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EVALUATION OF ANTIPYRETIC EFFECTS OF A COMBINED POLYHERBAL EXTRACT OF TULSI, CUMIN, CURCUMIN, AND GINGER IN FEMALE RATS

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ABSTRACT

Objective: The study aimed to evaluate the antipyretic effects of a polyherbal extract combining Tulsi (Ocimum sanctum), Cumin (Cuminum cyminum), Curcumin (Curcuma longa), and Ginger (Zingiber officinale) on pyrexia in female rats. The objective was to determine whether the combined extract exhibits a synergistic antipyretic effect, providing a natural alternative to conventional antipyretic drugs.

Materials and Methods: The study involved female Wistar rats, divided into five groups: a control group, a standard drug group (treated with paracetamol), and three test groups treated with different doses of the polyherbal extract. Pyrexia was induced in the rats using Brewer's yeast. The combined extract was prepared by mixing the individual extracts of Tulsi, Cumin, Curcumin, and Ginger in equal proportions. The rectal temperature of the rats was measured at regular intervals post-treatment to assess the antipyretic activity.

Results and Discussion: The polyherbal extract significantly reduced the elevated body temperature in the treated rats compared to the control group. The highest dose of the extract demonstrated an antipyretic effect comparable to that of paracetamol. The results suggest a potential synergistic interaction between the herbs, enhancing their overall antipyretic efficacy. The discussion highlights the relevance of combining these herbs, which have individual

medicinal properties, to achieve a potent antipyretic effect.

Conclusion: The study concluded that the combined polyherbal extract of Tulsi, Cumin, Curcumin, and Ginger exhibits significant antipyretic activity in female rats. This polyherbal formulation could serve as an effective natural alternative to synthetic antipyretic drugs, warranting further research for clinical applications.

Keywords: Antipyretic activity, Polyherbal extract, Tulsi (Ocimum sanctum), Cumin (Cuminum cyminum), Curcumin (Curcuma longa), Ginger (Zingiber officinale)

INTRODUCTION

Fever is a common clinical condition characterized by an elevation in body temperature, often due to infection, inflammation, or other underlying conditions.[1] While conventional antipyretic drugs like paracetamol and ibuprofen are widely used to manage fever, concerns about their side effects and the development of drug resistance have led to an increased interest in natural alternatives.[2] Herbal medicine, with its rich history in traditional systems like Ayurveda, offers a promising approach to fever management due to its effectiveness and lower risk of adverse effects.[3]

Tulsi (Ocimum sanctum), Cumin (Cuminum cyminum), Curcumin (Curcuma longa), and Ginger (Zingiber officinale) are well-known medicinal plants traditionally used for their anti-inflammatory, antioxidant, and antipyretic properties.[4] Tulsi is revered in Ayurveda for its ability to enhance immunity and combat fever. Cumin is known for its anti-inflammatory and digestive benefits.[5] Curcumin, the active compound in turmeric, has been extensively studied for its potent anti-inflammatory and immune-modulating effects. Ginger is widely recognized for its ability to reduce inflammation and relieve symptoms associated with fever.[6, 7, 8]

This study aims to evaluate the antipyretic effects of a combined polyherbal extract of Tulsi, Cumin, Curcumin, and Ginger in female Wistar rats. By exploring the synergistic effects of these herbs, the study seeks to provide evidence for the potential use of this polyherbal formulation as a natural and effective alternative to synthetic antipyretics, addressing the growing demand for safer and more holistic approaches to fever management.

MATERIAL AND METHODS

1. **Study Design**

The study was designed to evaluate the antipyretic effects of a combined polyherbal extract comprising Tulsi (Ocimum sanctum), Cumin (Cuminum cyminum), Curcumin (Curcuma longa), and Ginger (Zingiber officinale) in female Wistar rats. The experiment was conducted in compliance with ethical guidelines for the care and use of laboratory animals.

2. **Plant Material Collection and Preparation**

- **Tulsi (Ocimum sanctum):** Fresh leaves of Tulsi were collected from a local herbal garden. The leaves were authenticated by a botanist and washed thoroughly with distilled water to remove any impurities.
- **Cumin (Cuminum cyminum):** Cumin seeds were procured from a local market and were identified and authenticated by a taxonomist.
- **Curcumin (Curcuma longa):** Curcumin rhizomes were obtained from an organic farm, dried, and authenticated.
- **Ginger (Zingiber officinale):** Fresh ginger rhizomes were purchased from a local market and authenticated by an expert.

After collection, all plant materials were shade-dried separately for seven days, then powdered using a mechanical grinder. The powdered samples were stored in airtight containers at room temperature until extraction.

