



Evaluation of anti-pyretic activity of *Ocimum sanctum linn* using Brewer's Yeast induced pyrexia in albino rats

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Article history

Received 20th Sept 2017
Received in revised form 16th Nov 2017
Accepted 24th Dec 2017

ABSTRACT

Many herbal plants have been found to be having antipyretic effects. The present study investigates the antipyretic activity of the extracts of *Ocimum sanctum* plant on brewer's yeast induced fever in experimental rats. 30 albino rats weighing 120g-150g were used. They were divided into five groups of six rats each. Group one serve as control (n=6) and was given 1ml of normal saline, group two serves as inducer group (n=6) was treated with brewer yeast alone, group three serves as standard group (n=6) was given 150mg/kg of paracetamol, while groups four and five serves as test groups were treated with 100mg/kg and 300mg/kg (n=6) of *Ocimum sanctum* respectively. A 20% suspension of 10ml/kg of brewer's yeast was injected subcutaneously to induce fever in all the experimental animals. After 18hrs, the rectal temperature was taken and the animals,

were administered *Ocimum sanctum* (100mg/kg, 300mg/kg) and paracetamol (standard group, 150mg/kg) orally. The body temperature of the rats was measured rectally over a period of 4hours. *Ocimum sanctum* (100mg/kg and 300mg/kg) significantly reduced yeast induced pyrexia when compared with the group two (20ml/kg, brewer's yeast). The group three (paracetamol, 150mg/kg) also show significant reduction when compared with group two (20ml/kg, brewer yeast. Thus, this experiment shows that the antipyretic effect of *Ocimum sanctum* is dose dependent and the effect is as a result of the flavonoid component of the extract. These data therefore suggest that extract of *Ocimum sanctum* possesses significant antipyretic activity and its mechanism could be by inhibition of release of inflammatory mediators and prostaglandins.

KEYWORDS:

Anti-pyretic activity, *Ocimum sanctum* (Tulsi), Paracetamol, Yeast, albino rats.

1. INTRODUCTION

Fever is defined as the elevation of core body temperature above normal; in normal adults, the average oral temperature is 37°C (98.6°F) (1). Fever is a medical sign rather than a disease and it may be caused as a secondary impact of infection, malignancy or other diseased states. Fever occurs when the body's thermostat (located in the hypothalamus-anterior pituitary) resets at a higher temperature, primarily in response to an infection. From the recent scientific discovery, most of the antipyretic drugs have been developed to reduce elevated body temperature, of which many acts by the mechanism of inhibition of the COX-2 expression to reduce PGE2 biosynthesis.

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It is currently accepted that prostaglandin E2 (PGE2) is the final fever mediator in the brain, specifically in the pre-optic area of the anterior hypothalamus. Many drugs on chronic usage can be able to result in several side effects including gastrointestinal, renal, hepatic, central nervous system and dermatological effects (2).

A rich heritage of knowledge on preventive and curative medicines was available in ancient scholastic work. The beneficial medicinal effects of plant materials typically result from the combinations of secondary products present in the plant (3). Many of the plants were found to show the anti-pyretic activity hence the use of traditional plants as relieving agents can be advantageous in many aspects such as easy availability, economical with no or limited side effects.

2. MATERIAL AND METHODS

Ocimum sanctum (also tulsi, tulasī, or Holy Basil) is an aromatic plant in the family Lamiaceae which is native throughout the old world tropics and widespread as a cultivated plant. Tulsi is an erect, much branched sub-shrub 30-60 cm tall, with simple opposite green or purple leaves that are strongly scented and hairy stems. Three varieties of Tulsi are –

Rama or Light Tulsi (*Ocimum Sanctum*)
Shyama or Dark Tulsi (*Ocimum Sanctum*)
Vana Tulsi (*Ocimum Gratissimum*)

PLANT TAXONOMY:

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Lamiales

Family: Lamiaceae

Genus: *Ocimum*

Species: *O. Sanctum*

Botanical Name: *Ocimum sanctum*

Eugenol, the main phytoconstituent of *Ocimum sanctum* involved in showing of its antipyretic activity by reducing or inhibition of prostaglandin synthesis⁽⁴⁾.

Drugs and chemicals:

Paracetamol was purchased from CDFCL. The solvents and other chemicals of analytical grade were used and obtained from the institute's central store. Brewer's yeast was purchased from local market of Blue bird brand.

Collection & extraction of Leaves:

The whole fresh leaves of *O. sanctum* were collected from the local areas of Ibrahimpatnam and are air dried under shade for two days and then powdered. 100 g of powder was taken and kept for maceration for two days in 1000ml of distilled water, frequently stirred and about 5 to 10 drops of chloroform per day was added. Then it was filtered using a muslin cloth, so as to remove insoluble material. The filtrate was again filtered by double layered muslin cloth and then poured into ordinary, cleaned and already weighed plates for drying. Finally, the chocolate-colored semisolid residue was weighed and pooled together in an air and water proof container kept in a refrigerator at 4°C. From this fresh preparations were made whenever required (5).

