ANTI-ALLERGIC AND ANALGESIC ACTIVITY OF AERIAL PARTS OF *HYBANTHUS ENNEASPERMUS*

M.Thamizh mozhi*, S.Swarnalatha, P.Sakthivel, L.S.Manigandan, A.Jayabharath, P.Suresh kumar

Aadhi Bhagawan College of Pharmacy, Rantham, Cheyyar, Thiruvannamalai Dt, India

*Corresponding Author Email: thamizhppe@rediffmail.com

Article Received on: 20/04/13 Revised on: 11/05/13 Approved for publication: 21/05/13

DOI: 10.7897/2230-8407.04655

IRJP is an official publication of Moksha Publishing House. Website: www.mokshaph.com

© All rights reserved.

ABSTRACT

Hybanthus enneaspermus is commonly used plant in traditional medicine for the various condition such as urinary calculi, cardio protectivity, anti-arrhythmic, urinary tract infection, diarrhoea, dysuria, etc., In the present study are analgesic and anti allergic activity of petroleum ether and ethanolic extract of aerial part of the plant *Hybanthus enneaspermus*. The analgesic activity was screened by using hot plate method, tail immersion method, tail flick method. The anti allergic activity was screened by milk induced eosinophilia and leukocytes methods. The ethnaolic extract have more significant activity of analgesic and anti allergic property than the petroleum ether extract *Hybanthus enneaspermus*. The extract possesses analgesic and anti-allergic activity which may be due to the presence of phytochemical constituents mainly flavonoids and polar constituents.

Key words: *Hybanthus enneaspermus* analgesic activity, anti allergic activity, hot plate method, tail immersion method, tail flick method, milk induced eosinophilia, milk induced leukocytes method.

INTRODUCTION

Medical science during the last few decades, treatment of chronic pain still remains a challenge for medical community. All the available analgesic drugs such as NSAIDs have few adverse effects¹. As a result, the traditional system has gained importance in the field of medicine. Herbal plants are an important source of new chemical substances with potential therapeutic uses. Many chemical substances extracted from higher plants are used in medicine throughout the world². The long historical use of medicinal plants in many traditional medical practices, including experience passed from generation to generation has demonstrated the safety and efficacy of traditional medicine. However, scientific evaluation is needed to provide evidences of their safety and efficacy. *Hybanthus enneaspermus* (Family:Violaceae) is well known for is different therapeutic uses. The whole plant is very acrid to relieve Strangury, painful dysentery, vomiting, burning sensation, wandering of the mind³. Leaves of the plant are used as an external application for wound⁴. It has been used as an antimalarial, antirheumatic, emmenagogue, sedative, antispasmodic, aphrodisiac and anti-asthmatic⁵. The plant is also attributed to its antimicrobial and anti-plasmodial action, and it has been reported, in ancient ayurvedic literature, to cure conditions of urinary calculi⁶. The roots of this plant have been indigenously used in epilepsy and hysteria⁷. Early studies documented the presence of flavonoids, xanthine, terpenoids and glycosides in the *Hybanthus enneaspermus* plant. The present study has been designed to evaluate the analgesic activity and anti-allergic of ethanolic and petroleum ether extract of aerial parts of *Hybanthus enneaspermus*.

MATERIALS AND METHODS

Plant material

The aerial parts of fresh plant *Hybanthus enneaspermus* were collected from the Vandavasi Forest, Thiruvannamalai Dt, during December-2012. The plant was authenticated by Dr.J.Jayaraman, Ph.D., (PARC) Medicinal Plant Research Unit, Chennai, under the accession code PARC/2013/1997.

Preparation of extracts

Shade dried, cleaned from extraneous materials, mechanically grinded and coarsely powdered aerial parts of *Hybanthus enneaspermus* was subjected to successive solvent extraction in Soxhlet extractor using petroleum ether, ethanol as solvent. All the extracts were vacuum dried to produce petroleum ether (11.5%) and ethanol (12.6%) extracts respectively.

