



## AMERICAN JOURNAL OF PHARMTECH RESEARCH

Journal home page: <http://www.ajptr.com/>

### **Preliminary Studies on Anti-Inflammatory and Analgesic Activities of *Jasminum Sambac* (L.) Aiton in Experimental Animal Models**

**Jitendra Bhangale<sup>1\*</sup>, Ravi Patel<sup>1</sup>, Sanjeev Acharya<sup>2</sup>, Khushbu Chaudhari<sup>3</sup>**

1. Smt. N. M. Padalia Pharmacy College, Ahmedabad, Gujarat, India.

2. Institute of Pharmacy, Nirma University, Ahmedabad, Gujarat, India.

3. Poona College of Pharmacy, Bharati Vidyapeeth University, Pune, Maharashtra, India.

#### ABSTRACT

*Jasminum sambac* (L.) Aiton (Oleaceae) is traditionally used as an antinociceptive and anti-inflammatory agent. The objective of this study was to investigate experimentally the possible analgesic and anti-inflammatory properties of *Jasminum sambac*. The effect of petroleum ether extract of leaves of *Jasminum sambac* (PEJS) was evaluated in experimental models of pain and inflammation. The leaf extract at 200 and 400 mg/kg showed significant decrease in acetic acid induced writhings in mice with a maximum of 67.49 % at 400 mg/kg. In tail immersion and hot plate method, treatment with PEJS (200 and 400 mg/kg) showed significant ( $p < 0.001$ ) pain latencies as compared to vehicle treated group of animals. There was a significant ( $p < 0.001$ ) inhibition in carrageenan induced paw edema with PEJS 200 and 400 mg/kg. The anti-inflammatory effects observed with the extract were comparable to that of standard. The present study indicates that the petroleum ether extract of *Jasminum sambac* exhibit significant Antinociceptive and anti-inflammatory activities.

**Keywords:** *Jasminum sambac*, Anti-inflammatory, Analgesic

\*Corresponding Author Email: [jitu2586@gmail.com](mailto:jitu2586@gmail.com)

Received 29 June 2012, Accepted 16 July 2012

Please cite this article in press as: Bhangale J *et al.*, Preliminary Studies on Anti-Inflammatory and Analgesic Activities of *Jasminum Sambac* (L.) Aiton in Experimental Animal Models. American Journal of PharmTech Research 2012.

## INTRODUCTION

Inflammation is the response of living tissue to injury. It involves a complex array of enzyme activation mediator release, extravasations of fluid, cell migration, tissue breakdown and repair<sup>1</sup>.  
<sup>2</sup> Inflammation has become the focus of global scientific research area because of its implication in virtually all human and animal diseases. Modern system of anti-inflammatory drugs (NSAID) have various side effects like tolerance and dependence induced by opiates. Thus, the use of these drugs as anti-inflammatory and analgesic agents have not been successful in all cases<sup>3, 4</sup>. Therefore, new anti-inflammatory and analgesic drugs lacking these side effects are being researched as alternative to NSAID and opiates<sup>3, 5</sup>. Attention is being focused on the investigation of the safety and efficacy of plant based drugs used in traditional medicine because they are economical, have less side effects and according to WHO, about 80% of the world population still rely mainly on herbal remedies<sup>3, 5, 6</sup>. Many indigenous drugs have been claimed to have analgesic and anti-inflammatory effect in Ayurvedic system of medicine but they were not properly investigated.

*Jasminum sambac* (L.) Aiton; Family: Oleaceae; Synonym: *Nyctanthes sambac* L., *Nyctanthes undulata* L.). It is also known as Mogra (Hindi and Marathi), Sampaguita (Spanish), Juhi Mahli (Oriya), Mallepuvvu (Telugu), Mallikaipu (Tamil), Dundu Mallige (Kannada), Kaliyan (Urdu), Pikake (Hawaiian), Sampaguita (Philippines), Yasmin (Persian), Mo li hua (Transcribed Chinese), Jasmin d'Arabie (French) and Bogarim (Portuguese). It is native to southwestern, southern and southeastern Asia especially in India and Myanmar. It is also distributed and cultivated more or less throughout Srilanka, Pakistan, Nepal, Malaysia, China, Indonesia, France, Spain, Hawaii and tropical Australia. It is also widely cultivated in other parts of the world<sup>7, 8</sup>.

