Available online at http://www.journalijdr.com

ISSN: 2230-9926

IJDR

International Journal of DEVELOPMENT RESEARCH

International Journal of Development Research
Vol. 5, Issue, 01, pp. 2914-2917, January, 2015

Full Length Research Article

ANTI-INFLAMMATORY AND ANTIPYRETIC ACTIVITY OF *CURCUMA LONGA* L. COLLECTED FROM UTTARAKHAND

Neelam Arya, *Om Prakash, Vivekanand and Pant, A. K.

Department of Chemistry, College of Basic Science and Humanities, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, 263145 India

ARTICLE INFO

Article History:

Received 13th October, 2014
Received in revised form
03rd November, 2014
Accepted 24th December, 2014
Published online 26th January, 2015

Key words:

Anti-inflammatory,
Antipyretic,
Indomethacin,
Paracetamol and Turmeric.

ABSTRACT

The plant extracts of *Curcuma longa* L., a perennial herb is a member of the Zingiberaceae (ginger) family. The methanolic extracts were investigated for its anti-inflammatory and antipyretic activities in animal models. The extract at different doses used showed good anti-inflammatory activity which has been done significantly, by the formation of paw edema induced by carrageenan model. Anti-inflammatory effects of plants were monitored every hour after carrageenan injection. These results were also comparable to Indomethacin, the reference drugs used in this study. In antipyretic activity paracetamol is used as reference drug. Result showed that the methanolic extract collected from the Ukhimath (100mg/kg body wt) showed better result as compared to Haldwani extracts, which might be because of climatic, edaphic and genetic variation.

INTRODUCTION

Turmeric (*Curcuma longa* L.) is a rhizomatous herbaceous perennial plant of the ginger family, Zingiberaceae. It is native to tropical South Asia but is now widely cultivated in the tropical and subtropical regions of the world. In Hindi it is commonly known as 'Haldi'. In Ayurveda medicine, turmeric is primarily used as a treatment for inflammatory conditions and in traditional Chinese medicine, it is used as stimulant, aspirant, carminative, cordeal, emenagogue, astringent, detergent, diuretic and martirnet (Remadevi *et al*., 2007). The turmeric contains curcumin as the active ingredient, which is a yellow coloured phenolic pigment obtained from the powdered rhizome of *Curcuma longa* L. in the crude extracts of *Curcuma longa* L. about 70-76 % curcumin is present, along with about 16% demethoxycurcumin and 8% bisdemethoxycurcumin (Cooper *et al*., 1994). Recent studies have demonstrated a wide spectrum of therapeutic effects, such as anti-inflammatory and antioxidant (Menon and Sudheer, 2007), antitumor (Bisht *et al*., 2007), antibacterial (Negi *et al*., 1999), antiviral (Bourne *et al*., 1999), anti-spasmodic (Itthipanichpong *et al*., 2003), immunomodulation (Gautam *et al*., 2007) and hepatoprotective (Park *et al*., 2000). Knowing that plants have a large number of chemical substances, which have several pharmacological actions, we studied the anti-inflammatory and antipyretic studies of methanolic extracts of turmeric rhizome collected from two different regions of Uttarakhand (hill and plain region).

Corresponding author: Om Prakash,
Department of Chemistry, College of Basic Science and Humanities, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, 263145 India.

MATERIALS AND METHODS

Plant material: The rhizomes of turmeric was collected from two different regions, one from higher altitude place Ukhimath, district Rudraprayag and another one from plain region place Haldwani, district Nanital. All the samples were washed thoroughly under tape water, sliced, air dried, ground to fine powdered and dipped in methanol.

Animals: Total 6 groups of 6 mice in each group were selected to evaluate the anti-inflammatory and Antipyretic activities of extracts of *Curcuma longa* (L.).The experiments were carried out with two concentrations of extracts (50mg/kg and 100mg/kg body wt). Indomethacin and paracetamol, were

used as standard drugs for different activities and saline water used as control and administered orally to mice in the experiment.