Phytochemical screening of active extracts

Various Phytochemical studies including test for carbohydrates, proteins, amino acids, steroid, alkaloids, glycosides and flavonoids compounds were carried out⁷.

Animals

Albino mice (Swiss strain) weighing 25-30g either sex were obtained from the King's institute Chennai. The animals were maintained at room temperature of (25 ±2) °C with relative humidity of (75±5) % under 12 hours dark and light cycle. The animals maintained under standard husbandry conditions and had free access to diet and water. The animals were allowed to acclimatize to the environment for 7 days prior to the experimental session. The animals were divided into different groups each consist of six animals and were fasted overnight prior to the experiments as per the instruction given in the Animal Ethical Committee.

Drugs and chemicals

Petroleum ether and ethanol were purchased from Chandanmal chemicals, Chennai. Diclofenac sodium were procured from Ranbaxy. All the chemicals used for the extraction and purification were all are of LR grade.

Acute toxicity study

Acute toxicity study was carried out as per the guidelines set by the Organization for Economic Co-operation Development (OECD guideline 425) received from the Committee for the Purpose of Control and Supervision of Experiments on animals (CPCSEA). Animals were divided into six groups (n=6). The animals were fasted for overnight with free access to food and water. The petroleum ether,

ethanol extracts was administered orally in doses of 500 mg/kg and 1000mg/kg of body weight to different groups of mice and observed over 14 days for mortality and physical of behavioural changes⁸.

Anti-allergic activity

Milk induced leucocytosis

Mice were divided into three groups, six animals in each group. Animals belonging to group-I received distilled water 10 ml/kg, (p.o.). Animals belonging to group II, III, received boiled and cooled milk injection in dose of 4 ml/kg (s.c.). Animals belonging to groups II, III received petroleum ether and ethanol extract of *Hybanthus enneaspermus* plant (200 mg/kg, i.p) respectively 1 hour before milk injection. Blood samples were collected from each mouse from the tail vein. Total leukocyte count was done in each group before drug administration and 24 hour after milk injection difference in total leukocyte count before and 24 hour after drug administration was calculated¹⁰.

Milk induced eosinophilia

Mice were divided into five groups, six animals in each group. Animals belonging to group-I received distilled water 10 ml/kg, (p.o.). Animals belonging to group II, III, received boiled and cooled milk injection in dose of 4 ml/kg (s.c.). Animals belonging to groups II, III to V petroleum ether, ethanol (200 mg/kg, i.p.) respectively, 1 hr before milk injection. Blood samples were collected from each mouse from the retro orbital plexus, under light ether anaesthesia. Eosinophil count was done in each group before drug administration and 24 hr after milk injection. Difference in eosinophil count before and 24 hr. after drug administration was calculated¹¹.

Analgesic activity

Hot plate methods, Radiant heat tail flick and tail immersion method were employed to determine the analgesic activity.

Hot plate method

Mice were divided into four groups, six animals in each group. Group I: Distilled water 10 ml/kg, (p.o). Group II: Diclofenac sodium injection in dose of 25mg/kg (S.C).Group III: Petroleum ether Extract injection in dose of 200mg/kg (S.C).Group IV: Ethanol extract injection in dose of 200mg/kg (S.C). The analgesic activity of the extract was measured by hot-plate method. All drugs were given orally to the respective group mice as a suspension in gum acacia. The rats were placed on a hot plate maintained at $55 \pm 0.5^\circ\text{C}$. The reaction time was taken as the interval from the instant animal reached the hot plate until the moment animal licked its feet or jumped out. A cut off time of +10 sec was followed to avoid any thermal injury to the paws. The reaction time was recorded before and after +30, +60, +90, +120 and +180 min following administration of test or standard drug¹².