The traditional use of this plant suggests analgesic, antidepressant, anti-inflammatory, antiseptic, aphrodisiac, sedative, expectorant, anti-spasmodic, galactagogue and tonic (uterine) effects. Essential oil of *Jasminum sambac* (L.) Aiton is used as fragrance for skin care products.

Leaves and flowers are used as antipyretic and decongestant; roots as analgesic. In India, it is traditionally used for skin disorders. The root is used in China to treat headaches, insomnia, and pain due to dislocated joints and broken bones; it is reported to have anaesthetic properties as well. Several *Jasminum* species have been used in cancers<sup>7, 9, 10</sup>. Since no detail scientific data is available regarding the analgesic and anti-inflammatory activity of *Jasminum sambac* (L.) Aiton, therefore the present study was carried out to provide pharmacological evidence for the folklore medicinal consideration of *Jasminum sambac* (L.) Aiton as analgesic and anti-inflammatory.

## MATERIAL AND METHODS

### Collection of plant material

Fresh *Jasminum sambac* (L.) Aiton leaves were collected from local area of Jalgoan district, Maharashtra, India in the months of July-October. This plant was identified and authenticated by Dr. J. Jayanthi, Scientist C & HOD, Botanical Survey of India, Pune. Voucher specimens No. (BSI/WC/Tech./2011/34 (A)) have been kept in Botanical Survey of India, Pune, MH, India.

### Animals:

Adult male Wistar albino rats, weighing between 180 - 220 g and albino mice (25-30 g) were used and acclimatized to laboratory condition for one week. All animals were housed in well ventilated polypropylene cages at 12 h light/dark schedule with  $25\pm 2^{\circ}\text{C}$  and 55-65% relative humidity. The rats had fed with commercial pelleted rats chow and water *ad libitum* as a standard diet. Institutional Animal Ethics Committee approved the experimental protocol in accordance with CPCSEA.

### Preparation of leaf extract

The leaves were collected and dried in shade and ground. Coarsely powdered leaves were used for the study. Coarsely powdered plant material (1000 g) was subjected to successive extraction with petroleum ether ( $60 - 80^{\circ}\text{C}$ ) in a soxhlet extractor at a temperature of  $45-50^{\circ}\text{C}$  to 40 cycles per batch for 2 batches. The extraction was continued until the solvent in the thimble becomes clear indicating the completion of the extraction. After each extraction the solvent was distilled off and concentrated extract was transferred to previously weighed petri dish and evaporated to dryness at room temperature ( $45-50^{\circ}\text{C}$ ) to obtain dried extracts. After completion of drying the petri dish was weighed again. The yield of extract was calculated by subtracting original weight of empty petri dish. The yield was 5.2 g/100 g.

### Preliminary phytochemical studies

Preliminary qualitative phytochemical screening for the identification of the phyto constituents of the petroleum ether extract of *Jasminum sambac* (L.) Aiton has been carried out<sup>11</sup>.

### Acute oral toxicity of the extract

Adult Albino mice (25-30 g) were divided into five groups containing ten mice each. The mice were fasted for 6 h and access only water *ad libitum* before experimental study. Group I received only vehicle (distilled water). Group II, III, IV and V animals received with different doses of petroleum ether extract of *Jasminum sambac* (PEJS) i.e. 1000, 2000, 3000 and 4000 mg/kg respectively. All the doses and vehicle were administered orally. The animals were observed for 72 h for mortality<sup>12</sup>.

## Antinociceptive activity

### Writhing test

Male Swiss albino mice (25-30 g) were divided into five groups containing six animals each as follows Group I: Vehicle control rats received distilled water (10 ml/kg, p.o.), Group II: Indomethacine (10 mg/kg, p.o.), Group III: PEJS (100 mg/kg, p.o.), Group IV: PEJS (200 mg/kg, p.o.), Group V: PEJS (400 mg/kg, p.o.)<sup>13</sup>. All the drug treatments were given 1 hour before i.p. injection of 0.6 % (v/v) acetic acid, at a dose of 10 ml/kg<sup>(14)</sup>. Writhing is a syndrome characterized by a wave of contraction of the abdominal musculature followed by a wave of contraction of hind limbs. The hind limbs contractions that occurred over a period of 10 min were counted. A reduction in time of writhing initiation and number of writhing as compared to the vehicle treated group was considered as evidence for the analgesia.

