of yeast suspension decreased to 40.7°C within 1h of 200mg/kg methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux treatment followed by 40.1°C at 2h and further reduced to 39.7°C at 4h showing a considerable decrease in compared to paracetamol.

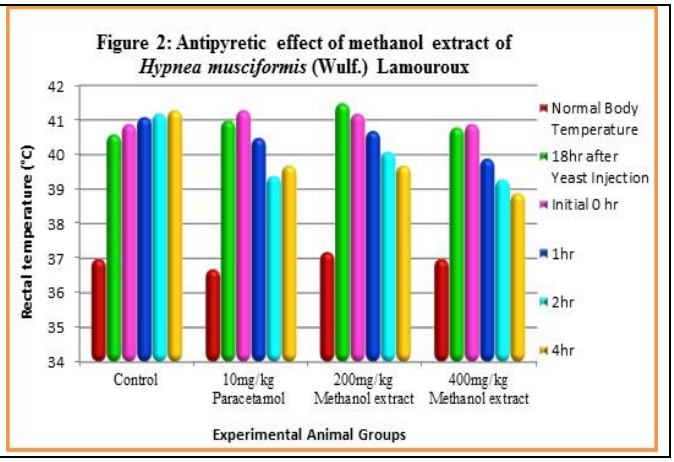
In contrast, 400mg/kg methanol extract also showed the decreased in temperature from 40.8°C to 39.9°C after 1h of treating with the administration of the methanol crude extract of *Hypnea musciformis* (Wulf.) Lamouroux. When the time was increased up to 4h, the results were observed significant reduced temperature to 38.9°C. Both 200 and 400mg/kg marked antipyretic activity detected were significantly different than the controls ($p<0.05$). Generally, for all concentration of methanol crude extract of *Hypnea musciformis* (Wulf.) Lamouroux showed marked antipyretic activities, hence, 400mg/kg methanol extract was highly effective than 200mg/kg. This result revealed that the methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux have detectable antipyretic activity as compared with standard paracetamol**.**

Table 1: Antipyretic effect of methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux

Groups	Rectal temperature (°C)		Time after administration			
	Normal Body Temperature	18hr after Yeast injection	Initial 0hr	1hr	2hr	4hr
Control	37.0±0.02	40.6±0.17	40.9±0.31	41.1±0.13	41.2±0.18	41.3±0.14
10mg/kg Paracetamol	36.7±0.06	41.0±0.21	41.3±0.15	40.5±0.24	39.7±0.09	39.4±0.11
200mg/kg Methanol extract	37.2±0.03	41.5±0.14	41.2±0.23	40.7±0.09	40.1±0.07	39.7±0.15
400mg/kg Methanol extract	37.0±0.04	40.8±0.09	40.9±0.16	39.9±0.13	39.3±0.08	38.9±0.19

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

Figure 1: Natural Habit of *Hypnea musciformis* (Wulf.) Lamouroux



DISCUSSION

Fever is a complex physiologic response triggered by infections or aseptic stimuli. Elevation in body temperature occurs when the concentration of prostaglandin E2 (PGE2) 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 PGE2 within the hypothalamic region [7]. A natural antipyretic agent with reduced or no toxicity is therefore, essential [17]. 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 [18]. Yeast induced pyrexia is called pathogenic fever which is due to the production of prostaglandins (PGE2) which set the thermoregulatory center at a higher temperature [19].

The methanol extract showed more pronounced effect in lowering the hyperthermia, but found to have similar effect as the standard drug Paracetamol at 4th hour of administration. The extracts are likely to reduce pyrexia by reducing brain concentration of prostaglandin E2 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 [20]. Antipyretics have been shown to suppress fever by inhibiting prostaglandin synthetase, resulting in the blockade of the synthesis of prostaglandin in the brain or

suppressing the rise of interleukin-1α production subsequent to interferon production Flavanoids like baicalin have been shown to exert antipyretic effect by suppressing TNF-α [21] and its related compounds also exhibit inhibition of arachidonic acid peroxidation, which results in reduction of prostaglandin levels thus reducing the fever and pain [22].

The results of present study indicate that the methanol crude extract of *Hypnea musciformis* (Wulf.) Lamouroux possesses significant antipyretic effect compared to the effect of standard drug paracetamol on yeast induced pyrexia in rats. This may be attributed to the presence of various secondary metabolites present in the methanol extract which may be involved in inhibition of prostaglandin synthesis. Also, there are several mediators or multiprocessors underlining the pathogenesis of fever. Inhibition of any of these mediators may bring about antipyresis.

CONCLUSION

The present study showed dose dependent antipyretic activity of crude methanol extract of *Hypnea musciformis* (Wulf.) Lamouroux collected from Manapad coast in the south east coast of Tamil Nadu. Though, the antipyretic activity exhibited by the extract was closely related to reference drugs, it was clear that the methanol crude extract possess components having pharmacological significance. Further studies are under progress to isolate pharmacologically active compounds from the methanol crude extract of *Hypnea musciformis* (Wulf.) Lamouroux to determine other bioactivities.