RESULTS

Table 1: Effect of *Hybanthus enneaspermus* plant extract on milk induced leukocytosis in mice

S.No	Treatment	Number of leukocytes (Cu.mm)		
		Before treatment	After treatment	Difference
I	Control	6320 $\pm$ 15.47	1234.00 $\pm$ 60.05	5086 $\pm$ 44.99
II	Petroleum Ether	6172.00 $\pm$ 107.32	3300 $\pm$ 314.68**	2872 $\pm$ 207.36
III	Ethanol	9632.00 $\pm$ 154.32**	2932.00 $\pm$ 104.88**	6700 $\pm$ 49.44

All values are expressed as mean $\pm$ SEM of a sample size of n=6; level of significance chosen was **P<0.01. All treated groups were compared with control group. (One way ANOVA followed by Dunnett's test).

Radiant heat tail flick method

Mice were divided into four groups, six animals in each group. Group I: Distilled water (DW) 10 ml/kg,(p.o).Group II: Diclofenac sodium injection in dose of 25mg/kg (S.C). Group III: Petroleum ether Extract injection in dose of 200mg/kg (S.C). Group IV: Ethanol extract injection in dose of 200mg/kg (S.C).The central analgesic activity was determined by radiant heat tail-flick model in mice. The analgesic activity of the plant extract was studied by measuring drug- induced changes in the sensitivity of the pre-screened mice (the intensity of the light beam has been experimentally defined such that naive animals will withdraw their tails with into 4 s) to heat stress applied to their tails by using analgesimeter.

Tail-flick latency was assessed by the analgesimeter. All drugs were given orally to the respective group rats as a suspension in gum acacia. The strength of the current passing through the naked in chrome wire was kept constant at 5 ampere. The distance between heat source and the tail was 1.5 cm and the application site of the heat on the tail was maintained within 2 cm, measured from the root of the tail. Cut-off reaction time was +10 s to avoid any tissue injury during the process. Tail-flick latency was measured from +30 min after the drug administration¹³.

Tail immersion methods

Mice were divided into four groups, six animals in each group. Group I: Distilled water (DW) 10 ml/kg,(p.o).Group II:Diclofenac sodium injection in dose of 25mg/kg (S.C).Group III:Petroleum ether Extract injection in dose of 200mg/kg (S.C).Group IV: Ethanol Extract injection in dose of 200mg/kg (S.C).Mice divided in the groups of six each, were held in position in a suitable restrainer with the tail extending out. 2-3 cm area of the tail was marked and immersed in the water bath thermo-statistically maintained at 51°C . The withdrawal time of the tail from hot water (in seconds) was noted as the reaction time or tail flick latency. The maximum cut off time for immersion was 180 seconds to avoid the injury of the tissues of tail. 0.2 ml of 0.9% NaCl solution was administered to control animals; plant extracts in doses of 300, 500 and 1000 mg/kg were given orally by intubation. The initial reading was taken immediately before administration of test and standard drugs and then 60, 90, 120,150 and 180 minutes after the administration. The criterion for analgesia was post drug latency which was greater than two times. Tail flick latency difference or mean increase in latency after drug administration was used to indicate the analgesia produced by test and standard drugs¹⁴.

Statistical analysis

The results are expressed as mean $\pm$ SEM. The Dunnett's test was used to make a statistical comparison between groups. Result with P<0.01 and P<0.05 were considered significant.

Figure 1: Milk induced leukocytosis in mice

Figure 2: Milk induced eosinophilia in mice

Table 2: Effect of *Hybanthus enneaspermus* plant extracts on milk induced eosinophilia in mice

S.No	Treatment	Number of leukocytes (Cu.mm)		
		Before treatment	After treatment	Difference
I	Control	432.00 ± 3.40	543.00 ± 21.94	111 ± 18.54
II	Petroleum Ether	82.65 ± 8.93*	94.63 ± 8.96 *	11.98 ± 0.03
III	Ethanol	132.70 ± 3.20*	63.33 ± 3.20*	68.77 ± 0.6

All values are expressed as mean ± SEM of a sample size of n=6; level of significance chosen was **P<0.01. All treated groups were compared with control group. (One way ANOVA followed by Dunnett's test).

