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Antipyretic activity of aqueous extract of heart wood of *Pterocarpus santalinus* L. in yeast induced pyrexia

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Abstract

Pterocarpus santalinus have been traditionally used in the treatment of headache, skin diseases, fever, boils, scorpion-sting and to improve sight. However, anti-pyretic efficacy has not been scientifically validated. Therefore the study aims to investigate the antipyretic activity of its heart wood aqueous extract using brewer's yeast induced pyrexia method. A total of thirty Wister Albino male rats weighing between 100-200g were used for this study. The method was standardized by subcutaneous injection of yeast suspension (10m/kg body weight) which increased the rectal temperature after 20 hours. Rectal temperatures were recorded at regular intervals using a digital thermometer. The aqueous extract (400mg/kg & 800mg/kg) of heart wood of *P. santalinus* possessed significant antipyretic activity but the effect was slow when compared to the standard antipyretic drug paracetamol (150 mg/kg body weight).

Keywords: Antipyretic, *Pterocarpus santalinus* L., heart wood, Wister albino male rats

Introduction

Plants have been shown to contain phytochemicals (bioactive compounds) that act as defense systems to combat various diseases [1]. *Pterocarpus santalinus* L. (Leguminosae) has been used traditionally in treatment of headache, skin diseases, fever, boils, scorpion-sting and to improve sight [2]. Phytochemical investigations on the heartwood of *P. santalinus* have led to the identification of isoflavone, isoflavone glucosides, aurone glycosides, lignans, yellow or orange pigments, and terpenoids [3]. Previous pharmacological studies have revealed that *P. santalinus* extract possessed anti-hyperglycaemic [4, 5], Anti-helicobacter pylori [6], wound healing [7], anti-allergic [8] anti-ulceractivities [9, 10] as well as anti-inflammatory, cytotoxic, and TNF- α producing effects of its individual components [11]. Since the wood of *P. santalinus* is a traditional medicament used against fever, it would be effective to study the antipyretic activity of this plant as no study has been reported. So the present study has been carried out to evaluate the *in vivo* antipyretic activity of the aqueous heart wood extract by yeast induced pyrexia method.

Materials and Methods

Collection of Plant Material: The heartwood sample of *Pterocarpus santalinus* was collected from Changanassery, Kottayam (District), Kerala, India. The sample was identified and authenticated by Dr. V B Sreekumar, Forest Botany Department, Kerala Forest Research Institute, Peechi P.O, Thrissur, Kerala. A voucher specimen (Accession No: 16686) was submitted in the Herbarium of Kerala Forest Research Institute, Peechi P.O, Thrissur.

Preparation of Aqueous Extract of Plant Samples: The plant sample was washed thoroughly under tap water, dried under shade and ground to a fine powder in an electrical blender. The aqueous extract was prepared in distilled water using a soxhlet apparatus by continuous heat extraction. The extract was concentrated in a rotary evaporator and lyophilized

Animals

Thirty Wister albino male rats (100-200 g) purchased from the College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala were used for the study. They were housed in well protected polypropylene cages and maintained in standard laboratory conditions. The work was conducted at the Dept. of Veterinary Pharmacology & Toxicology, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala. The experiment was performed in accordance with the CPCSEA norms and were approved by the Institute of Animal Ethical Committee (IAEC), of College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala as per Order No IAEC/CVASMTY 2/18-19.

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Antipyretic activity studies

Wistar Albino rats of male sex weighing between 100-200g

were used in the study. The Experimental protocol was as follows:

S. No	Group	Treatment
1	Control	Served as control, receive normal saline.
2	Standard	Rats orally receive 150mg/kg paracetamol dissolved in distilled water
3	Test 1	Rats orally receive 200 mg/kg <i>Pterocarpus santalinus</i> L. extract
4	Test 2	Rats orally receive 400 mg/kg <i>Pterocarpus santalinus</i> L. extract
5	Test 3	Rats orally receive 800 mg/kg <i>Pterocarpus santalinus</i> L. extract

Method

A digital thermometer was inserted to a depth of 2 cm into the rectum of rats to record its initial rectal temperatures. One day prior to the study, 10 mL/kg of Brewer's yeast suspension (15% w/v in 0.9% saline) was injected subcutaneously below the nape of the neck. The site of injection was massaged in order to spread the suspension beneath the skin. Immediately after yeast injection, food was withdrawn. 21 hours post challenge, the rise in rectal temperature was recorded [12, 13]. The measurement was repeated at 1 hour interval for 5 hours. Positive control for the study was Paracetamol 150mg/kg body weight.

Statistical Methods: The variation of data is expressed in terms mean \pm SEM (n=6). The results were analysed by one way ANOVA followed by Tukey's HSD test using IBM SPSS, Statistics 20.

Result

Rats treated with *P. santalinus* aqueous extract possess significant antipyretic property. *P. santalinus* extract was able to reduce the body temperature but the effect was slower compared to the standard. The result showed that the antipyretic effect was in a dose dependent manner. The observed results are statistically significant at $p < 0.001$.

