EXPERIMENTAL EVALUATION OF ETHANOL EXTRACT OF CURCUMA CAESIA ROXB. ON LOCOMOTOR AND LEARNING BEHAVIOUR

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ABSTRACT

Curcuma caesia Roxb. belongs to the family Zingiberaceae. Fresh and dried Curcuma caesia rhizomes in traditional system of medicine are used in treating wound healing, infections, leukoderma, fever, asthma, cancer, piles, bronchitis, ulcer, bruises etc. In current study curcuma caesia was evaluated for locomotor, memory and learning behavioral activities in mice. The effects of the drug were assessed on its exploratory behaviour using head dip apparatus. Learning behavioral activity was performed using stationary rod. Plant extract in different doses (150 and 300mg/kg) was administered at 07, 15 and 30 days orally, and observed the effects regarding its antidepressant and anxiolytic activities. In this study, it is considered curcuma caesia is a valuable source of natural products of potential medicinal value. It requires further studies.

KEYWORDS:- Antidepressant, Cage crossing activity, Curcuma caesia, Head dip test, Mood elevation, Stationary rod test.

INTRODUCTION

Curcuma caesia (Roxb.) or black turmeric (Kali haldi) is a perennial herb with bluish-black rhizome, belonging to the family Zingiberaceae. Plant has large tuberous rhizome which is underground and ovoid about 2–6 cm in diameter and covered with adventitious roots (Panchol et al., 2003). Plant rhizomes have aromatic nature. Color of inner portion of the curcuma caesia rhizome is bluish-black that produces a sweet smell that is indicating the presence of essential oil (Pandey and Chowdhary, 2003).

Volatile oil of rhizome contains 30 constituents that is representing the oil (97.48%) with (Z)-ocimene (8.2%), camphor (14%–28.3%), curcumene (2.82%), ar-curcumene (6.8%), borneol (4.4%), 1, 8-cineole (5.3%), 1, 8-cineole (27%–48%), ar-turmeone (12.3%), elemene (4.8%), bornyl acetate (3.3%) (Pandey and Chowdhary, 2003) as well as ocimine (15.66%), zingiberol (12.60), total phenol, flavonoids, alkaloids and soluble protein (Sarangthem and Haokip, 2010), alpha-pinene, isofuranodienone, zingiberene, starch and furanodienone.

Medicinal uses of the curcuma caesia arise from the bioactive constituents such as curcuminoids exhibit free radical scavenging property (Song et al., 2001), flavonoids and phenolic compounds are responsible for multiple biological effects including anti-inflammatory, anti-carcinogenic etc (Miller, 1996), oleoresins from these species (most of which are unutilized) would have good potential of anti-bacterial agent (Rajamma et al., 2012), curcuminoids are responsible for wound healing, hypoglycemic, anti-microbial activities (Chatopadhyay et al., 2004) and essential oil of plant rhizome has been known for its antifungal activity (Banerjee and Nigam, 1976).

It has anti-oxidant (Chirangini et al., 2004; Jayaprakasha et al., 2010), anti-leprosy (Israr et al., 2012), analgesic and antipyretic (Kaur et al., 2013), anti-coagulant (Trivedi, 2003), anti-cancer (Symkumar and Sasikumar, 2007), anti-asthmatic (Paliwal et al., 2011), anti-emetic (Ravindran et al., 2007), muscle relaxant property (Karmakar et al., 2011) and anti-ulcer properties (Das et al., 2012).

MATERIALS AND METHODS

Extract preparation: The rhizome of Curcuma caesia was collected for soaking in ethanol for ten days and ethanol was filtered. Extract of Curcuma caesia was collected by means of evaporation of the mixture and thick concentrated mass was achieved. The concentrated mass of curcuma caesia was used for locomotor and learning behavioral activities.

Animals: Healthy adult albino mice weighing 25-30 g were used in present study. Animals divided into three groups each containing six animals. Group-I: treated with 0.1ml (p.o) normal saline served as control. Group-II: treated with 150 mg/kg (p.o) plant extract served as treated group. Group-III: treated with 300 mg/kg (p.o) plant extract served as treated.