3. **Preparation of Polyherbal Extract**

The powdered plant materials were extracted using the following method:

- **Solvent:** 70% ethanol was used as the extraction solvent.
- **Procedure:**

    i. **Tulsi:** 100 g of dried Tulsi leaf powder was extracted using 500 mL of 70% ethanol.
    ii. **Cumin:** 100 g of dried Cumin seed powder was extracted with 500 mL of 70% ethanol.
    iii. **Curcumin:** 100 g of dried Curcumin powder was extracted with 500 mL of 70% ethanol.
    iv. **Ginger:** 100 g of dried Ginger rhizome powder was extracted with 500 mL of 70% ethanol.

Each plant material was subjected to cold maceration for 72 hours with occasional shaking. After the extraction period, the mixtures were filtered through Whatman No. 1 filter paper. The filtrates were concentrated using a rotary evaporator under reduced pressure at 40°C to obtain the respective crude extracts. The crude extracts were then dried in a vacuum desiccator to yield a dry mass, which was weighed and recorded.

The dried extracts of Tulsi, Cumin, Curcumin, and Ginger were then mixed in equal proportions by weight to create the polyherbal extract. The final polyherbal extract was stored in airtight containers at 4°C until use.

4. **Experimental Animals**

- **Animal Selection:** Female Wistar rats (150–200 g) were selected for the study. The choice of female rats was based on their stability in thermoregulatory response during the estrous cycle, ensuring consistent experimental outcomes.
- **Housing and Feeding Conditions:** The animals were housed in standard laboratory conditions (temperature: 22 ± 2°C; humidity: 55 ± 5%; 12-hour light/dark cycle) with free access to standard rodent feed and water ad libitum. They were acclimatized to the laboratory environment for one week prior to the experiment.
- **Ethical Approval:** The study was approved by the Institutional Animal Ethics Committee (IAEC) in accordance with the guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), India.

5. **Induction of Pyrexia**

- **Pyrexia Induction Method:** Pyrexia was induced in the rats using Brewer's yeast.
- **Procedure:**

  i. A 20% suspension of Brewer's yeast in distilled water was prepared.
  ii. Each rat received a subcutaneous injection of 10 mL/kg of the Brewer's yeast suspension in the dorsal region.
  iii. This method was selected because it induces a fever response similar to that seen in humans, making it a suitable model for antipyretic studies.

- **Baseline Temperature Measurement:** The rectal temperature of each rat was measured using a digital rectal thermometer before yeast injection to obtain the baseline temperature.
- **Fever Onset:** After yeast injection, the rectal temperature was measured every hour for 6 hours. Rats with a temperature increase of at least 1°C were selected for the antipyretic study.

6. **Experimental Groups**

The rats were randomly divided into five groups, with six rats in each group (n = 6):

1. **Group I (Control):** Received distilled water (10 mL/kg) orally.
2. **Group II (Standard):** Received Paracetamol (150 mg/kg) orally.
3. **Group III (Low Dose Polyherbal Extract):** Received the polyherbal extract at 100 mg/kg orally.
4. **Group IV (Medium Dose Polyherbal Extract):** Received the polyherbal extract at 200 mg/kg orally.
5. **Group V (High Dose Polyherbal Extract):** Received the polyherbal extract at 400 mg/kg orally.

7. **Drug Administration**

- **Dosage:** The dosages for the polyherbal extract were selected based on preliminary studies. The extracts were suspended in distilled water and administered orally using an oral gavage.
- **Control and Standard Treatment:** The control group received distilled water, and the standard group was treated with paracetamol (150 mg/kg), a well-known antipyretic, to serve as a positive control.

8. **Measurement of Antipyretic Activity**

- **Temperature Monitoring:** After the administration of the test and standard treatments, rectal temperatures were measured at intervals of 1, 2, 3, 4, and 5 hours using a digital rectal thermometer.
- **Temperature Reduction:** The antipyretic effect was evaluated based on the reduction in rectal temperature from the peak temperature observed after yeast injection. The percentage reduction in temperature was calculated for each group at different time intervals.

9. **Statistical Analysis**

- **Data Analysis:** Data were expressed as mean ± standard error of the mean (SEM).
- **Statistical Tests:** The differences between the control and treatment groups were analyzed using one-way analysis of variance (ANOVA) followed by Dunnett's multiple comparison test.
- **Significance Level:** A p-value of <0.05 was considered statistically significant.

1.1. RESULTS AND DISCUSSION

1. **Rectal Temperature Measurements**

The antipyretic effects of the polyherbal extract were evaluated by measuring the rectal temperature of female Wistar rats at various time points after the induction of pyrexia and administration of the treatments. The temperatures were recorded at baseline (pre-yeast injection), after yeast-induced pyrexia, and at 1, 2, 3, 4, and 5 hours post-treatment (table 1).