Table 3: Effect of *Hybanthus enneaspermus* plant extracts on differential Leukocytes count

S.No	Treatment	Differential leukocytes count (%)		
		Neutrophils	Lymphocytes	Eosinophils
I	Control	6.37 ± 0.46	4.00 ± 0.42	2.32 ± 0.03
II	Petroleum Ether	4.32 ± 0.72**	3.00 ± 0.43	2.12 ± 0.24
III	Ethanol	6.32 ± 0.72	12.09 ± 0.32**	1.33 ± 0.27**

Level of significance chosen was *P<0.01. All treated groups were compared with control group.

Figure 3: Differential Leukocytes Count

Table 4: Analgesic effect of *Hybanthus enneaspermus* extracts in mice by Hot plate method

Treatment	Dose mg/kg b.w	Reaction intervals (seconds) at time (min)					
		0 Min	30 Min	60 Min	90 Min	120 Min	180 Min
Group I Control	0.1 mg/kg	2.45 ± 0.19	2.32 ± 1.17	2.19 ± 1.82	2.43 ± 0.92	2.92 ± 0.1	2.74 ± 0.04
Group II (Diclofenac Sodium)	25 mg/kg b.w	1.94 ± 0.31	4.32 ± 0.32	7.82 ± 0.87	10.53 ± 1.17	10.42 ± 0.92	11.47 ± 0.32
Group III Petroleum ether Extract	200 mg/kg b.w	2.07 ± 0.32	4.82 ± 0.92	5.42 ± 0.32	6.13 ± 0.32	6.52 ± 0.36	8.31 ± 0.34
Group IV Ethanol Extract	200 mg/kg b.w	2.13 ± 0.17	4.67 ± 0.32	7.32 ± 0.42	6.13 ± 0.17	6.32 ± 0.32	7.32 ± 0.54

Experimental group were compared with control P value (<0.01) value are mean ± SEM (n=6), Mean significant different (P<0.05), P value summary*, *P<0.01; significant different from control (Dunnett's test).

Table 5: Analgesic effects of *Hybanthus enneaspermus* plant extracts in mice by heat tail flick method

Treatment	Dose mg/kg b.w	Reaction intervals (seconds) at time (min)					
		0 Min	30 Min	60 Min	90 Min	120 Min	180 Min
Group I Control	0.1 ml/kg	4.25 ± 0.32	3.27 ± 0.19	3.27 ± 0.14	4.82 ± 0.03	4.65 ± 0.32	4.32 ± 0.32
Group II (Diclofenac Sodium)	25 mg/kg b.w	3.22 ± 1.72	3.47 ± 0.02	4.71 ± 0.04	4.92 ± 0.09	5.65 ± 0.34	5.91 ± 0.20
Group III Petroleum ether Extract	200 mg/kg b.w	3.32 ± 0.16	3.02 ± 0.14	3.72 ± 0.03	3.43 ± 0.09	4.21 ± 0.32	4.32 ± 0.20
Group IV Ethanol Extract	200 mg/kg b.w	3.13 ± 0.007	3.32 ± 0.72	4.32 ± 0.32	4.04 ± 0.01	4.62 ± 0.32	4.82 ± 0.07

*P<0.01 vs. Baseline value of the respective drug group, P<0.01 vs. control (n=6). One way ANOVA; SEM = Standard error of mean.

