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R Arora

Pharmacy Institute, 19,
Knowledge Park-II,
Institutional Area, Noida
Institute of Engineering and
Technology, Greater Noida, U.P,
India

A Mazumder

Pharmacy Institute, 19,
Knowledge Park-II,
Institutional Area, Noida
Institute of Engineering and
Technology, Greater Noida, U.P,
India

A Study on Antipyretic activity of methanolic extract of rhizomes of *Hedychium spicatum* Plant

R Arora and A Mazumder

Abstract

Hedychium spicatum (Ham-ex-Smith), known as Shati in Ayurvedic classics, is documented for the treatment of cough, hiccough, fever and asthma. The present study was designed to evaluate the antipyretic activity of rhizome of *Hedychium spicatum* (Zingiberaceae). The Methanolic extract was taken for the study and evaluated for antipyretic activity using Brewer's yeast induced pyrexia in Wistar strain albino rats. The methanolic extract at a dose of 100mg/kg & 200mg/kg were evaluated for antipyretic activity. The extract of *H. spicatum* plant showed a significant ($P < 0.01$) dose dependent antipyretic effect in yeast induced elevation of body temperature in experimental rats. This study has pointed to the potential application of *H. spicatum* as an antipyretic drug when compared with the standard drug.

Keywords: *Hedychium spicatum* plant, Methanolic extract, Antipyretic activity, Brewer's yeast.

Introduction

H. spicatum (Ham-ex-Smith) is a perennial rhizomatous herb belonging to the family Zingiberaceae. It grows throughout the subtropical Himalaya in the Indian state of Assam, Arunachal Pradesh and Uttarakhand within an altitudinal range of 1000–3000 m (Samant, 1997, Thakur, 1989) [9, 13]. *H. spicatum* rhizome is mentioned as Shati in Ayurvedic classics and has been used in various dosage forms to treat cough, wound ulcer, fever, respiratory problems and hiccough. The rhizomes have a strong aromatic odor and bitter taste. In local language, the rhizomes are commonly known as kapur kachari or ban Haldi. (Chopra, 1956) [2]. Rhizomes are also used as perfume in tobacco and insect repellent. The rhizome extract has been reported to contain essential oil, starch, resins, organic acids, glycosides, albumen and saccharides, which has been advocated for blood purification and treatments of bronchitis, indigestion, eye disease and inflammations (Sravani, 2011, Srimal, 1984) [10, 11]. Rhizome is reported to contain β sitosterol and its glucosides, furanoid diterpene-hedychenone and 7-hydroxyhedychenone and essential oil contains cineole, terpinene, limonene, phellandrene, p-cymene, linalool and terpenol. The plant rhizomes possess hypoglycaemic, vasodilator, spasmolytic, hypotensive, antioxidant and antimicrobial properties. (Giri, 2010) [4]. Powdered rhizome of *H. spicatum* has been used clinically for the treatment of asthma (Chaturvedi, 1975) [1] and tropical pulmonary eosinophilia (Sahu, 1979) [8] and as anti-inflammatory and analgesic. (Tandon, 1997) [12].

An extensive search of the literature reveals no reports on the antipyretic activity of the plant. Thus, present investigation was planned to find out the therapeutic level of methanolic extract of *H. spicatum* plant in antipyretic activity.

Materials and Methods

The raw materials of *H. spicatum* were procured from the supplier (S.S. Herbal, 485/2, Katra Ishwar Bhavan, Khari Baoli, Delhi) and the sample was identified and authenticated. A voucher specimen has been retained in the Pharmacy Institute, N.I.E.T., Greater Noida, for future reference.

Preparation of extract and dose

500 gm of air dried powdered plant material was extracted with methanol in soxhlet apparatus for 96 hrs. The extract was then filtered and again suspended in the above mixture for 24 hrs. Finally extracts was filtered and concentrated over water bath at a temperature of 40 °C. The extract was cooled and kept in desiccator overnight. The extracts was weighed and used for further studies. The yield was 8.8g with respect to dry starting materials with characteristic odour & greasy consistency. In this study, Propylene glycol was used as vehicle and

Correspondence**R Arora**

Pharmacy Institute, 19,
Knowledge Park-II,
Institutional Area, Noida
Institute of Engineering and
Technology, Greater Noida, U.P,
India

Paracetamol suspended in propylene glycol was used as standard drug. Methanolic extract suspended in Propylene glycol was used as test drug.

Preparation of fever inducing agent

15% w/v suspension of yeast in 0.5% w/v methyl cellulose was used to induce pyrexia in experimental animals. (Vogel, 2002) [15].

Test animals

Wister rats of either sex, weighing 120 - 130 g were used for the antipyretic test. The animals were kept under controlled conditions (temperature, 25 ± 2 °C; light/dark cycle, 12/12 h) and fed with standard pellet diet and water ad libitum. The study received prior approval from the Institutional Animal Ethical Committee, Pharmacy Institute NIET, Greater Noida, UP, India (approval reference no. 1121\ac\CPCSEA\07). Animal handling was followed the guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) (CPCSEA 2003) [3].