REFERENCES

1. Hazeena BV, Velavan S. Lipids regulating activity of *Asparagus racemosus* root in young and aged rats. *Indian Journal of Gerontology,* 25(3), 2011, 273-285.
2. Oh KB, Lee JH, Chung SC, Shin J, Shin HJ, Kim HK. Antimicrobial activities of the bromophenols from the red alga *Odonthalia corymbifera* and some synthetic derivatives. *Bioorganic and Med. Chem. Lett,* 18, 2008, 104-108.
3. Somepalli V, Gopala K, Panchagnula AL, Gottumukkala G, Subbaraju V. Synthesis, structural revision, and biological activities of 4-chloroaurone, a metabolite of marine brown alga *Spatoglossum variabile*. *Tetrahedron,* 63(29), 2007, 6909-6914.
4. Thirumaran G, Anantharaman P. Antibacterial activity and antifungal activities of marine macro alga (*Hydroclathrus clathratus*) from the Gulf of Mannar Biosphere Reserve. *Environ. and Ecol.* 24S(1), 2006, 55-58.
5. Lindequist U, Schweder T. Marine Biotechnology. In: Rehm, H. J., Reed, G. (Eds.), Biotechnology, 10, 2001, 441-484.
6. Newman DJ, Cragg GM, Snader KM. Natural products as source of new drugs over the period 1981-2002. *J. Nat. Prod.*, 66, 2003, 1022-1037.
7. Rajani GP, Deepak G, Sowjanya K, Sahithi B. Screening of antipyretic activity of aerial parts of *Nelumbo nucifera* gaertn in yeast induced pyrexia. *Pharmacologyonline,* 1, 2011, 1120-1124.
8. Duraisankar M, Ravichandran V. Antipyretic Potential of Polyherbal Ayurvedic Products. *Asian Journal Pharmaceutical and Clinical Research*, 5(2), 2012, 146-150.
9. Periyasamy G, Upal KM, Malaya G. Antipyretic potential of *Galega pupurea* root. *Intl. Research Journal of Pharmacy*, 2(11), 2011, 151-152.
10. John Peter Paul J. Screening of Antipyretic activity of methanol extract of *Gracilaria corticata* J.Ag. (Red Seaweed) in Hare Island, Thoothukudi, Tamil Nadu, India. *Asian Journal of Pharmaceutical and Clinical Research,* 7(3), 2014, 142-144.
11. John Peter Paul J, Shri Devi SDK. Antipyretic Activity of Methanol Extract of *Gracilaria Dura* (Ag.) J.Ag. (Red Seaweed) in Hare Island, Thoothukudi, Tamil Nadu, India. *Acta Biomedica Scientia,* 1(2), 2014, 80-83.
12. John Peter Paul J, Shri Devi SDK. Effect of Seaweed Liquid Fertilizer of *Gracilaria dura* (Ag.) J.Ag. (Red Seaweed) on *Pennisetum glaucum* (L.) R.Br., in Thoothukudi, Tamil Nadu, India. *Indo American Journal of Pharmaceutical Research*, 4(4), 2014, 2183-2187.
13. John Peter Paul J, Yuvaraj P. Phytochemical analysis of *Padina distromatica* Hauck. *Indo American Journal of Pharmaceutical Research,* 3(7), 2013, 5290-5297.
14. Zimmerman M. Ethical guidelines for investigations of experimental pain in conscious animals. *Pain*, 16, 1983, 109-110.
15. Hukkeri VI, Patil BS, Savadi RV, Nagathan CV. Analgesic, antipyretic and diuretic activities of *Basella rubra* Linn. *Indian Drugs*, 41(9), 2004, 536-539.
16. Jain PS, Mallipedi S, Belsare DP, Mandal SC, Pal SC. Analgesic activity of stem bark of *Kigelia pinnata* Linn. *Indian Drugs*, 44(1), 2007, 63-65.
17. Sankar A, Subhadra D, Arunprasath B, Subageetha A, Anusha CH. Boiled milk induced pyrexia in rabbits- antipyretic activity *Vernonia cinerea* roots. *International Journal of Plant Sciences and Research,* 2(1), 2010, 127-131.
18. Ighodaro I, Raymond IO, Steve OO, Osahon O. Antipyretic and analgesic effects of the aqueous extract of the Fruit pulp of *Hunteria umbellata* Schum (Apocynaceae). *Tropical Journal of Pharmaceutical Research,* 8(4), 2009, 331-336.

19. Aman A. Alzubier M, Patrick NO. Investigation of anti-inflammatory, antipyretic and analgesic effect of Yemeni Sid honey. *World Academy of Science, Engineering and Technology*, 80, 2011, 47-52.
20. Jude E Okokon and Paul Nwafor. Antiinflammatory, analgesic and antipyretic activities of ethanol root extract of *Croton zambesicus* .Pak. J. Pharm. Sci.2010, 23(4): 385-392.
21. Adesokan AA, Yakubu MT, Owoyele BV, Akanji MA, Soladoye AO, Lawal O. Effect of administration of aqueous and ethanol extracts of *Enantia chlorantha* stem bark on brewer's yeast induced pyresis in rats. *African J of Biochemistry*, 2(7), 2008, 165-169.
22. Germain S, Taiwe E, Bum N, Theophile D, Emmanuel T, Norbert W, Neteydji S, Amadou D, Fleur C, Okomolo M, Paul D, Michel W. Antipyretic and antinociceptive effects of *Nauclea latifolia* roots decoction and possible mechanisms of action. *Pharm Biol*, 49(1), 2011, 15-25.