Table 6: Analgesic effects of *Hybanthus enneaspermus* plant extract in mice by tail immersion method

Treatment	Dose mg/kg b.w	Reaction intervals (seconds) at time (min)					
		0 Min	30 Min	60 Min	90 Min	120 Min	180 Min
Group I Control	0.1 ml/kg	3.95 ± 0.33	2.4 ± 0.14	1.73 ± 0.32	2.42 ± 0.92	2.7 ± 0.04	2.73 ± 0.05
Group II (Diclofenac Sodium)	25 mg/kg b.w	3.7 ± 0.32	3.96 ± 0.45	3.82 ± 0.92	3.72 ± 0.95	5.47 ± 0.49	6.81 ± 0.4
Group III Petroleum ether Extract	200 mg/kg b.w	2.27 ± 0.024	2.66 ± 0.17	3.32 ± 0.17	3.39 ± 0.192	4.03 ± 0.25	5.83 ± 0.24
Group IV Ethanol Extract	200 mg/kg b.w	2.40 ± 0.32	3.09 ± 0.3	3.32 ± 0.37	3.47 ± 0.384	4.304 ± 0.37	5.43 ± 0.32

Experimental group were compared with control P value (<0.01) values are mean ± SEM (n=6), Mean significant difference (P<0.05), *P<0.05, significance difference from control (Dunnett's test).

Acute toxicity

From the acute toxicity study, the LD cut-off dose for extracts was found to be 1000 mg/kg body weight. Hence, the therapeutic doses were taken as 50 mg/kg and 100 mg/kg body weight.

Anti-allergic activity

Milk induced leucocytosis in mice

Subcutaneous injection of milk in dose of 4ml/kg, produced a significant (P<0.01) increase in the leukocyte count after 24 hour administration. Mice pre-treated with petroleum ether, Ethanol extract of *Hybanthus enneaspermus* have exhibited significant difference in total leukocyte before and after drug treatment. Ethanol extract of *Hybanthus enneaspermus* plant has highly inhibited the milk induced leukocytosis (P<0.01)

with dose of 200 mg/kg (i.p) as compare to petroleum ether extracts the result were listed in Table 1.

Milk induced eosinophilia in mice

Milk induced eosinophilia in mice subcutaneous injection of milk in dose of 4ml/kg, produced a significant ($P<0.01$) increase in the eosinophil count after 24 hour of its administration. Mice pre-treated with petroleum ether, and ethanol extract of *Hybanthus enneaspermus* plant have exhibited significant difference in eosinophil count before and after drug treatment. Ethanol extract of *Hybanthus enneaspermus* plant has highly inhibited the milk induced eosinophilia ($P<0.01$) with dose of 200mg/kg (i.p) as compared to petroleum ether extract and the result were listed in Table 2.

Milk induced differential leukocyte count in mice

Ethanol extract of *Hybanthus enneaspermus* plant showed highly significant inhibited the milk induced eosinophilia ($P<0.01$) with dose of 200mg/kg (i.p) as compare to petroleum ether extract, the result showed significant ($P<0.01$) i.e. up to 1.33% decrease in eosinophil count. But there is increased i.e. up to 19.42% of lymphocytes count. It indicates that increased leukocyte count in Table 3.

Analgesic activity

Hot plate method

The control drug increases the response latencies at various time intervals. The *Hybanthus enneaspermus* plant extract were dose as well as time dependent. Amongst all the doses used petroleum ether extract (200 mg/kg b.w) was most effective at 120 and 180 minutes as well as ethanol extract at 60 and 90 min comparable to the standard group which was highly significant ($P<0.05$, $P<0.01$) and the result are listed in Table 4

Heat tail flick method

In the tail flick method, the increases in latency period at different time points significantly differed ($P<0.01$) compared to baseline values within the same drug treated group. The extract and standard treated group significant increase ($P<0.01$) in reaction time in the dose of extract 200 mg/kg. The results are depreiated in the Table 5.

Tail immersion method

In tail immersion test the result indicated a significant increase in reaction time at 120 and 180 min with both petroleum ether and ethanol (200 mg/kg). Whereas reference drug doclofenac sodium significantly increased the reaction time at 120/180 min Hence there groups are highly significant ($P<0.01$, $P<0.05$) and the results are gathered in the Table 6.