Actue Anti-inflammatory Activity

The method of (Henriques *et al.,* 1987) was used for the assessment of anti-inflammatory activity of the extracts (50 and 100 mg/kg). Actute inflammation was induced by injection of carrageenean (0.1 ml, 1% w/v in saline) into the subplantar tissue of the right hind paw 1h after oral administration of the drug. The paw volume was measured by plethysmometer (UGO Basile, Italy) at 1, 3 and 24h after the carrageenan injection. Indomethacin suspension at a dose of 10mg/kg orally was used as the standard anti-inflammatory drug. The reduction in the volume displacement of hind foot in comparison to control was taken as anti-inflammatory effect.

Antipyretic activity

To evaluate the antipyretic activity of test compounds, pyrexia was developed by using yeast as per method (Rao *et al.,* 1997). A thermistor probe was inserted in to the rectum after restraining the mice to record the basal body temperature. The animals were then given a subcutaneous injection of 10ml/kg of 20% suspension of Brewer's yeast *(Sacchromyces cerevisiae)*. The mice were allowed to remain quiet in the cage for 18hr. within this period, animals developed 0.5˚C or more rise in the body temperature. At nineteenth hour, the rates were again restrained to record their rectal temperature. Immediately, 0.1ml/10gm of the extracts used for the experiments in the doses of 50 and 100mg/kg and standard drug, paracetamol (33mg/kg) were administered orally. Control group was given 0.2ml normal saline. Temperature was recorded at hourly interval in all the mice up to 3hr. percentage reduction in rectal temperature was calculated by considering the total fall in temperature to normal level as 100%.

$$\% \text{ Reduction} = \frac{(B - C)}{(B - A)} \times 100$$

Where: A= normal temp, B= Pyrexia temp, C= temp at hourly interval

Statistical analysis

Data were expressed as the mean ± SEM. The data were analyzed using one way analysis of variance (ANOVA) followed by Dunett's test. Data were considered different at significance level of $p < 0.05$. The test has been done using SPSS version 16.0.

RESULTS AND DISCUSSION

Acute anti-inflammatory assay

Edema formation in paw is the result of a synergism between various inflammatory mediators that increase vascular permeability and/or the mediators that increase blood flow (Italenti *et al.,* 1995). Carrageenan- induced paw edema is widely used for determining the acute phase of inflammation. Carrageenan is the phlogistic agent of choice for testing anti-inflammatory drugs as it is not known to be antigenic and is devoid of apparent systemic effects. Histamine, 5-hydroxytryptamine and bradykinin are the first detectable mediators in the early phase of carrageenan-induced inflammation (Di Rosa and Willoughly, 1971), whereas prostaglandins are detectable in the late phase of inflammation. In our study, the saline treated control mice, the paw volume was not inhibited. When compared with control, methanolic extracts of *Curcuma longa* collected from Ukhimath (SP-1) and Haldwani (SP-2) revealed some extent of anti-inflammatory activity against the carrageenan induced paw edema. Ibuprofen, at the dose of 40mg/kg body weight exhibited significant ($P < 0.05$) oedema inhibition (39.13% at 24 hrs).

Table 1. Acute anti-inflammatory activity of extracts of *Curcuma longa* collected from Ukhimath (SP-1) and Haldwani (SP-2) (Mean±SE, n=6)

Group	Treatments	Dose (mg/kg)	Change in Paw thickness			% inhibition	
			0 hrs	4 hrs	24 hrs	4 hrs	24 hrs
1	Control	0.2 ml	2.35±0.04	2.33±0.03	2.3±0.03	0.85	2.12
2	Ibuprofen	40	2.30±0.02	1.75[a]±0.04	1.4[ab]±0.04	23.91	39.13
3	SP-1	50	2.26±0.02	1.72[a]0.01	1.52[ab]±0.02	23.89	32.74
4		100	2.29±0.03	1.7[a]±0.03	1.5[ab]±0.03	29.76	35.50
5	SP-2	50	2.18±0.04	1.9[ab]±0.04	1.63[ab]±0.03	12.84	25.22
6		100	2.36±0.03	1.87[ab]±0.02	1.59[ab]±0.02	20.76	32.63

