



ANALGESIC EFFICACY OF METHANOLIC EXTRACT OF *ACTINIOPTERIS RADIATA* (SW.) L. IN ALBINO MICE

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ABSTRACT

Actiniopteris radiata is an important medicinal plant, used in traditional medicines for the treatment of various diseases. In the present study, analgesic activity of the methanolic extract of *Actiniopteris radiata* was investigated. The methanolic extract of *Actiniopteris radiata* were ingested orally in the form of suspension in two different doses 175 mg/kg and 300 mg/kg body weight. The analgesic effect of *Actiniopteris radiata* was tested in mice by Acetic Acid Induced Writhing (AAIW) and Eddys Hot Plate (EHP) method, results were compared with the standard (pentazocin 5 mg/kg). The results showed significant inhibition of number of writhing in AAIW and jumping, licking responses in EHP method. The results indicate that the extracts could possess analgesic properties and it can be suggested that methanolic extract of *Actiniopteris radiata* can be used in the management of painful conditions.

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INTRODUCTION

Actiniopteris radiata (SW.) L. is an terrestrial fern. It belongs to the Pteridaceae family (RRCBI-15005). It is found throughout India, especially the peninsula, in dry rocky places, below 4,000ft. The plants 8-25cm high rooting in the crevices of rocks or in between the joints of bricks walls in moist and shady places. The plant contains several chemical constituents like hentricontane, hentriacontanol, β -sistosterol, quercetin-3-rutinoside, β -sistosterol, palmitate, β -sistosterol-D-glucoside, alkaloids, glycosides, flavonoids, tannins, phenols (Taneja and Tiwari, 1974; Taneja and Tiwari, 1972). The plant is claimed to possess antifertility, styptic, anthelmintic, anti-tubercular activity (Wealth of India, 2006), antihistaminic and anticholinergic activity (Vivek and Gautam, 2011), wound healing activity (Taneja and Tiwari, 1974), antimicrobial activity (Naik and Jadage, 2010; Reddy et al., 2008).

Pain is an unpleasant sensation and it is one of the main health problem of the world's population. Many drugs are used to relieve the pain, drugs like morphin (Brune, 1990), aspirin (Willele et al., 1987) have been significantly used but, their prolonged use may cause side effect (Cena et al., 2003). Consequently, there is a need to develop the natural remedies for the treatment with minimum side effects.

The use of natural remedies for the treatment of painful conditions have long history starting with Ayurveda, Unani, Siddha, till today and the world health organization estimates that about 80% of the population depend on plants for primary health care (De Silva, 1997).

Some work on analgesic activity of *Actiniopteris radiata* has been done (Naik and Jadge, 2010), but there were no reports on the methanolic extract of *Actiniopteris radiata*, hence an attempt has been made in the present study to investigate the analgesic effect of the *Actiniopteris radiata* collected from Gulbarga region.

MATERIALS AND METHODS

Plant material- The whole plant materials were collected from Gulbarga region in the month of September and authenticated at National Ayurveda Dietetics Research Institute, Bangalore.

Extraction- The whole plant materials were washed shade dried and powdered. The weighed quantity of dried powder was subjected to Soxhlet extraction by using methanol and obtained extract were dried and stored at 30^oC for further use.

Animals- Albino mice weighing between 20- 25g were selected for the analgesic activity were maintained under hygienic conditions according to the guidelines of Institutional Animal Ethics Committee and all the animals were fed with standard pellet food (VRK, Nutritions Ltd, Pune).

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Experimental design

- Group 1 - Control
- Group 2 - Standard/pentazocin (5 mg/kg)
- Group 3 – 175 mg/kg (Methanolic Extract of *Actinopteria radiata*)
- Group 4 – 300 mg/kg (Methanolic Extract of *Actinopteria radiata*)

Acetic Acid Induced Writhing Method

The methanolic extract was evaluated for its analgesic activity by acetic acid induced writhing model (Gerhard, 1997; Siegund *et al.*, 1957, Reddy *et al.*, 2007) injected with volume of 1% v/v acetic acid (1 ml/100 mg of body weight of the animal). Albino mice (20 to 25 gm) were divided into four groups each consisting of six animals. Group one served as control, Group second served as standard (Pentazocin 5 mg/Kg BW ip), Group third receives methanolic extract (175 mg/kg BW) and the fourth Group received methanolic extract (300 mg/kg) of *A. radiata*. The writhing movements were observed and counted for a period of 15 minutes after acetic acid administration. The mean writhing scores in control, extracts and pentazocin treated groups were calculated. The % inhibition in writhing was calculated by the following formula

$$\% \text{ Inhibition in writhing} = \frac{\text{Average writhing in control} - \text{Average writhing in test}}{\text{Average writhing in control}} \times 100$$

Eddys Hot Plate Method

The method as described by Turner, 1965 was adopted. Mice were divided into 4 groups of six animals each and drug treatments were given as, Group -1 served as a control, only water and food is provided, Group-2 as standard [Pentazocin 5 mg/kg], Group- 3 Methanolic Extract of *A. radiata* 175 mg/kg, and for Group- 4 Methanolic Extract of *A. radiata* at 300 mg/kg is administered. Animals were placed on the Eddy’s hot plate maintained at 55±10 °c. The reaction time in control and treated animals was recorded at 0, 30, 60, 120, 240 minutes.