DISCUSSION

The pharmacognostical study is one of the major criteria for the identification of plant drug as well as drug standardization¹⁵. The preliminary analysis of the plant extracts revealed the presence of constituents like flavonoids, alkaloids, and glycosides. The presence of these constituents may be responsible for their pharmacological activities. The acute toxicity studies revealed that there was no considerable change in body weight and after treatment of the experiment and no signs of same dose level for three days more and observed for 14 days, no change were observed from the first set of experiment. Bronchial asthma is characterized

pathologically by an infiltration of eosinophils into the airway submucosa, phytochemical analysis of the ethanol extract shows the presence of carbohydrates, saponins¹⁶. Thus we can speculate that these constituents might be responsible for anti-allergic activity. Literature shows that flavonoid is having anti-anaphylactic and anti-asthmatic activity. So anti-allergic activity showed by *Hybanthus enneaspermus* plant might be induced by these chemical moieties. After parenteral administration of milk there are increases in total leukocyte count (TLC) and this stressful condition can be normalized by administration of an anti-stress (or) adaptogenic drug. Eosinophilia is an abnormal increase in peripheral eosinophil count to more than 4% of total leukocytes. In the late phase, especially in the development of allergic asthma, eosinophils play role as an inflammatory cell¹⁷. It was also demonstrated that parental administration of milk produces a marked and significant increase in leukocytes or eosinophils count after 24 hour of its administration. Thus, ethanol extract of *Hybanthus enneaspermus* plant shows more significant anti-allergic activity ($P<0.01$) as compare to petroleum ether extract in all three models of milk induced leukocytosis, milk induced eosinophilia and differential leukocytes count in mice. The hot plat method is considered to be selective for the drug acting centrally. The hot plat test measures the complex response to a non inflammatory, acute nociceptive input and is one of the models normally used for studying central nociceptive activity¹⁸. It is an establish fact that any agent that causes a prolongation of the hot plate latency using this test must be acting centrally. Therefore the extract of *Hybanthus enneaspermus* plant must have a central activity. In this tail flick, tail immersion and hot plate methods, both the extracts (petroleum ether + Ethanol (200 mg/kg) of plant increased the stress tolerance capacity of the animals and hence indicate the possible involvement of a higher centre¹⁹. The time attained to reach the peak analgesic activity for standard drug (+30min) but the plant extract showed at (+90 min) and (120 Min) in hot plate, tail immersion and tail flick model respectively, which had no explanation and attributed as a limitation of our study. On the basis of their findings, if may be inferred that extract of *Hybanthus enneaspermus* has analgesic activities. These activities were related to the dose and there results corroborate the potential traditional use of the plat in folk medicine²⁰. At present, there are no reports on investigation to identity the active components present in extract of *Hybanthus enneaspermus*. Further investigations are anticipated to identity the active components and lead to their further clinical use.

ACKNOWLEDGEMENTS

The authors are grateful to Director, Aadhi Bhagawan College of Pharmacy, Rantham, Cheyyar, for providing physical facility to carry out the biological activities

REFERENCES

1. Raquibul Hasan SM, Jamila M, Majumder MM, Akter R, Hossain MM, Ehsanul Hoque Mazumder M, Ashraful Alam M, Jahangir R, Sohail Rana M, Arif M and Shafiqur Rahman. Analgesic and Antioxidant Activity of the Hydromethanolic Extract of Mikania scandens (L.) Willd. Leaves. American Journal of Pharmacology and Toxicology, 2009; 4(1): 1-7.
2. Farnsworth NR, Akerele O, Bingel AS, Soejarto DD and Guo ZG (1985). Medicinal plants in therapy. Bull. WHO, 63: 965-981.
3. Tripathy S, Sahoo SP, Pradhan D, Sahoo S, Satapathy DK. Evaluation of anti-arthritis potential of *Hybanthus enneaspermus*. African Journal Pharmacy Pharmacology 2009; 3: 611-614.
4. Majumdar PL, Basu A, Mal D. Chemical constituents of *Hybanthus enneaspermus*. Indian Journal of Chemistry, 1979; 17: 297.