Table 1: Rectal Temperature (°C) of Rats at Different Time Intervals

Group	Baseline (0 h)	Post-Yeast Injection (6 h)	1 h	2 h	3 h	4 h	5 h
Control (Distilled Water)	36.8 ± 0.1	38.9 ± 0.2	38.7 ± 0.2	38.6 ± 0.1	38.4 ± 0.1	38.3 ± 0.1	38.1 ± 0.1
Paracetamol (150 mg/kg)	36.9 ± 0.1	39.0 ± 0.2	37.5 ± 0.2	37.0 ± 0.1	36.7 ± 0.1	36.6 ± 0.1	36.5 ± 0.1

Group	Baseline (0 h)	Post-Yeast Injection (6 h)	1 h	2 h	3 h	4 h	5 h
Polyherbal Extract (100 mg/kg)	36.8 ± 0.2	39.1 ± 0.2	38.2 ± 0.1	37.8 ± 0.1	37.6 ± 0.1	37.4 ± 0.1	37.2 ± 0.2
Polyherbal Extract (200 mg/kg)	36.7 ± 0.1	39.0 ± 0.2	37.8 ± 0.1	37.4 ± 0.1	37.1 ± 0.2	36.8 ± 0.1	36.7 ± 0.1
Polyherbal Extract (400 mg/kg)	36.9 ± 0.1	39.1 ± 0.2	37.3 ± 0.1	37.0 ± 0.2	36.7 ± 0.1	36.5 ± 0.1	36.4 ± 0.1

2. **Antipyretic Effect of the Polyherbal Extract**

The polyherbal extract at all tested doses (100 mg/kg, 200 mg/kg, and 400 mg/kg) significantly reduced the elevated body temperature in a dose-dependent manner. The reduction in rectal temperature was compared with the control group and the standard antipyretic drug, paracetamol.

- **Control Group:** The control group (distilled water) showed a slight reduction in temperature over time, but the reduction was minimal and did not return to baseline levels, indicating that distilled water had no significant antipyretic effect.
- **Standard Group (Paracetamol 150 mg/kg):** Paracetamol, a widely used antipyretic, significantly reduced the rectal temperature of the rats. The temperature dropped steadily over time and returned close to baseline levels within 5 hours (table 2).
- **Polyherbal Extract Groups:**
    - **Low Dose (100 mg/kg):** The polyherbal extract at 100 mg/kg showed a moderate antipyretic effect. The temperature reduction was significant compared to the control group but less pronounced than in the higher-dose groups.
    - **Medium Dose (200 mg/kg):** At 200 mg/kg, the polyherbal extract produced a greater reduction in temperature. The temperature reduction pattern was more consistent, indicating a stronger antipyretic effect.
    - **High Dose (400 mg/kg):** The 400 mg/kg dose of the polyherbal extract exhibited the most potent antipyretic activity, with a temperature reduction pattern similar to that of the paracetamol group. The rectal temperature returned close to baseline levels by the 5th hour.

Table 2: Percentage Reduction in Rectal Temperature from Post-Yeast Injection Temperature

Group	1 h (%)	2 h (%)	3 h (%)	4 h (%)	5 h (%)
Control (Distilled Water)	0.5 ± 0.2	0.8 ± 0.2	1.3 ± 0.2	1.6 ± 0.3	2.0 ± 0.3
Paracetamol (150 mg/kg)	3.8 ± 0.3	5.1 ± 0.3	6.1 ± 0.4	6.5 ± 0.4	6.8 ± 0.5
Polyherbal Extract (100 mg/kg)	2.3 ± 0.3	3.3 ± 0.3	3.8 ± 0.3	4.3 ± 0.4	4.8 ± 0.4

Group	1 h (%)	2 h (%)	3 h (%)	4 h (%)	5 h (%)
Polyherbal Extract (200 mg/kg)	3.1 ± 0.3	4.1 ± 0.3	4.8 ± 0.4	5.6 ± 0.4	5.8 ± 0.4
Polyherbal Extract (400 mg/kg)	3.9 ± 0.4	5.1 ± 0.4	6.1 ± 0.4	6.7 ± 0.5	6.9 ± 0.5

CONCLUSION

The study concluded that the combined polyherbal extract of Tulsi, Cumin, Curcumin, and Ginger exhibits significant antipyretic activity in female rats. This polyherbal formulation could serve as an effective natural alternative to synthetic antipyretic drugs, warranting further research for clinical applications.

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