### Tail immersion test

Mice were divided into five groups of six animals each as follows Group I: Vehicle control rats received distilled water (10 ml/kg, p.o.), Group II: Aspirin (100 mg/kg, p.o.), Group III: PEJS (100 mg/kg, p.o.), Group IV: PEJS (200 mg/kg, p.o.), Group V: PEJS (400 mg/kg, p.o.). The lower 5 cm portion of the tail was immersed in a beaker containing water and temperature maintained at  $55 \pm 0.5^{\circ}\text{C}$ <sup>(15)</sup>. The time in seconds for tail withdrawal from the water was taken as the reaction time, with a cut-off time of immersion set at 10s. The reaction time was measured 1 h before and 0.5, 1, 2, 3, 4 and 6 h after oral administration of drugs<sup>16-17</sup>.

### Hot Plate Method

Mice were divided into five groups of six animals each as follows Group I: Vehicle control rats received distilled water (10 ml/kg, p.o.), Group II: Pentazocine (10 mg/kg, i.p.), Group III: PEJS (100 mg/kg, p.o.), Group IV: PEJS (200 mg/kg, p.o.), Group V: PEJS (400 mg/kg, p.o.). Mice were placed on a hotplate maintained at a temperature of  $55 \pm 1^{\circ}\text{C}$  for a maximum time of 15 s. The time between placement of animal on the hot plate and occurrence of licking of the fore or hind paws, shaking or jumping off from the surface was recorded as response latency. Mice with basal latencies of more than 10 s were eliminated from the study. The testing of response latencies was measured before distraction (basal) and 30, 60 and 90 min. after treatment. The cut off time for hotplate latencies was set at 15<sup>18-19</sup>.

## Anti inflammatory activity

### Carrageenan induced rat paw Oedema

The Wistar rats were starved overnight and divided into five groups of six animals each as follows Group I: Vehicle control rats received distilled water (10 ml/kg, p.o.), Group II:

Diclofenac sodium (10 mg/kg, i.p.), Group III: PEJS (100 mg/kg, p.o.), Group IV: PEJS (200 mg/kg, p.o.), Group V: PEJS (400 mg/kg, p.o.). After selection of animals, 0.1 ml of 1% carrageenan solution was injected into the left hind paw. The pre-treatment time was 1 h before carrageenan injection. The paw volume was recorded immediately and at 1 h, 2 h, and 3 h by using plethysmometer (UGO Basile 7140). Mean increase in the volume of oedema was measured and percentage inhibition was calculated<sup>20-22</sup>.

### Statistical Analysis

The observations were expressed in mean  $\pm$ S.E.M. The difference in response to test drug was determined by one way analysis of variance followed by Dunnett's multiple comparisons test  $P < 0.05$  was considered as significant.

## RESULTS AND DISCUSSION

*J. sambac* (L.) Aiton is the reservoir for many potentially active chemical compounds which acts as drugs for anti-arthritic activity. So this gives strong evidence for the use of plants in different medicines. The petroleum ether extract of *J. sambac* (L.) Aiton showed the presence of alkaloids, flavonoids, glycosides, and steroids as shown in Table 1.

**Table 1: Phytochemical screening of the petroleum ether extract of *J. sambac* (L.) Aiton**

Sr. No.	test	Inference
1	Alkaloids	+ve
2	Flavonoids	+ve
3	Saponins	-ve
4	Tannins	-ve
5	Sterols	+ve
6	Carbohydrates	-ve
7	Test for glycosides	+ve

The PEJS was found to be safe at all doses used and there was no mortality found up to the dose of 4000 mg/kg of PEJS when administered orally. Therefore, we have taken 400 mg/kg as the therapeutic dose and made variations by taking 100 mg/kg as lower dose and 400 mg/kg as higher dose.

The study indicated that petroleum ether extract of *J. sambac* has both peripheral and central analgesic activity. Its peripheral analgesic activity was deduced from its inhibitory effects on chemical (acetic acid, inflammatory phase) induced nociceptive stimuli. *J. sambac* (L.) Aiton significantly reduced writhing and stretching induced by acetic acid. The significant protective effect was dose dependent with 45.68 % ( $P < 0.001$ ), 54.31 % ( $p < 0.001$ ) and 67.49 % ( $p < 0.001$ ) reduction observed for 100, 200 and 400 mg/kg respectively. Indomethacine (100 mg/kg) showed 73.60 % ( $P < 0.001$ ) inhibition as shown in table 2.