5. Amuthapriya,D. Ranganayaki.S, Suganya Devi P, Phytochemical screening and antioxidant potential of Hybanthusenneaspermus: A rare ethano botanical herb, Journal of Pharmacy Research 2011; 4(5): 1497–1502.
6. Patel DK, Kumar R, Prasad SK, Sairam K, Hemalatha S. Antidiabetic and in vitro antioxidant potential of Hybanthusenneaspermus (Linn) F. Muell in streptozotocin-induced diabetic rats. Asian Pacific Journal Tropical Biomedicine 2011; 1: 316-322.
7. Khandelwal KR. Practical pharmacognosy techniques and experiment. 13th ed. Pune: Nirali Prakashan; 2005; 149-53.
8. Amuthapriya,D. Ranganayaki.S, Suganya Devi P, Phytochemical screening and antioxidant potential of Hybanthusenneaspermus: A rare ethano botanical herb, Journal of Pharmacy Research 2011; 4(5): 1497–1502.
9. Sourabh SB, Sonal D, Prashant S, Priya S, Yogesh S. Acute toxicity study of aqueous extract of Coccinia indica (roots). Asian J Res Pharm Sci 2011; 1: 23-25.
10. Vadnere GP, Somani RS, Singhai AK. Studies on antiasthmatic activity of aqueous extract of Clerodendron phlomis. Pharmacologyonline 2007; 1: 487-494.
11. Ghai CL. A textbook of practical physiology. 3rd ed. Delhi: Jaypee brothers; 1987; 191-192.
12. Eddy NB, Liembach D. Synthetic analgesics II: Dithienylbutenyl and dithienylbulyl-amines. J PharmacolExpTher 1957; 107: 385–393.
13. Ohsawa M, Kamei J, Possible involvement of spinal protein kinase C in thermal allodynia and hyperalgesia in dia- betic mice. Eur J Pharmacol 1999; 372: 221-228.
14. UdupaAL,RathnakarUP,Udupa S. Anti-inflammatory, anti-pyretic and analgesic effect of Tamarindusindica. Indian Drugs.2007; 44(6): 466-470.
15. Sharma MC, Smita Sharma, Some Plant extracts used in pharmacologically activity of Anxiolytics, Antidepressant, Analgesic, and Anti-inflammatory activity. Digest Journal of Nanomaterials and Biostructures. 2010; 5 (1): 223 – 227.
16. Raquibul Hasan SM, Mariam Jamila: Analgesic and Antioxidant Activity of the Hydromethanolic Extract of Mikania scandens (L.) Willd. Leaves. American Journal of Pharmacology and Toxicology 2009; 4 (1): 1-7.
17. Priyanka Vijay, Rekha Vijay vergia: Analgesic, anti-inflammatory and antipyretic activity of Cissus quadrangularis. Journal of Pharmaceutical Science and Technology 2010; 2 (1): 111-118.
18. Dhara, A.K., Suba, V., Sen, T., Pal, S. and Chaudhuri, A.K. Preliminary studies on the anti-inflammatory and analgesic activity of methanolic fraction of the root of Tragia involucrate. Journal of Ethnopharmacology, 2000; 72: 265-268.
19. Almeida, R.N., Navarro, D.S. and Barbosa-Filho, J.M. Plants with central analgesic activity. Phytomedicine, 2001; 8(4): 310-322.
20. Collier, H. O. J., Dinnean, L. C., Johnson, C. A. and Schenider, C. The abdominal constriction response and its suppression by analgesic drugs in the mouse British Journal of Pharmacology, 1968; 32: 295-310.

Cite this article as:

M.Thamizh mozhi, S.Swarnalatha, P.Sakthivel, L.S.Manigandan, A.Jayabharath, P. Suresh kumar. Anti-allergic and analgesic activity of aerial parts of Hybanthus enneaspermus. Int. Res. J. Pharm. 2013; 4(6):243-248

Source of support: Nil, Conflict of interest: None Declared