Animals

30 albino rats weighing between 120-150g of either sex were procured from the sanzyme for this experimental study. They were divided into five

groups (n=6). They were acclimatized to the normal laboratory conditions for seven days before the commencement of the experimental procedure and allowed access to standard dry pellet diet and water ad libitum. The experimental protocol was approved by IAEC (Institutional animal ethics committee), for using animals in this experiment. Animals were fasted overnight with free access to water prior to each experiment (6).

GROUPING:

Animals were grouped into-

Group 1-It is called as control group.

This group was given with 1ml of saline.

Group 2-It is called as negative control group.

This group was treated with 10 ml/kg brewer's yeast alone.

Group 3 -It is called as standard reference group.

This group was treated with brewer yeast and with 150mg/kg of Paracetamol.

Group 4- It is called as test group.

This group was treated with brewer's yeast and 100mg/kg of *Ocimum sanctum*.

Group 5- It is also a test group.

This group was treated with brewer's yeast and 300mg/kg of *Ocimum sanctum* (7).

INDUCTION OF PYREXIA:

Fever was induced by injecting 10ml/Kg (subcutaneous) of 20% suspension of brewer's yeast in normal saline below the nape of the neck. The temperature was measured after 18 hours using rectal thermometer.

ADMINISTRATION OF DRUGS:

After the 18 hours of the induction of pyrexia- The paracetamol drug of appropriate dose (150mg/kg) was dissolved in saline solution and was given orally to the experimental albino rats of group-3.

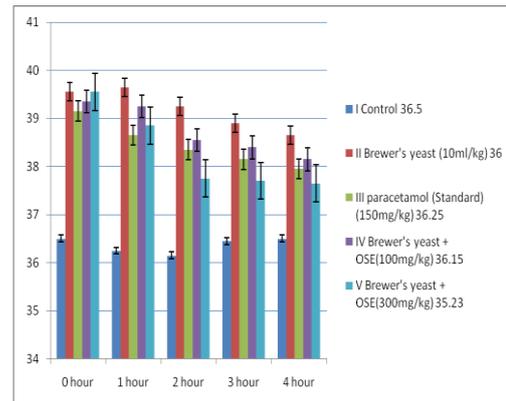
The test solution of *Ocimum sanctum* extract of doses 100mg/kg and 300mg/kg was dissolved in 0.8% Tween80 and was given orally to the experimental rats of group-4 and 5 respectively (8).

Statistical Analysis

Results are expressed as mean \pm SEM. Statistical analysis of data was performed using ANOVA to study differences among the means.

3. RESULTS & DISCUSSION

Groups	Treatment	Initial rectal Temperature (°c)	Rectal temperature after 18 hours of Yeast injection (°c)				
			0 hour	1 hour	2 hour	3 hour	4 hour
I	Control	36.5 ± 0.35	36.5 ± 0.30	36.25 ± 0.34	36.15 ± 0.55	36.45 ± 0.15	36.5 ± 0.30
II	Brewer's yeast (10ml/kg)	36 ± 0.30	39.55 ± 0.30	39.65 ± 0.54	39.25 ± 0.27	38.9 ± 0.35	38.65 ± 0.20
III	paracetamol (Standard) (150mg/kg)	36.25 ± 0.25	39.15 ± 0.12	38.65 ± 0.24**	38.35 ± 0.15	38.15 ± 0.20*	37.95 ± 0.15*
IV	Brewer's yeast + OSE(100mg/kg)	36.15 ± 0.55	39.35 ± 0.43	39.25 ± 0.40	38.55 ± 0.38	38.4 ± 0.45*	38.15 ± 0.35*
V	Brewer's yeast + OSE(300mg/kg)	36.15 ± 0.35	39.55 ± 0.25	38.85 ± 0.55	37.75 ± 0.65*	37.7 ± 0.50*	37.65 ± 0.40*



Values are Mean ± S.E.M. (n=5) Significance vs. Negative control group: *P<0.05, **P<0.01.

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⁽⁹⁾.

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. Flavonoids are known to target prostaglandins which are involved in the pyrexia. Hence the presence of flavonoids in plant may be contributory to its antipyretic activity⁽¹⁰⁾.

Fever is known to be caused by several endogenous pyrogens such as interleukin-1 β , interleukin-6, interleukin-8, tumor necrosis factor- α , macrophageprotein-1 and prostaglandins. Prostaglandin synthesis may be activated by tumor necrosis factor- α and phospholipase A₂. Brewer's

yeast induces both TNF- α and prostaglandin synthesis⁽¹¹⁾.