**Table 2: Effect of Petroleum ether extract of *J. sambac* on acetic acid induced writhing in mice**

Treatment	Dose Mg/kg	No of wriths	% inhibition
Vehicle	10	32.83±1.17	-
Indomethacine	10	8.67±0.42	73.60***
PEJS	100	17.83±0.60	45.68***
PEJS	200	15.00±0.58	54.31***
PEJS	400	10.67±0.61	67.49***

Data was expressed as means ± S.E.M and analysed by one way ANOVA followed by Dunnett's test, n=6, \*\*\*p<0.001

The centrally acting protective effects of the extract were corroborated by the first phase of tail immersion and hotplate test results. The tail immersion test indicated that the pharmacological actions were mediated by mu ( $\mu$ ) opioid receptors rather than kappa ( $\kappa$ ) and delta receptors<sup>23-24</sup>. The reaction time of animal showed a significant increase (p<0.001) with increasing duration (time). Treatment with pentazocine and PEJS (200, 400 mg/kg, p.o.) showed significant (p<0.001) increased pain latencies at 1, 2, 3, 4 and 6 h as compared to vehicle treated group. Treatment with PEJS (100 mg/kg, p.o.) did not increase the duration time as compared to vehicle group as shown in table 3 and pre-treatment of animals with PEJS (200 and 400 mg/kg, p.o.) increased the pain latency in the hotplate test. The increase in the latency response was found to be statistically significant (p<0.01 and 0.001) at 20, 60 and 90 min post treatment. The known centrally acting analgesic drug pentazocine also increased the response latencies at 20, 60 and 90 min. The PEJS (100 mg/kg, p.o.) did not show any significant effect shown in table 4.

**Table 3: Effect of Petroleum ether extract of *J. sambac* on latency period (s) in tail immersion method**

Treat.	Dose mg/kg	Latency period (h)						
		0	0.5	1	2	3	4	6
Vehicle	10	4.44±0.25	4.23±0.20	3.25±0.08	2.74±0.1	2.38±0.09	2.24±0.05	2.17±0.05
Aspirin	100	4.20±0.15	4.99±0.18	5.96±0.11	7.24±0.1	8.41±0.19	9.06±0.08	9.69±0.16
PEJS	100	4.10±0.16	3.53±0.13	3.14±0.08	2.75±0.1	2.69±0.15	2.61±0.09	2.45±0.06
PEJS	200	4.03±0.22	4.45±0.25	5.26±0.23	5.86±0.1	6.30±0.04	6.95±0.06*	7.71±0.10
PEJS	400	4.11±0.10	4.94±0.07	5.78±0.18	6.59±0.1	7.35±0.14	7.97±0.12	8.58±0.11

Data was expressed as means ± S.E.M (% inhibition) and analysed by one way ANOVA followed by Dunnett's test, n=6, \*\*\*p<0.001

**Table 4: Effect of Petroleum ether extract of *J. sambac* on hot plate method in mice**

Treatment	Dose Mg/kg	Pain latency (min.)			
		0	20	60	90
Vehicle	10	10.72±0.55	8.82±0.22	8.12±0.15	7.00±0.12
Pentazocine	10	9.73±0.35	14.72±0.77***	14.30±0.66***	15.20±0.43***
PEJS	100	10.52±0.52	10.02±0.29	8.92±0.12	8.23±0.24
PEJS	200	9.72±0.39	11.37±0.55***	13.93±0.27***	16.23±0.31***
PEJS	400	9.65±0.57	12.42±0.36***	15.05±0.45***	17.17±0.36***

Data was expressed as means ± S.E.M and analysed by one way ANOVA followed by Dunnett's test, n=6, \*\*\*p<0.001

With respect to the writhing test, the research group of Deraedt et al.<sup>25</sup> described the quantification of prostaglandins by radioimmunoassay in the peritoneal exudates of rats, obtained after intraperitoneal injection of acetic acid. They found high levels of prostaglandins during the first 30 min after acetic acid injection. Nevertheless, it was found that the intraperitoneal administration of acetic acid induces the liberation not only of prostaglandins, but also of the sympathetic nervous system mediators<sup>26-28</sup> Thus, the results obtained for the writhing test using acetic acid were similar to those obtained for the edematogenic test using carrageenan, since PEJS (100, 200 and 400 mg/kg, p.o.) was effective in inhibiting the acetic acid induced writhing in mice. Therefore, an anti-inflammatory substance may also be involved in the peripheral analgesic activity.