Housing: The mice were housed two per cage under an alternate 12 h light: dark cycle at temperature (25 ± 2°C) and humidity (45 to 55%) controlled environment at the department of Pharmacology, University of Karachi with free access to food and water.
Methods

Locomotor activity by cage crossing method: Locomotor activity of plant extract was determined by using cage crossing test in mice (Nuzhat and Rahila, 2012). The animals were divided into three groups each containing six mice. One served as control group, two groups for extract at doses 150 and 300 mg/kg.

Cage crossing activity: Cage crossing activity (Prut and Belzung, 2003) was used for the locomotor activity in mice. It consisted of a transparent cage measuring about 26cm (h) x26cm (w) x 26cm (l) and by the surrounded walls escaping of the animals was prevented. Albino mice control and other two treated groups were placed in the centre of the cage separately for the period of 10 minutes and count the number of cage crossing (Tahira et al., 2006) after administration of extract of Curcuma caesia at 07, 15 and 30 days of dosing.

Memory and learning behavioral methods: Memory and learning behavior of plant extract were determined by using head dip test and stationary rod test in mice (Nuzhat and Rahila, 2012). The animals were divided into three groups each containing six mice. One served as control group, two groups for extract at doses 150 and 300 mg/kg.

Head dip test: For learning ability and exploration and of the animals, head dip test was used for measuring head-dipping (Kliethermes and Crabbe, 2006). Exploratory box is consisted a wooden board measuring about 35cm x 45cm x 45cm with 10 holes of 2.5cm diameter which are evenly spaced. Albino mice control and treated groups of two different doses were placed separately in an exploratory box for head dipping for 10 minutes. The number of head dips was counted after the administration of extract of Curcuma caesia at 07, 15 and 30 days of dosing at 150 and 300 mg/kg.

Statistical calculations: All results were expressed as average value ± standard deviation. The significance of difference between averages was determined by Newman (1939) and Keuls (1952) test and data obtained from current study was analyzed for P-value <0.01 which was considered significant and P-value <0.001 was considered highly significant, following the one way ANOVA.

RESULTS

Effect on cage crossing activity: Post-hoc analysis by Newman-Keuls test showed that animals at 15 and 30 days of dosing of extract of Curcuma caesia (300 mg/kg) showed highly significant decrease in number of crossing of cage, i.e., 35 ± 9.71 and 32 ± 8.23 respectively in comparison to control animals group, i.e., 76 ± 8.36 (Fig. 1). Animals after dosing of extract of Curcuma caesia (300 mg/kg) at 07 days showed non-significant decrease in number of crossing of cage, i.e., 56 ± 9.45 in comparison to control animals.

Result showed that animals at 15 and 30 days of dosing of extract of Curcuma caesia (150 mg/kg) showed significant decrease in number of crossing of cage, i.e., 45 ± 7.74 and 36 ± 2.33 respectively in comparison to control animals group, i.e., 76 ± 8.36. Animals after dosing of extract of Curcuma caesia (150 mg/kg) at 07 days showed non-significant decrease in no. of crossing of cage, i.e., 68 ± 7.42 in comparison to control animals (Fig. 2).

Results showed that the number of crossings of cage due to the extract of Curcuma caesia (300 mg/kg) group after 15 and 30 days of dosing was significantly not lower than 150 mg/kg of dosing.

Effect on head dip test: Results showed that animals after dosing of extract of Curcuma caesia (300 mg/kg) at 30 days of dosing showed significant decrease in number of head dips, i.e., 21 ± 4.23 in comparison to control animals group, i.e., 43 ± 2.11. Animals at 15 days of dosing of extract of Curcuma caesia (300 mg/kg) showed significant decrease in number of head dips, i.e., 27 ± 3.43 in comparison to control animals. Animals after dosing of extract of Curcuma caesia (300 mg/kg) at 07 days showed non-significant decrease in number of head dips, i.e., 36±5.23 in comparison to control animals (Fig. 3).