(one way ANOVA followed by dunetts multiple comparison test) [a] = significant (P<0.05) as compared to control, [b] = significant (P<0.05) as compared to drug
SP-1= Sample collected from Ukhimath, SP-2= Sample collected from Haldwani

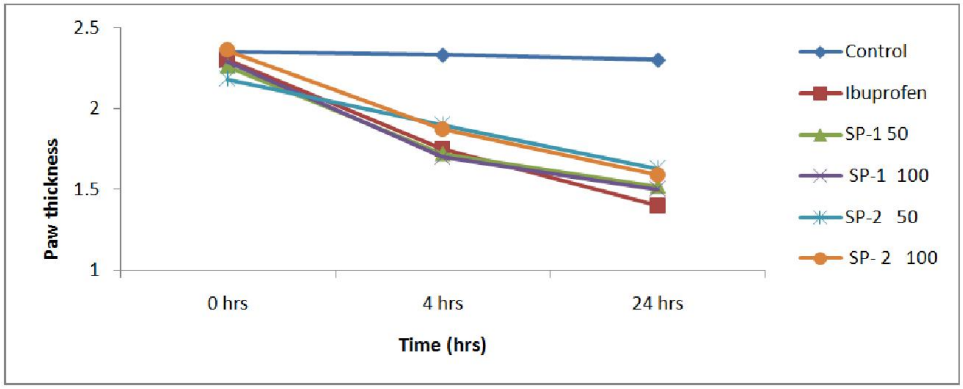

Fig 1. Acute anti-inflammatory activity of extracts of Curcuma longa collected from Ukhimath (SP-1) and Haldwani (SP-2)

Table 2. Antipyretic activity of methanolic extracts of *Curcuma longa* collected from Ukhimath (SP-1) and Haldwani (SP-2)

Groups	Treatments	Dose mg/kg body wt.	Body temp. before administration of drug (˚C)		Body temp. before administration of drug (˚C)			
			-18 hrs	0 hrs	1 hrs	2 hrs	3hrs	6hrs
1	Control	0.2ml	37.45±0.02	38.61±0.03	38.79±0.02	38.72±0.03	38.7±0.01	38.66±0.03
2	Paracetamol	33	37.34±0.01	38.6±0.05	37.54±0.03 [a] (84.13%)	37.48±0.03 [a] (88.88%)	37.46±0.02 [a] (90.48%)	37.38±0.02 [a] (96.83%)
3	SP-1	50	37.36±0.03	38.66±0.03	37.77±0.02 [ab] (72.36%)	37.68±0.02 [ab] (79.67%)	37.47±0.02 [a] (91.54%	37.35±0.02 [a] (100.00%)
4		100	37.31±0.02	38.65±0.02	37.67±0.01 [ab] (73.13%)	37.66±0.03 [ab] (79.85%)	37.41±0.04 [a] (92.53%)	37.30±0.01 [a] (100.00%)
5	SP-2	50	37.27±0.02	38.63±0.04	37.74±0.02 [ab] (65.44%)	37.71±0.01 [ab] (67.65%)	37.44±0.04 [a] (87.50%)	37.29±0.04 [a] (98.53%)
6		100	37.26±0.03	38.64±0.02	37.68±0.02 [ab] (69.57%)	37.7±0.01 [ab] (68.12%)	37.4±0.02 [a] (89.86%)	37.27±0.01 [a] (99.28%)

(one way ANOVA followed by dunetts multiple comparison test), [a] = significant (P<0.05) as compared to control
[b] = significant (P<0.05) as compared to drug, SP-1= Sample collected from Ukhimath, SP-2= Sample collected from Haldwani