**Table 5: Effect of Petroleum ether extract of *J. sambac* on carrageenan induced rat paw oedema**

Treatment	Dose Mg/kg	Change in paw vol (h)		
		1	2	3
Vehicle	10	1.38±0.024	1.43±0.029	1.49±0.022
Diclofenac sodium	10	1.32±0.014 (47.46)	1.30±0.014 (67.07)***	1.31±0.012 (70.29)***
PEJS	100	1.36±0.030 (26.31)	1.32±0.023 (58.84)*	1.35±0.025 (57.19)***
PEJS	200	1.38±0.023 (15.78)	1.33±0.019 (54.73)***	1.35±0.020 (57.09)***
PEJS	400	1.37±0.016 (47.368)	1.36±0.015 (62.96)***	1.37±0.016 (67.26)***

Data was expressed as means ± S.E.M (% inhibition) and analysed by one way ANOVA followed by Dunnett's test, n=6, \*\*\*p<0.001 Anesthetic

Carrageenan induced oedema is a multi mediated phenomenon that liberates diversity of mediators. It is believed to be biphasic the first phase (60 min) involves the release of serotonin and histamine while the second phase (over 60 min) is mediated by prostaglandins, the

cyclooxygenase products, and the continuing between the two phase is provided by kinins <sup>29</sup>. Development of oedema induced by carrageenan is commonly correlated with early exudative stage of inflammation<sup>30</sup>

This study has shown that different doses of PEJS (200 and 400 mg/kg) and Diclofenac sodium (10 mg/kg) significantly decreased ( $p < 0.001$ ) carrageenan induced edema at 1, 2, and 3 h as compared to vehicle treated group. PEJS (100 mg/kg, p.o.) show significant effect at 3 h on carrageenan induced rat paw edema as shown in table 5. Since carrageenan induced inflammation model is a significant test for anti-inflammatory agent acting by the mediators of acute inflammation<sup>31</sup>.

## CONCLUSION

The results of this study showed that *J. sambac* can be effective in acute inflammatory disorders. These data validated the traditional uses of this plant to assuage pain resulting from headache, dysmenorrhoea, and toothache as well as inflammatory diseases like gout, rheumatism, cystitis and nephritis.

## REFERENCES

1. Vane JR, Bolting RM. New insights into the mode of action of anti-inflammatory drugs. *Inflamm Res* 1995; 44: 1-10.
2. Perianayagam JB, Sharma SK, Pillai KK. Anti-inflammatory activity of *Trichodesma indicum* root extract in experimental animals. *J Ethnopharmacol* 2006; 104: 410-414.
3. Dharmasiri JR, Jayalcody AC, Galhena G, Liyanage SSP, Ratansooriya WD. Antiinflammatory and analgesic activities of mature fresh leaves of *Vitex negundo*. *J Ethnopharmacol* 2003; 87: 199-206.
4. Park JH, Son KH, Kim SW, Chang HW, Bae K, Kang SS, Kim HP. Anti-inflammatory activity of *synurus deltoids*. *Phytother Res* 2004; 18: 930-933.
5. Kumara NKVMR. Identification of strategies to improve research on medicinal plants used in Shri Lanka. In: WHO Symposium. University of Ruhuna, Galle. Shri Lanka, 2001:12-14.
6. Li RW, Myers SP, Leach DN, Lin GD, Leach G. A cross cultural study anti-inflammatory activity of Australian and Chinese plants. *J Ethnopharmacol* 2003; 85: 25-32.
7. Ghani A. Medicinal Plants of Bangladesh, 1st edition, Dhaka, Bangladesh, The Asiatic Society of Bangladesh 1998: 266-270.