Statistical Analysis

The data was subjected to statistical analysis (One way ANOVA) using the software InStat Graph Pad version 4.0 and the values are expressed as mean ± SEM. Data represent average of three replicates. Values (Mean ± SD) in a column followed by the same letter are not significantly different (P > 0.05).

RESULTS

Acetic Acid Induced Writhing: The effect of Methanolic Extract of *A. radiata* on Acetic Acid Induced Writhing in mice is presented in Table 1.

Table 1 Analgesic effect of methanolic extract of *Actinopteria radiata* by Acetic acid induced writhing method

Groups	Dose mg/kg	Mean writhing	Percentage inhibition of writhing
		15 min	
Group-1	Control	45.23±2.45	-
Group-2	Pentazocin 5 mg/kg	0.00	100
Group-3	MEAR 175 mg/kg	8.81±2.21*	80.93
Group-4	MEAR 300 mg/kg	3.21±1.21**	93.33

Data represent average of three replicates. Values (Mean ± SD) in a column followed by the same letter are not significantly different (P > 0.05). p* <0.05, p** <0.01, p*** <0.001 and p> 0.05. MEAR-Methanolic Extract of *Actinopteria radiata*.

In Acetic Acid Induced Writhing model the extract showed 80.93% and 93.33 % inhibition of writhing response at 175 mg/kg and 300 mg/kg respectively. The results were found to be significant in comparison to the control.

Eddys Hot Plate: The results of analgesic activity by Eddys Hot Plate Method were given in Table 2.

Table 2 Analgesic effect of methanolic extract of *Actinopteria radiata* by Eddys hot plate method.

Groups	Dose mg/kg	Reaction time				
		0 min	30min	60min	120min	240min
Group1	Control	4.1±0.02	4.2±0.01	4.2±0.01	4.1±0.02*	4.1±0.02
Group2	Pentazocin 5mg/kg	3.4±0.02	3.8±0.02***	4.8±0.02**	6.3±0.02**	5.3±0.02**
Group3	MEAR 175mg/kg	3.3±0.00	3.4±0.00***	4.1±0.01***	5.1±0.03***	4.8±0.03***
Group4	MEAR 300mg/kg	3.3±0.01	3.6±0.04***	5.0±0.04***	7.8±0.04***	7.1±0.04***

Data represent average of three replicates. Values (Mean ± SD) in a column followed by the same letter are not significantly different (P > 0.05). p* <0.05, p** <0.01, p*** <0.001 and p> 0.05. MEAR- Methanolic Extract of *Actinopteria radiata*.

The reaction time of Group -1 (control) at 0, 30, 60, 120 and 240 min were 4.1±0.02, 4.2±0.01, 4.2±0.01, 4.1±0.02 and 4.1±0.02. The mean values of Group-2 (standard) at 0, 30, 60, 120 and 240 min were 3.4±0.02, 3.8±0.02, 4.8±0.02, 6.3±0.02 and 5.3±0.02. The mean values of Group-3 (175mg/kg) at 0, 30, 60, 120 and 240 min were 3.3±0.00, 3.4±0.00, 4.1±0.01, 5.1±0.03 and 4.8±0.03. The mean values of Group-4 (300mg/kg) at 0, 30, 60, 120 and 240 min were 3.3±0.01, 3.6±0.04, 5.0±0.04, 7.8±0.04 and 7.1±0.04 respectively.

DISCUSSIONS

In the present study, methanolic extract of *Actinopteria radiata* was used for its analgesic activity and the results showed significant analgesic effect on both the models.

In the Acetic Acid Induced Writhing Method, writhing responses decreased as the dose of plant extract increased and in Eddys Hot Plate method also number of jumping and licking responses in mice decreased as the dose of the extract increased, in EHP method effect is observed after the treatment but remarkable changes were observed after 120 min of treatment when compared to 30, 60, 240 min. The results of AAIW and EHP method were relatively similar with the standard group. Statistical analysis showed that the methanolic extract of *Actinopteria radiata* has significant inhibition in number of writhing in AAIW method when compared to control group. It has been reported that maximum inhibition was observed in the aqueous extract (300 mg/kg) 100% inhibition and in the ethanolic extract (300 mg/kg) 95.24% inhibition is observed (Naik and Jadge, 2010), from the results of the present investigation the rate of inhibition in the methanolic extract (300 mg/kg) was 93.33% and it is approximately similar to the results of ethanolic extract of previous report. And significant inhibition in number of jumping and licking responses were observed when compared to standard at both the tested concentrations similarly observed in EHP method. In both the methods noticed responses as the dose of the extract increased. It has been reported that alkaloids, flavonoids, sterols and tannins have a significant role in analgesic activity (Ferro *et al.*, 2005; Rehman, 2012; Zulfiker *et al.*, 2010) and preliminary screening of the

Actiniopteris radiata shows the presence of alkaloids, flavonoids, steroids and tannins (Taneja and Tiwari, 1974; 1972) and these plant metabolites may be responsible for the analgesic property. Therefore, results obtained by the study suggests that the methanolic extract of *Actiniopteris radiata* might relieve the pain in differed concentrations in normal conditions.

CONCLUSIONS

The results indicate that the extracts could possess analgesic properties. All these effects and the changes in the behavioral activities could be suggested as contributory effects to use methanolic extract of *A. radiata* in the potential management during painful conditions. Present investigation reveals that the methanolic extract of *A. radiata* is capable of inhibiting the painful conditions. This is likely to be the focus of the forthcoming studies and it needs further evaluation to trace the biomolecular mechanism of *A. radiata*.

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