Post-hoc analysis by Newman-Keuls test shows that animals after dosing of extract of Curcuma caesia (150 mg/kg) at 15 and 30 days of dosing showed significant decrease in number of head dips, i.e., 29 ± 1.24 and 25 ± 3.63 respectively in comparison to control animals group, i.e. 43 ± 2.11. Animals after dosing of extract of Curcuma caesia (150 mg/kg) at 07 days showed non-significant decrease in no. of head dips, i.e., 40 ± 2.26 in comparison to control animals group, i.e., 43 ± 2.11 (Fig. 4).
Evaluation of ethanol extract on locomotor and learning behaviour

Effect on stationary test: Post-hoc analysis by Newman-Keuls test shows that animals at 30 days of dosing of extract of *Curcuma caesia* (300 mg/kg) showed highly significant increase in time taken to cross the rod, i.e., 13 ± 2.15 (sec) in comparison to control animals group, i.e., 8 ± 1.25 (sec). Animals at 15 days of dosing of extract of *Curcuma caesia* (300 mg/kg) showed significant decrease in time taken to cross the rod, i.e., 11 ± 1.21 (sec) in comparison to control animals group, i.e., 8 ± 1.25 (sec). Animals after dosing of extract of *Curcuma caesia* (300 mg/kg) at 07 days showed non-significant decrease in time taken to cross the rod, i.e., 8 ± 1.32 (sec) in comparison to control animals group, i.e., 8 ± 1.25 (sec) (Fig. 5).

Post-hoc analysis by Newman-Keuls test shows that animals at 15 and 30 days of dosing of extract of *Curcuma caesia* (150 mg/kg) showed significant decrease in time taken to cross the rod, i.e., 12 ± 1.14 and 13 ± 1.15 (sec) in comparison to control animals group, i.e., 8 ± 1.25 (sec). Animals after dosing of extract of *Curcuma caesia* at 07 days showed non-significant decrease in time taken to cross the rod, i.e., 7 ± 1.32 (sec) in comparison to control animals group, i.e., 8 ± 1.25 (sec) (Fig. 6).
DISCUSSION

Most of the pharmaceutical modern medicines have side and toxic effects and they are expensive. Traditional medicines are potent, effective, and inexpensive and possess lesser side effects (Kumar et al., 2010). *Curcuma caesia* appears to have a wide spectrum of activities against several pathological conditions.

In current study exploratory and locomotor activities were measured by the head dip test. Such experiments are used in the field of behavioral pharmacology. The spontaneous activity of the mice was decreased after long-term dosing of *curcuma caesia*. Decrease number of head dips indicates the reduction locomotion and exploratory behavior in animals. After observing the behavior and results, it suggests that plant has anxiolytic activity because mice is not showing the exploratory activity.

Antipsychotic drugs including typical and atypical decreased the locomotor activity. Brain region amygdala is involved in anxiety and fear responses and also involved in other several neurological disorders like acute state of anxiety (Moya et al., 2011). By the tyrosine modulation or changes in dopamine psychological stress can be reduced and concentrations of nor adrenaline may improve stress (Chen et al., 2009).

For the muscular coordination and locomotor activity, stationary rod test was performed (Griffey et al., 2006). Dopamine plays an important role in movement disorders such as Parkinson disease (Leng et al., 2004). In stationary rod activity experiment animals were passive after long-term dosing of *curcuma caesia*, it could be due to the effect of anxiolytic and it is in accordance to Niimia et al., (2008). In current study there is reduction in muscular coordination and locomotor activity which is responsible the passive behavior and not allowing the animals to reach the other platform of the stationary rod and it is probably due to low level of 5Hydroxytryptophan (5HT). Viggiano et al., (2003), reported that the brain regions striatum and cerebellum are related to the muscular coordination and locomotor activity. Galina and Pavlova (2001) reported that dopamine and 5Hydroxytryptophan are also involved in muscular coordination and locomotor control but the mechanism and effects of both are different in different species of animals as well as increase level of 5Hydroxytryptophan increase the locomotor but since current study shows reduction in locomotor activity it could be due to the decrease level of 5Hydroxytryptophan produced by *Curcuma caesia*.

In cage crossing test, animals were passive as compared to the treated animal group. Muscles relaxant activity of the animals was also observed after administration of *Curcuma caesia*. According to the Radhakrishnan et al., (2001), the muscles strength reduction is due to sedative action of the plant extract and anxiolytic activity which was observed is due to decreased level of 5Hydroxytryptophan. The current study indicates that the decrease level of 5Hydroxytryptophan and increase level of dopamine could be responsible for the reduction in muscles strength. *Curcuma caesia* anxiolytic activity requires further research and investigations so as confirm its use as anxiolytic agent.

REFERENCES


