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A Study on Evaluation of Antipyretic and Analgesic Activities of *Curcuma longa* Extract

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ABSTRACT: Turmeric has been used for centuries in many indigenous medical systems, including the Ayurvedic systems, to treat inflammatory diseases and human afflictions. Hence, the present study was conducted with the main objectives of evaluating the antipyretic and analgesic activities of rhizome extract of *Curcuma longa*. Rhizome of *C. longa* was subjected to successive solvent extraction by continuous hot extraction (Soxhlet) with ethanol. Brewer's yeast's antipyretic and acetic acid induced writhing test was used for the evaluation of antipyretic and analgesic effects of ethanolic rhizome extract of *C. longa* respectively. Results depicted that writhing inhibition (%) and antipyretic effect of ethanolic rhizome extract of *C. longa* at the concentration of 25 µl/L and 100 µl/L respectively was found to be at par with that of positive control *i.e.*, standard Diclofenac sodium drug. In conclusion, our study results clearly demonstrated that ethanolic rhizome extract of *C. longa* exhibited antipyretic and analgesic activities. Hence, rhizome of *C. longa* could be considered for development natural antipyretic and analgesic drugs.

Keywords: *Curcuma longa*, Rhizome, Extract, Antipyretic, Analgesic.

INTRODUCTION

The need for products made from plants for therapeutic purposes has grown in recent decades (Herman and von Richter 2012). Aromatic herbs are used in primary healthcare across many nations, especially in rural areas (Kamatou *et al.,* 2005), and 80% of people in developing nations still rely on these conventional resources (Begossi, 1996).

Algeria has a sizeable collection of natural species that represent a highly significant phytogenetic heritage (Ladoh Yemeda *et al.,* 2014). Numerous bioactive molecules, including flavonoids, tannins, coumarins, alkaloids, and essential oils, have therapeutic properties (De la Cruz Frias *et al.,* 2016; Bidie *et al.,* 2011; Abedini, 2013). Due to their medicinal qualities and other uses in industries like food, aromatherapy, and cosmetics, essential oils currently provide significant advantages (Zenasni, 2014).

A body's immune system reacts to harmful stimuli by causing inflammation when immune cells, molecular mediators, and inflammatory cytokines are involved. Inflammation is brought on by exposure to a pathogen, radiation, extremely high or low temperatures, and autoimmune processes (Ferrero-Miliani *et al.,* 2007; Medzhitov, 2010). Chronic inflammatory responses are related to the progression and manifestation of various inflammatory-related diseases, including rheumatoid arthritis, septic syndrome, cardiovascular diseases, cancer and neurodegenerative diseases (Chen *et al.,* 2018). Synthetic drugs commonly used for the treatment of pain and inflammation like non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroids provide symptomatic and short-lived relief. Also, their long-term uses are associated with several serious adverse effects. Hence, the discovery of new and safe analgesic, antipyretic and antiinflammatory drug is needed.

Curcuma longa (Turmeric) is a member of the ginger family (Zingiberaceae) indigenous to the Indian subcontinent (Hanif *et al.,* 1997). Turmeric is commonly called haridra or haldi in India (Gog and Ng 1987). Turmeric has been used for centuries in many indigenous medical systems, including the Ayurvedic systems, to treat inflammatory diseases and human afflictions. Turmeric's active constituents are yellowish orange volatile oils called curcuminoids known as curcumin. In animal studies, curcumin has shown antioxidant, antineoplastic, antiviral, anti-inflammatory, antibacterial, antifungal, anticoagulant, antifertility, cardiovascular protective, hepatoprotective, and immunostimulant activity (Kumar and Sakhya 2013). With these viewpoints, in the present study we aimed to evaluate the antipyretic and analgesic activities of rhizome extract of *Curcuma longa*.

MATERIAL AND METHODS

Samples Collection. The rhizomes of *C. longa* were purchased from the local market of Bengaluru. The rhizomes were sprayed with ethanol, and then shade dried at room temperature for 10 days. The dried rhizomes were crushed to fine powder with help of

electric grinder and stored in airtight containers for further analysis.

Extraction. Approximately 50 g of dried and coarsely powdered rhizome of *C. longa* was subjected to successive solvent extraction by continuous hot extraction (Soxhlet) with 550 mL of ethanol. All the extracts were concentrated by distilling the solvent in a rotary flash evaporator. The extracts were preserved in airtight containers and stored at room temperature until further use (Rauf *et al.*, 2014; Kamurthy *et al.*, 2015).

Ethical Approval. The study was conducted in compliance with the guidelines laid down by the Institutional Animal Ethics Committee (IAEC) approved by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), India. All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

Experimental Animals. Healthy male Wistar albino rats weighing between 150-200 g were used. They were maintained at 25ºC with relative humidity of 45 to 50% and under standard environmental conditions with 12:12h light/dark cycle in polypropylene cages for one week before the experiments. The animals were fed with standard pellet feed and water was given *adlibitum*. The animals were deprived of food for 24 hours before experimentation, but had free access to drinking water. All experiments were performed in the morning.

Determination of Analgesic Activity

Acetic acid-induced writhing model: Wistar albino rats of any sex (male/female) of body weight 150-250 g were fasted overnight with *ad libitum* access to water and the animals were divided in to six groups of six animals in each group as follows:

Groups	Treatment	No. of Animals/Group
Negative Control	Normal Saline (25 µl/L)	6
Positive Control	Diclofenac sodium (25 mg/kg)	6
Group-A	Ethanolic Rhizome extract of *C. longa* (25 µl/L)	6
Group-B	Ethanolic Rhizome extract of *C. longa* (50 µl/L)	6
Group-C	Ethanolic Rhizome extract of *C. longa* (75 µl/L)	6
Group-D	Ethanolic Rhizome extract of *C. longa* (100 µl/L)	6

Wistar albino rats were treated intra peritoneally with normal saline, diclofenac sodium and ethanolic rhizome extract of *C. longa* in the respective groups one hour before treatment with acetic acid. A writhing was recorded with the help of stopwatch and analgesic activity of each group was calculated using following formula.