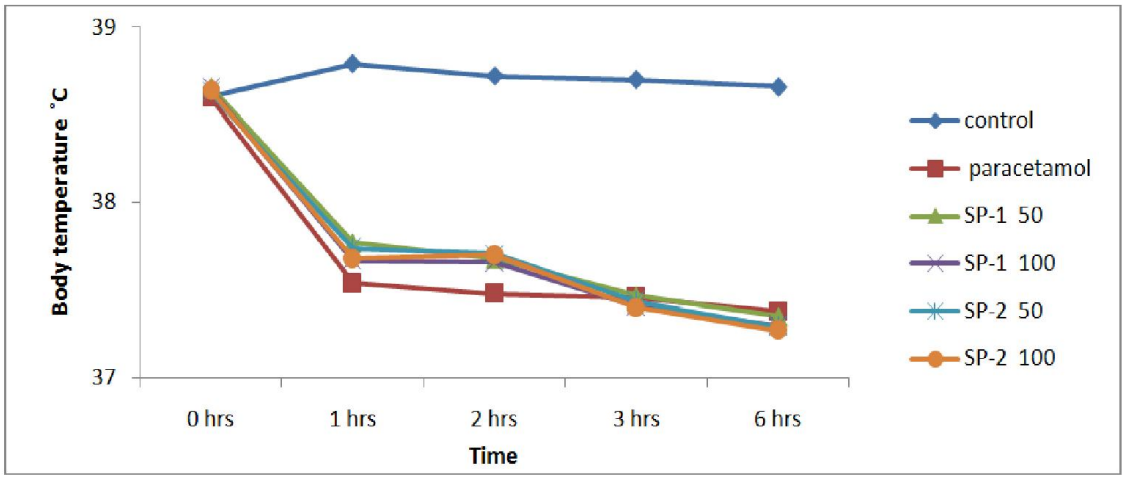

Fig. 2. Antipyretic activity of methanolic extracts of *Curcuma longa* collected from Ukhimath (SP-1) and Haldwani (SP-2)

Methanolic extracts at doses of 50 and 100 mg/kg body weight also possessed significant (P<0.05) inhibitory effect on carrageenan induced paw oedema. Persual of Table 1 and Fig. 1 revealed that the anti-inflammatory effect of SP1 and SP2 was dose dependent with minimum at 50 and maximum at 100 mg/kg body wt.

The development of oedema in the mice hind paw following the injection of carrageenan has been describe as a biphasic, age-weight dependent agent by the release of histamine, serotonine and bradykinin which act as mediators in the early phase of carrageenan-induced inflammation and Prostaglandins are involved to increase vascular permeability in the late phase of inflammation. This study showed that all the doses of turmeric rhizome extracts effectively suppressed the inflammation by inhibiting the cyclooxygenase synthesis which is nearly similar to anti inflammatory drug Ibuprofen, whose mechanism of action is inhibition of the cyclooxygenase enzyme.

Antipyretic activity

The results of the antipyretic activity of the methanolic extracts of *Curcuma longa* collected from different places are presented in Table 2 and Fig 2. Administration of the yeast to the mice produced significant increase in rectal temperature 18hrs after yeast injection. All the extracta showed antipyretic effect like the reference drug Paracetamol.

However, methanolic extract of *Curcuma longa* collected from Ukhimath (Rudraprayag) showed the maximum reduction in increased temperature (73.13%) at dose of 100mg/kg after 1hour. All the samples revealed significant (p<0.05) antipyretic effects in a dose dependent manner. The maximum pyrexia inhibition was observed at 6 hrs. Both the extracts showed intense effects like the reference drug paracetamol in 1hour (72.36%, 73.13%, 65.44% and 69.57%). In 6th hour, all the extracts showed better activity than the reference drug Paracetamol but in 3rd hour only extracts of sample SP-1 showed better activity than the reference drug**.** Like paracetamol, all extracts showed significant antipyretic activity throughout the period of six hour. Previous study corroborate that the increase in the body temperature intensified the lipid peroxidation process which indicates that pyrexia is associated with increased oxidative stress. The antioxidant supplementation decreased the lipid peroxidation processes (Brzezinska and Slebodzinska, 2001).

