

TOPICAL ANALGESIC ACTIVITY OF ESSENTIAL OIL EXTRACTED FROM *SPHAERANTHUS INDICUS* (ASTERACEAE)DIPTI KANTA PADHAN^{1*}, PATEL SRIBALLAV¹, MOHANTY ARNABADITYA²¹Department of Pharmacognosy, the Pharmaceutical College, Bijenagar, Odisha, India. ²Department of Pharmacology, the Pharmaceutical College, Bijenagar, Odisha, India. Email: diptikanta.padhan@gmail.com

Received: 08 February 2017, Received and Accepted: 24 February 2017

ABSTRACT**Objective:** The objective of this study was to evaluate the topical analgesic effects of essential oil extracted from *Sphaeranthus indicus* (Asteraceae).**Methods:** The essential oil was extracted from fresh flower of *S. indicus*. Topical ointment containing essential oil was investigated for analgesic activity in rat using hot-plate method. Diclofenac sodium gel was taken as standard drug.**Result:** The analgesic activity of topical preparation was observed in the early phase. The analgesic activity of topical preparation containing 2% *S. indicus* flower essential oil showed significant activity (11.5±0.34 and 11.83±0.40) comparative to standard drug diclofenac sodium (11.83±0.31 and 12.66±0.61) at 90 and 120 minutes of application of drug by hot-plate method (p<0.001).**Conclusion:** Hence, the study validates the traditional use of *S. indicus* to relieve pain.**Keywords:** Analgesic activity, *Sphaeranthus indicus*, Essential oil, Topical ointment.© 2017 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2017.v10i5.17594>**INTRODUCTION**

Pain is defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage [1]." Common drugs for pain relief, such as pentazocine and diclofenac, have been widely used in recent decades [2]. In most instances, these analgesic drugs, particularly opioids and nonopioids analgesic drugs can only relieve 50% of the pain in about 30% of patients [3]. In addition, many of these drugs cause serious side effects. Studies have shown that opiates cause physical dependency, tolerance, and addiction while nonsteroidal anti-inflammatory drugs usually cause gastrointestinal disorders [4].

As a result, people rely on herbal medicines for alternative treatment of pain. Herbal drugs have lesser side effects, easily available and cost effective as compare to synthetic drugs [5].

Sphaeranthus indicus is a well-known folkloric drug in Ayurveda and available at plain and moist land of India [6]. Traditionally, different parts of *S. indicus* uses in various disorders such as bark for piles [7]; root for chest-pains, cough [8]; leaf for worm trouble, cough, dysurea, jaundice [9-12]; specially whole parts of the plant is used to relieve pain and swelling [13-16].

Hence, this study is an attempt to evaluate the topical analgesic activity of essential oil extracted from flower of the plant *S. indicus*.

In these tests, a brief noxious stimulus of short duration is applied, detected by free nerve endings and conducted through conducting neuronal pathways [17]. The hot-plate test method involves higher brain functions and is considered a supraspinally organized response [18].

METHODS**Essential oil extraction**

The plant was collected from Western area of Bargarh District of Odisha, India, in the month of December 2015 and was identified by Botanical Garden, Kolkata, India, Vide Voucher Specimen No:

CNH/TECH – II/2015/24/295. Fresh flowering head of *S. indicus* was subjected to hydrodistillation by Clevenger apparatus for 5 hrs [19].

Preparation of herbal ointment

Ointment base was prepared by taking polyethylene glycol 400 (10%), mannitol (5%), petroleum jelly (65%), and liquid paraffin (20%). Two formulation was prepared contain 1% and 2% essential oil of *S. indicus* flower [20].

Animals

Healthy adult albino rats weighing 150-200 g were used for the experiment study. Animals were maintained at 22-24°C with a 12 hrs light-dark cycle. They were allowed to standard laboratory feed and water. The animals were divided into four groups and each group contains six albino rats. The study protocol was approved by the Institutional Animal Ethics Committee (Registration No. 1376/ac/10/CPCSEA). The experimental procedures were carried out in accordance of the ethical guidelines for investigations of experimental pain in conscious animals [21].