Table 1: Effect of aqueous extracts of *P. santalinus* on body temperature in yeast induced pyrexia

Groups	Rectal temperature of rats in $^{\circ}$ Fahrenheit						
	0 hr	20 hr	21 hr	22 hr	23 hr	24 hr	25 hr
Normal	97.82 \pm 0.26 ^{ab}	97.16 \pm 0.11 ^a	97.16 \pm 0.22 ^a	98.00 \pm 0.31 ^a	98.31 \pm 0.19 ^a	97.89 \pm 0.15 ^a	97.43 \pm 0.22 ^a
Control	98.21 \pm 0.30 ^{bc}	100.76 \pm 0.24 ^b	101.11 \pm 0.22 ^c	101.06 \pm 0.21 ^e	100.26 \pm 0.18 ^d	99.84 \pm 0.15 ^c	99.43 \pm 0.20 ^d
Standard	97.02 \pm 0.36 ^a	101.24 \pm 0.22 ^b	99.91 \pm 0.19 ^b	99.11 \pm 0.35 ^{ab}	98.54 \pm 0.24 ^b	98.29 \pm 0.27 ^{ab}	98.04 \pm 0.23 ^{ab}
<i>P. santalinus</i> 200 mg/kg	98.99 \pm 0.13 ^c	101.36 \pm 0.22 ^b	100.94 \pm 0.19 ^{bc}	100.70 \pm 0.17 ^{de}	100.03 \pm 0.18 ^{cd}	99.00 \pm 0.10 ^c	98.99 \pm 0.12 ^{cd}
<i>P. santalinus</i> 400 mg/kg	98.99 \pm 0.11 ^c	101.31 \pm 0.16 ^b	100.74 \pm 0.18 ^{bc}	100.52 \pm 0.16 ^{cde}	99.99 \pm 0.13 ^{bcd}	99.37 \pm 0.16 ^{bc}	98.32 \pm 0.22 ^{abc}
<i>P. santalinus</i> 800 mg/kg	97.18 \pm 0.35 ^{ab}	101.58 \pm 0.18 ^b	100.43 \pm 0.34 ^{bc}	99.50 \pm 0.24 ^b	98.78 \pm 0.37 ^{abc}	98.52 \pm 0.34 ^{ab}	98.39 \pm 0.27 ^{bc}

Mean value \pm SEM within a column with different letters differ significantly ($p < 0.001$) evaluated using the multiple comparison Tukey's HSD. n = 6.

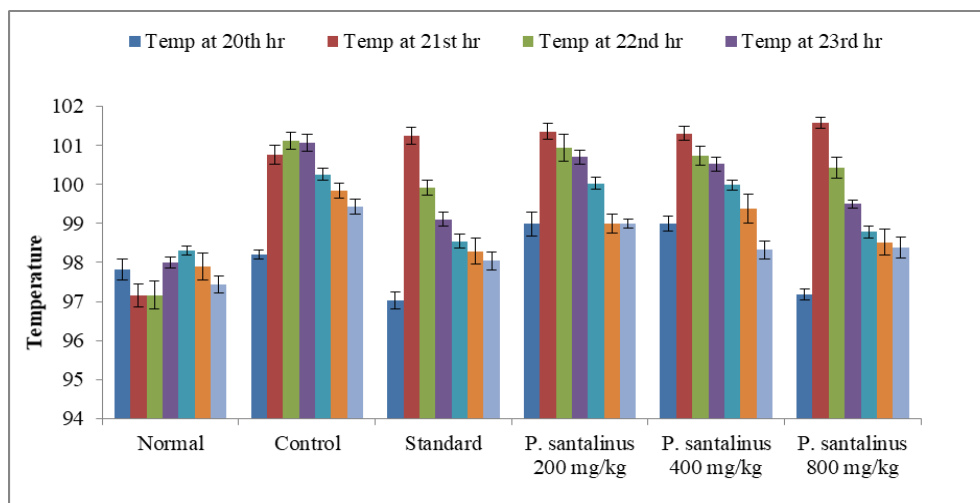


Fig 1: Antipyretic effect of *P. santalinus* aqueous extract on Wistar Albino rats

Discussion

Qualitative phytochemical screening showed the presence of tannins, flavanoids, terpenoids, alkaloids, phenols and saponins. A number of these phytochemicals have been shown to exhibit inhibitory action on cyclooxygenase enzyme and, as a result, produce antipyretic activity by preventing the formation of prostaglandins or by increasing the concentration of body's own antipyretic components [14]. Flavonoids are known to target prostaglandins which are involved in the pyrexia. Hence the presence of flavonoids in the aqueous heartwood extract of *P. santalinus* plant may be responsible its antipyretic activity. Alkaloids extracted from the stem bark

of *Hunteria zeylanica*, possesses antipyretic effects [15]. Hence presence of alkaloids in this extract could also be responsible for the antipyretic activity. Saponins are suggested to act synergistically to exert antipyretic activity [16]. Anti-pyretic activity can be due to saponins which are involved in inhibition of prostaglandin synthesis. The antipyretic effect of ethanolic root extracts of *Asparagus racemosus* on yeast-induced hyperthermia in rats was attributed to the saponins in the extracts [17]. The aqueous heart wood extract *P. santalinus* at all the dose levels did not lower rectal temperature in the first and second hours as effectively as in the third hour. It

may be because the active principles in the extracts required biotransformation so as to become antipyretic.

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