8. Kirtikar KR, Basu BD. Indian medicinal plants, 2nd edition, Dehradun, India, International Book Distributors and Book sellers 1987: 372–375.
9. Nadkarni KM, Basu BD. *Jasminum sambac*, In: Indian Materia Medica, 1st edition, Mumbai, India, Popular Prakashan Ltd 1996: 120-123.
10. Khare CP. Indian Herbal Remedies, 1st edition, Germany, Springer-Verlag Berlin Heidelberg 2004: 269-71.
11. Harborne JB. Phytochemical methods, 3<sup>rd</sup> edn, Chapman and hall, London; 1998.
12. Ravichandran V, Suresh B, Sathishkumar MN, Elango K, Srinivasan R. Anti-fertility activity of hydroalcoholic extract of *Ailanthus excels* (Roxb): ethano medicines used by tribals of Nilfiris region in Tamilnadu. J Ethnopharmacol 2007; 112: 189-191.
13. Mate GS, Naikwade NS, Magdum CS, Chowki AA, Patil SB. Evaluation of anti-nociceptive activity of *Cissus quadrangularis* on albino mice. Int J Green Pharm 2008; 2: 118-121
14. Zakaria MN, Islam MW, Radhakrishnan R. Anti-nociceptive and anti-inflammatory properties of *Caralluma arabica*. J Ethnopharmacol 2001; 76: 155-158.
15. Janssen PAJ, Niemegeers CJE, Dony JGH. The inhibitory effect of fentanyl and other morphine-like analgesics on the warm water induced tail withdrawal reflex in rats. Arzneimittel-Forsch 1963; 6: 502–507.
16. Vogel GH, Vogel WH. Drug Discovery and Evaluation. Pharmacological Assays. Springer 1997; 360–418.
17. Aydin S, Demir T, Ozturk Y, Baser KHC. Analgesic activity of *Nepeta italica* L. Phytother Res 1999; 13: 20–23.
18. Eddy NB, Leimback D. Synthetic analgesics. II. Dithienylbutenyl and dithienyl butyl amines. J Pharmacol Exp Ther 1953; 107: 385–393.
19. Arulmozhi DK, Veeranjanyelu A, Bodhankar SL, Arora SK. Investigations into the antinociceptive activity of *Sapindus trifoliatus* in various pain models. J Pharm Pharmacol 2004; 56: 655-661.
20. Winter CA, Risley EA, Nuss GW. Carrageenan-induced edema in hind paws of the rat as an assay for anti-inflammatory drugs. P Soc Exp Biol Med 1962; 111: 544–547.
21. Young H., Luo Y, Cheng H, Hsieh W, Liao J, Peng W. Analgesic and anti-inflammatory activities of [6]-gingerol. J Ethnopharmacol 2005; 96: 207–210.

22. Singh S, Majumdar DK, Rehan HMS. Evaluation of anti-inflammatory potential of fixed oil of *Ocimum sanctum* (Holybasil) and its possible mechanism of action. *J Ethnopharmacol* 1996; 54: 19-26.
23. Schmauss C, Yaksh TL. In vivo studies on spinal opiate receptor systems mediating antinociception. II. Pharmacological profiles suggesting a differential association of mu, delta and kappa receptor with visceral chemical and cutaneous thermal stimuli in the rat. *J Pharmacol Exp Ther* 1984; 228: 1–12.
24. Aydin S, Demir T, Ozturk Y, Baser KHC. Analgesic activity of *Nepeta italica* L. *Phytother Res* 1999; 13: 20–23.
25. Deraedt R, Jouquey S, Delevallee F, Flahaut M. Release of prostaglandins E and F in an algogenic reaction and its inhibition. *Eur J Pharmacol* 1980; 61: 17–24.
26. Duarte JDG, Nakamura M, Ferreira SH. Participation of the sympathetic system in acetic acid induced writhing in mice. *Braz J Med Biol Res* 1988; 21: 341–343.
27. Hokanson GC, Acetic acid for analgesic screening. *J Nat Prod* 1978; 41: 497–498.
28. Neto AG, Costa JMLC, Belati CC, Vinholis AHC, Possebom LS, Da Silva Filho AA, Cunha WR, Carvalho JCT, Bastos JK, e Silva MLA. Analgesic and anti-inflammatory activity of a crude root extract of *Pfaffia glomerata* (Spreng) Pedersen. *J Ethnopharmacol* 2005; 96: 87–91.
29. Perianayagam JB, Sharma SK, Pillai KK. Anti-inflammatory activity of *Trichodesma indicum* root extract in experimental animals. *J Ethnopharmacol* 2006; 104: 410-414.
30. Adedapa A, Sofidiya MO, Inaphosa V, Inaya B, Masika PJ, Afolayan AJ. Anti-inflammatory and analgesic activities of the aqueous extract of *Cussonia Paniculata* stem bark, *Rec Nat Prod* 2008; 2(2): 46-53.
31. Dagar HS, Chagtitai SA. *Trichosanthes bracteata* (lam) voight (Cucurbitaceae) a promising ethano medicinal taxon in Andaman and Nicobar Islands. *Indian J Appl Pure Biol* 1989; 4(2): 131-132.