Analgesic activity

The hot-plate method described by AbdAllah *et al.* was carried out to evaluate the analgesic activity of ointment containing essential oil of *S. indicus* flower. A hot-plate test was performed using an electronically controlled hot-plate (Eddy's hot-plate) heated to 53°C (±0.1°C). Each rat of different groups was placed unrestrained on the hot-plate for basal reaction time measurement just before ointment base or drug application considered as zero time. The test group animals were applied with topical ointment (100 mg) at dose of 1% and 2% v/w on the hind paw of the albino rats. Similarly, standard and control group of animals were applied with diclofenac ointment (1.16%) and ointment base as same as test group, respectively. 30 minutes after the drug administration, the ointment remaining on the surface of the skin was wiped off with piece of cotton. Measurements of pain threshold for the treated animals were taken after 0.5, 1, 1.5, 2, 2.5, and 3 hrs after drug application. Latency to lift and licking a hind paw or attempted to jump from the apparatus was recorded for the control and drug-treated

Table 1: Analgesic activity of essential oil of *S. indicus* flower by hot-plate method

Treatment	Time of treatment of the drug in minutes						
	0	30	60	90	120	150	180
Control	4±0.26	3.83±0.31	3.83±0.31	4.16±0.31	4.16±0.31	4.33±0.33	4.33±0.21
Test 1%	4.33±0.21	5.17±0.31	7±0.37*	10.33±0.49**	10.16±0.31**	8.83±0.16*	7.33±0.33*
Test 2%	4.17±0.31	5.33±0.21	8±0.37**	11.5±0.34**	11.83±0.40**	10.67±0.49**	8.67±0.42**
Standard	4.33±0.21	5.33±0.33	8.33±0.33**	11.83±0.31**	12.66±0.61**	11.5±0.56**	8.83±0.31**

n=6; *p<0.05, **p<0.001 values are expressed as mean±SEM. One-way ANOVA followed by Dunnett's t-test, all the groups are compared with control. SEM: Standard error mean, *S. indicus*: *Sphaeranthus indicus*

groups. The cutoff time was 30 seconds to avoid further tissues damage from exposure to hot-plate [22].

RESULTS

The effect of the ointment having essential oil from *S. indicus* flower on animals assayed in the hot-plate changed in doses-dependent manner as well as latency time was observed (Table 1). At time 0 and 30 minutes, no significant antinociceptive effect was observed after the treatment with the essential oil of *S. indicus* flower at both the test doses compared with control. It was observed that the results obtained after 60 minutes of the treated animals with topical ointment 1% (10.33±0.49) and 2% (11.5±0.34) doses increased the basal reaction time significantly. But at 90 minutes, both the test dose of 1% and 2% showed better result compared with control. However, standard diclofenac ointment (1.16%) showed a potent analgesic response after at 60 (8.33±0.33), 90 (11.83±0.31), and 120 (12.66±0.61) minutes of stimuli and increased the basal reaction time significantly as compared to control group.

DISCUSSION

As flowering head of *S. indicus* is used in traditional as analgesic [23]. This study was conducted to validate folkloric uses of the flowers of plant by traditional healer.

Essential oil component is low molecular weight compounds, usually with high lipid solubility. They can penetrate the blood-brain barrier and act in the central nervous system [24]. The hot-plate test characterizes the central analgesic activity of the oil [25]. The results depicted that topical, administration of oil at both doses 1% and 2% significantly showed best activity at 90 and 120 minutes. The hot-plate method is considered to be selective for screening of the compound acting through the opioid receptor [26]. In various studies, the action of volatile oil is attributed to the combined effect of both their active and inactive compounds. The inactive compounds might be influence pharmacokinetics and bioavailability of the active compounds [27]. Further, it is difficult to establish a relationship between oil composition and biological activity, due to the synergistic action between the components [28]. Hence, it appears that the analgesic effect of essential oil from *S. indicus* flower is mainly due to the combined effect of terpenes and sesquiterpenes but not only by the majority constituents [29-31]. The terpenes present in the oil of plant *S. indicus* flower that may responsible for blocking the release of endogenous substances which excite the pain in nociceptive pathway [32].

CONCLUSION

Topical ointment preparation containing essential oil extracted from *S. indicus* flower showed potent analgesic activity at 1% and 2% doses. Further, the study is needed to find out the phytoconstituents responsible for its analgesic activity and its related mechanism.

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