Antipyretic studies (Brewer's yeast induced hyperpyrexia method)

Antipyretic activity of the methanolic rhizomes extracts of *H. spicatum* was studied as per the following. Body weights of the animals were recorded and they were randomly divided into 5 groups of 6 animals each as follows:

Yeast induced Pyrexia

Group I: animals served as control

Group II: animals were treated with 15% w/v yeast suspended in 0.5% w/v carboxy methyl cellulose solution via

subcutaneous injection (10ml/kg).

Group III: animals were administered with yeast (10 ml/kg) and the standard drug paracetamol (150mg/kg b.w.), orally

Group IV: animals were administered with yeast (10ml/kg,) and with methanolic rhizome extract of *H. spicatum* (100mg/kg b.w.), orally.

Group V: animals were administered with yeast (10ml/kg,) and with methanol rhizome extract of *H. spicatum* (200mg/kg b.w.), orally.

Induction of Pyrexia and estimation of body temperature

Yeast induced Pyrexia was induced by subcutaneous injection of 15 % w/v of brewer's yeast (10ml/kg) in distilled water. Basal rectal temperature was measured before the injection of yeast, by inserting digital clinical thermometer to a depth of 2 cm into the rectum. The rise in rectal temperature was recorded 18 h after yeast injection. Paracetamol 150mg/kg body weight was used as the standard antipyretic drug. Rectal temperature of animals was noted at regular intervals following the respective treatments. The temperature was measured at 1st, 2nd, and 3rd hour after drug administration (Turner, 1965) [14].

Statistical analysis

Data was expressed as mean standard error of mean. The results were analyzed statistically by ANOVA is followed by Dunnett's test (Ghosh, 2005, Kulkarni, 2006) [5, 6]. The results of experiments by proper statistical analysis as stated above are tabulated in table. no.1

Table 1: Antipyretic Effect of the extract of *H. spicatum* in Yeast induced pyretic rats

| S. No | Group | Treatment | Initial Rectal Temp (in °C before yeast injection) | Rectal Temperature in C after 18 hrs of yeast injection (Mean±SEM) | | | | | |
|-------|----------------------|-----------|--|--|--------------|--------------|--------------|------------|------------|
| | | | | 0 hr | 1hr | 2hrs | 4hrs | 19hrs | 24hrs |
| 1 | Control (PEG) | 5ml/kg | 36.3±0.05 | 37.4±0.12 | 36.76±0.18 | 37.73±0.24 | 38.1±0.15 | 39.26±0.18 | 39.37±0.12 |
| 2 | Standard Paracetamol | 150 mg/kg | 37.26±0.11 | 39.23±0.25** | 38.11±0.31** | 38.78±0.20** | 37±0.28** | 36.88±0.20 | 36.70±0.22 |
| 3 | Methanolic Extract | 100mg/kg | 37.75±0.18 | 39.63±0.30** | 39.26±0.37** | 38.5±0.18* | 37.33±0.008* | 37.66±0.18 | 36.86±0.20 |
| 4 | Methanolic Extract | 200mg/kg | 37.4±0.14 | 39.31±0.33** | 39.63±0.21** | 36.46±0.17** | 36.55±0.13** | 36.8±0.03 | 36.65±0.19 |

All values are Mean ±SEM, N=6; * P<0.001, when compared with normal control, ** P<0.01 when compared with diabetic control, *** P<0.05 when compared with diabetic control. (One-way ANOVA followed by Dunnett's t-test)

Results

The present study showed that the methanol extract of rhizomes of *H. spicatum* possessed significant antipyretic activity in Baker's yeast-induced pyrexia. The standard (paracetamol) achieved maximum antipyretic activity in 4 h; its activity decreased subsequently probably due to metabolism and excretion of the drug. On the other hand, maximum antipyretic activity for methanolic extract of *H. spicatum* occurred at 6 h, indicating slow but steady absorption of the drug from the GIT; this may have been responsible for the prolonged action of the extract. Subsequently, up to the 8th hour, its activity remained largely unchanged. The antipyretic activity of the extract was dose-dependent with the higher dose producing greater activity body temperature when it is elevated by factors such as exercise or increase in ambient temperature (Rajnaryana, 2006) [7]. Certain phytochemical compounds such as steroids, carbohydrates, tannins, triterpenoids, flavonoid glycosides

were found to be present in the extract during phytochemical screening. The antipyretic potentials of steroids, tannins, triterpenoids, flavonoid and coumarin glycosides have been reported in various studies. Therefore, the antipyretic activity of *H. spicatum* may be due to its contents of steroids, tannins, triterpenoids, flavonoid and coumarin glycosides.

Conclusion

The results demonstrated significant antipyretic activity of the methanol extract of *H. spicatum* rhizomes. Inhibition of the synthesis and/or release of inflammatory mediators may be its main mechanism(s) of action. These results also suggest that the presence of certain bioactive molecules may partly be responsible for the antipyretic activity of *H. spicatum* rhizomes, the isolation of which could help to obtain newer herbal antipyretic drugs in future. Further experimentation is under way in our laboratory to isolate the active molecules from *H. spicatum* rhizomes methanolic extract and to

establish the exact mechanism of action of the extract

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