The extracts are likely to reduce pyrexia by reducing brain concentration of prostaglandin E₂ especially in the hypothalamus through its action on COX-2 or by enhancement of the production of the body's own antipyretic substances. Thus it can be inferred that *Ocimum sanctum* inhibits the synthesis of prostaglandins. It has been established that there are two pathways leading to the transcription and induction of cyclo-oxygenase (COX)-2. Both pathways are activated by cytokines e.g. IL-1 α , IL-6 and tumor necrosis factor (TNF) which trigger central mechanisms that act via the transcription factors such nuclear factor (NF)kB and signal transducer and activator of transcription (STAT-3)⁽¹²⁾.

The efficacy of the antipyretic effect of *Ocimum sanctum* extract was observed to have increased with increased concentration (dose-dependent

manner). This can be said to be due to the increased concentration of the component of the extract exhibiting antipyretic effects.

4. CONCLUSION

Antipyretic activity of bioflavonoid eugenol from *Ocimum sanctum* plant extract was confirmed by the present experimental studies. *Ocimum sanctum* extract with two different doses of 100mg/kg and 300mg/kg showed the reduced temperature levels in the wistar albino experimental rats when compared to the temperatures of rats of control group. It is through the inhibition of prostaglandin (PGE₂). From these results, it can be concluded that the *Ocimum sanctum* plant extract at the dose level of 300mg/kg has shown marked decrease in temperature to normal. Hence possess antipyretic activity which was comparable with the paracetamol effect. Plant test extract of 100mg/kg was not so efficient as much as the dose level of 300mg/kg.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this paper.

REFERENCES

- [1]. Dalal Shalini and Zhukovsky S Donna, (2006). Pathophysiology and Management of Fever. The Journal of Supportive Oncology; volume 4 (01):009–016.
- [2]. G.I. Gege-Adebayo, A.S Bassi, V.U Igbokwe, Shafe M.O, (2013). Antipyretic effect of *Ocimum gratissimum* on brewer's

- yeast induced fever in wistar rats. Journal of Medicine and Medical Science Vol. 4(6) :247-251.
- [3].Pattanayak Priyabrata, Behera Pritishova, D. Debajyoti, and K. P. Sangram (2010 jan-jun). *Ocimum sanctum* Linn. A reservoir plant for therapeutic applications: An overview. Pharmacogn Rev; 4 (7):95-105.
- [4].S. Ekta, S. Sheel, D. Jaya and S. Swapnil (2012). Diversified potentials of *Ocimum sanctum* Linn (Tulsi): An exhaustive survey. Scholars Research Library. Journal of Natural Products and Plant Resources; 2 (1):39-48.
- [5].M. Siva, KR Shanmugam, B. Shanmugam, G. Venkata Subbaiah, S. Ravi, K. Sathyavelu Reddy, K. Mallikarjuna (2016 may-June).*Ocimum sanctum*: a review on the pharmacological properties. International Journal of Basic & Clinical Pharmacology: Volume 5; Issue 3: 558-565.
- [6].M. Lalit, MV Amberkar, Meena Kumari (2011). *Ocimum sanctum* Linn (Tulsi) - An overview. International Journal of Pharmaceutical Sciences Review and Research, volume 7 Issue 1, Article-009: 51-53.
- [7].M M Mrutyunjay, Zaman Sameer Uz, and S. Ramabhimaiah, (2014). Evaluation of the anti-inflammatory activity of *Ocimum sanctum* Linn (Tulsi) in albino rats. International Journal of current Microbiological and Applied Sciences, Volume 3; Number 1: pp. 198-205.
- [8].Kumar Anant, Agarwal Karishma, M.A Kumar et al., (2015). Pharmacological and phytochemical evaluation of *Ocimum sanctum* root extracts for its anti-inflammatory, analgesic and antipyretic activities. Pharmacogn Mag.; 11(Suppl 1): S217-S224.
- [9].H.Abdul Kaffoor, K.Arumugasamy, T.Sekar, R. Nantha Kumar, and A. Shalimol. (2016). Antipyretic activity of methanol leaf extract of *Magnolia nilagirica (zenkar) figlar* in wistar albino rats. International Journal of Recent Advances in Multidisciplinary Research Volume 03(01).1177-1178.
- [10]. V. Prasanth Reddy, G. Sudheshna, S.K. Afsar, S. Sai Saran, C. Raja Ram, K. Mahaboob basha, M. Mallikarjuna Reddy. (2012). Evaluation of Antipyretic Activity of *Citrullus colocynthis* Fruit Extract against Yeast Induced Pyrexia Model in Wistar Rats. Journal of Pharmacy Research Vol.5 (4).
- [11]. Bhattacharya S. and Roy B, (2010). Preliminary investigation on antipyretic activity of *Cuscuta reflexa* in rats. Journal of Advanced Pharmaceutical Technology & Research ; volume 1(1): 83-87.
- [12]. Erhirhie Earnest Oghenesuvwe, Ekene, Nwoke E. and Ajaghaku Daniel Lotanna, (2014).Guidelines on dosage calculation and stock solution preparation in experimental animals' studies. Journal of Natural Sciences Research. Vol.4, (18): 100-106.

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