Analgesic Activity – $(N_c\text{-}N_t)/N_c \times 100$

Where,

N_c: Control group; N_t: Test group

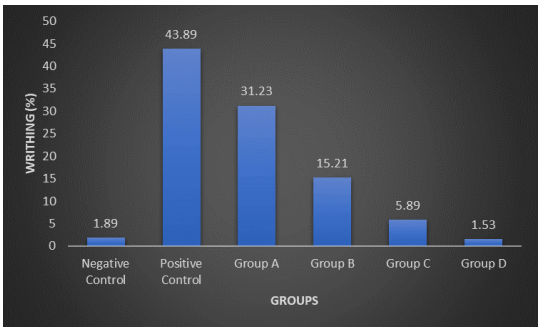
Determination of Antipyretic Activity. Wistar albino rats of any sex (male/female) weighing 150-250 g were fasted overnight with *ad libitum* access to water and the animals were divided in to six groups of six animals in each group as follows:

Groups	Treatment	No. of Animals / Group
Negative Control	Normal Saline (25 µl/L)	6
Positive Control	Diclofenac sodium (25 mg/kg)	6
Group-A	Ethanolic Rhizome extract of *C. longa* (25 µl/L)	6
Group-B	Ethanolic Rhizome extract of *C. longa* (50 µl/L)	6
Group-C	Ethanolic Rhizome extract of *C. longa* (75 µl/L)	6
Group-D	Ethanolic Rhizome extract of *C. longa* (100 µl/L)	6

All Wistar albino rats were injected below the nape of neck with brewer's yeast at different concentration *viz.* 25 µl/L, 50 µl/L, 75 µl/L, and 100 µl/L. The rectal temperature was measured on 0, 30 mins, 1 hr 2 hr and 4 hr time intervals using thermometer. Then Wistar albino rats were treated below the nape of neck with normal saline, diclofenac sodium and rhizome extract of *C. longa* in respective groups and rectal temperature was measured on 0, 30 mins, 1 hr 2 hr and 4 hr time intervals using thermometer.

RESULTS AND DISCUSSION

The mean writhing inhibition (%) exhibited in Negative Control, Positive Control, Group A, Group, B, Group C, and Group D was found to be 1.89, 43.89, 31.23, 15.21, 5.89, 1.53 respectively. These findings depicted that the writhing inhibition (%) of ethanolic rhizome extract of *C. longa*at the concentration of 25 µl/L was found to be at par with that of positive control i.e., standard Diclofenac Sodium drug (Fig. 1). These findings were comparable with previous studies reported in the literature (Pathan *et al.*, 2017; Subedi *et al.*, 2016).



Values were expressed as Mean; n=6

Fig. 1. Effect of ethanolic rhizome extract of *C. longa* on analgesic activity.

The results of the antipyretic effect of ethanolic rhizome extract of *C. longa* were as represented in Table 1. Results depicted that the antipyretic effect of ethanolic rhizome extract of *C. longa* at the dose level of 100 µl/L was comparable with that of positive control (Diclofenac sodium).

Table 1: Effect of ethanolic rhizome extract of *C. longa*on antipyretic activity.

Groups	0 mins	30 mins	1 hr	2 hr	4 hr
Negative Control	100.31	100.26	100.21	100.16	100.11
Positive Control	100.28	99.94	99.18	98.64	97.9
Group-A	100.43	100.09	99.33	98.79	98.05
Group-B	100.23	99.89	99.13	98.59	97.85
Group-C	100.18	99.84	99.08	98.54	97.80
Group-D	100.43	99.09	97.33	96.79	96.05

Values were expressed as Mean; n=6

According to literature reports, the analgesic effect of the writhing test is evaluated using the antipyretic activity of brewer's yeast and the analgesic activity of acetic acid (Subedi *et al.*, 2016). When injected into the albino rats' nape of the neck, brewer's yeast increases prostaglandin production in the body, causing pyrexia. Pathogenic fever, which is characterized by the production of prostaglandins as its etiological cause, is produced using brewer's yeast. An antipyretic effect can be achieved through prostaglandin synthesis. Prostaglandins and paracetamol both reduce the activity of the cyclooxygenase enzyme. (Muhammad *et al.*, 2021) reported the antipyretic effect of essential oil of *Eucalyptus globulus* (Muhammad *et al.*, 2021). In accordance with these literature findings, in our study treatment Wistar albino rats administered with ethanolic rhizome extract of *C. longa* at the concentration 100 µl/L shown antipyretic activity comparable with that of standard drug i.e., Diclofenac sodium.

CONCLUSIONS

The results of present study clearly demonstrated that ethanolic rhizome extract of *C. longa* exhibited antipyretic and analgesic activities. Hence, rhizome of *C. longa* could be considered for development natural antipyretic and analgesic drugs. However, further studies are recommended to be carried *in-vivo* model for further evaluation of efficacy and to elucidate the exact mechanism of action responsible for antipyretic and analgesic activities of rhizome of *C. longa*.

FUTURE SCORE

This study would be of immense important in development of natural antipyretic and analgesic drugs.

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Conflict of Interests. None.

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