Conclusion

The herbal preparations used in India traditional medicine can be important to understand their use in the past as well as nowadays. Knowing that plants have a large number of chemical substances, which have several pharmacological actions, we studied the anti-inflammatory and antipyretic studies of methanolic extracts of turmeric rhizome. Result showed that the methanolic extract collected from the

Ukhimath (100mg/kg body wt) showed better result as compared to Haldwani extracts, which might be because of climatic, edaphic and genetic variation.

REFERENCES

Bisht, S., Feldmann, G., Soni, S., Ravi, R., Karikar, C., Maitra, A., Maitra, A., 2007. Polymeric nanoparticle-encapsulated curcumin ("nanocurcumin"): a novel strategy for human cancer therapy. *J. Nanobiotechnology,* 5: 3.

Bourne, K.Z., Bourne, N., Reising, S.F., Stanberry, L.R., 1999. Plant products as topical microbicide candidates: assessment of in vitro and in vivo activity against herpes simplex virus type 2. *Antiviral Res.,* 42:219-226.

Brzezinska-Slebodzinska, E. 2001. Fever induced oxidative stress: The effect on thyroid status and the 5'-mono deiodinase activity, protective role of Selenium-vitamin E. *J. Physiol. Pharmacol.*, 52: 275-284.

Cooper, T.H., Clark, J.G., Guzinski, J.A., In: Ho, C.T., Osawa, T., Rosen, T., (Eds.) Food Phytochemicals for Cancer Prevention IIteas, spices and herbs. American Chemical Soeity: Washington DC, 1994; 23: 231-6).

Di Rosa, M. and Willoughby, D.A., 1971. Screens for anti-inflammatory drugs. J. Pharm. Pharmacol. 23, 297-298.

Gautam, S.C., Gao, X., Dulchavsky, S., 2007. Immunomodulation by curcumin. *Adv. Exp. Med. Biol.,* 595:321-41.

Henriques, M.G., Silva, P.M., Martins, M.A., Flores, C.A., Cunha, F.Q., Assreuy-Filho, J. and Corderio, R.B. 1987. Mouse paw oedema: A new model for inflammation. *Braz J Med Biol Res.*, 20: 243-249.

Italenti, A., Ianaro, A., Moncada, S. and Di Rose, M. 1995. Modulation of acute inflammation by endogenous nitric oxide. *Eur. Journal of Pharmacol.*, 211(2), 177-182.

Itthipanichpong. C., Ruangrungsi, N., Kemsri, W., Sawasdipanich, A., 2003. Antispasmodic effects of curcuminioids on isolated guinea pig ileum and rat uterus. *J. Med. Assoc.Thai.,* 86: 299-309.

Menon, V.P. and Sudheer, A.R., 2007. Antioxidant and anti-inflammatory properties of curcumin. *Adv Exp Med Biol.,* 595: 105-25.

Negi, P.S., Jayaprakasha, G.K., Jagan Mohan, Rao, L., Sakkariah, K.K., 1999. Antibacterial activity of turmeric oil: a byproduct from curcumin manufacture. *J. Agric. Food Chem.*, 47:4297-4300).

Park, E.J., Jeon, C.H., Ko, G., Kim, J., Sohn, D.H., 2000. Protective effect of curcumin in rat liver injury induced by carbon tetrachloride. J. Pharm. Pharmacol. 52:437-440.

Rao, R.R., Babu, R.M., Rao, M.R.V. and Babu, M.G.V. 1997. Studies on antipyretic, analgesic and hypoglycemic activities of root of *Gynandropsis gynandra Linn.* Ind. Drugs. 34(12), 690-694.

Ravindran, P.N., Nirmal Babu, K. and Sivaraman, K. 2007. Turmeric: The genus Curcuma (Medicinal and Aromatic Plants - Industrial Profiles), Publisher: CRC, 1 edition.

Remadevi, R., Surendran, E., Kimura, T. 2007. Turmeric in Traditional medicine. In Turmeric: the genus Curcuma, Ravindran, P. N., Nirmal Babu, K., Sivaraman, K., Eds. CRC Press: Boca Raton, London, New York, pp. 409-436.

****