Research Article

In vivo Pharmacological Investigations of Leaf Extracts of *Paederia foetida* (L.)

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ABSTRACT

The present study was done to evaluate *in vivo* anti-pyretic, neuropharmacological activity including open field and swimming test, gastrointestinal motility of different leaf extracts of *Paederia foetida* in Swiss albino mice following oral administration. *In-vivo* antipyretic test of methanol, ethanol and chloroform extracts of *Paederia foetida* leaf was done brewer's yeast method; neuropharmacological study was performed by open field test and swimming test, GI motility test was done by charcoal induced GI motility test. In case of forced swimming test methanol 400 mg/kg extract showed significant ($p<0.01$) result corresponding value of control group. *In-vivo* gastrointestinal motility test was conducted on methanol, ethanol and chloroform extracts on the doses of 100 mg/kg and 200 mg/kg. Both the dosage of ethanol extract showed significant ($p<0.01$) and ($p<0.001$) increase in gastrointestinal motility comparing with the control Methanol 200 mg/kg extract showed significant *in-vivo* anti pyretic effect on mice.

Keywords: *Paederia foetida*, *In-vivo* antipyretic activities, gastrointestinal motility, neuropharmacological activities.

INTRODUCTION

Paederia foetida is an important Ayurvedic medicinal herb. *Paederia* is from the Greek word *paederos* meaning opals, for some of the species have translucent drupes. *Foetida* means stinking. Its Sanskrit name is Gandha Prasirini. The word meaning in sanskrit is – it spreads bad smell. It is a unique feature of this herb. Gandha means smell, prasarini means spreading. Hindi name- Gandhaprasarani or Pasaran; English name- Chinese Flower Plant, Bengali name- Gandhabhaduliya, Gandhabhadule, Gandal. It was indicated for the treatment of gout, diarrhea, piles, dysentery, calculi, stomachic, emetic, ulcers and different type of inflammations. It has also been reported for anti-nociceptive[1] antiviral[2], anti-diarrheal[3], anti-tussive[4] and anti-inflammatory[5]. *Paederia foetida* belonging to family Rubiaceae is one of 30 species in the genus *Paederia.*

The origin of this plant is considered to be Eastern and southern Asian. It is usually found in different parts of Bangladesh and also in India like Assam, Bihar and Orissa. It possesses perennial twining vine from woody rootstock; stems to 7 m (23 ft) or more, climbing, or prostrate and rooting at the nodes. Leaves are opposite (rarely in whorls of 3), with conspicuous stipules.

Petioles are commonly to 6 cm (2.4 in) long; blades entire, oval to linear-lanceolate, 2-11 cm (1-4.3 in) long, hairy or glabrous, often lobed at base. The leaves and stems have disagreeable odor, especially when crushed. Flowers are small, grayish pink or lilac, in broad or long, "leafy" curving clusters, terminal or at leaf axils. Fruits are shiny brown, nearly globose capsule, to 0.7 cm (0.3 in) wide, with 2 black roundish seeds, often dotted with white raphides[6]. Major chemical constituents like asperuloside, scandoside, paederoside and a-and b paederine etc. are present in this plant[7]. As a part of our continuing studies on medicinal plants of Bangladesh the organic soluble materials of the leaf extracts of *Paederia foetida* were evaluated for *in-vivo* antipyretic activity, gastrointestinal motility and neuropharmacological activity through open field test (OFT) and forced swimming test (FST) for the first time[8-15].

MATERIALS AND METHODS

Collection, Identification and Processing of Plant Samples

The leaves of *Paederia foetida* was collected from Botanical garden, Curzon Hall at the University of Dhaka in June 2014 and was taxonomically identified with the help of the National Herbarium of Bangladesh, Mirpur-1, Dhaka (DACB; Accession Number- 39585). Leaf was sun dried for seven days. The dried leaf were then ground in coarse powder using high capacity grinding machine which was then stored in air-tight container with necessary markings for identification and kept in cool, dark and dry place for the investigation.

Extraction Procedure

The powdered plant parts (22 gm) were successively extracted in a soxhlet extractor at elevated temperature using 250 ml of distilled Methanol (40-60)°C which was followed by ethanol, and chloroform. After extraction all extracts kept in refrigerator 4°C for future investigation with their necessary markings for identification.

Experimental Animal

For the experiment Swiss albino mice of either sex, 4-5 weeks of age, weighing between 10-24 gm were collected from ICDDR, B, Dhaka. Animals were maintained under standard environmental conditions (temperature: (27.0 ±

1.0) °C, relative humidity: (55-65) % and 12 hour light/12 hour dark cycle) and free access to feed and water. The animals were acclimatized to laboratory condition for one week prior to experiments. All protocols for animal experiment were approved by the institutional animal ethical committee.

Gastrointestinal Motility Determination

Forty eight Swiss Albino mice, weighing between 10-20 g were selected and housed properly for 10 days before performing the experiment. On the test day, the animals were divided into eight groups of six mice each. They were weighed and deprived of food, with free access to water. Three hours after food deprivation, the animals in group 1 received orally by gavages 5 ml/kg body weight of 0.9% NaCl (normal saline) as control group, while those in group 2 received 5 mg/kg body weight of Butapen (hyocine butyl bromide) as standard group. The other six groups received their respective doses as shown in the table 1. After 90 min, 0.3 ml of an aqueous suspension of 5% charcoal in normal saline was administered to each animal orally by gavages (time 90 min). Sixty minutes later they had free access to food (time 150 min). The animals were observed at 5 min intervals until feces with charcoal were eliminated (maximum time of observation was 300 min). Charcoal was observed on the feces using normal light when it was easily visible, or using a microscope to help the identification of the black spots. The results were based on the time for the charcoal to be eliminated[16].

Anti-pyretic Activity

Forty eight Albino Swiss mice of both sexes (10-20 gm) were randomly divided into 8 groups and fasted overnight before the experiment with free access to water. The normal body temperature of each mouse was measured rectally at predetermined intervals and recorded. Fever was induced according to the method described by Smith and Hambourger (1935)[17]. A lubricated thermometer probe was inserted 3-4 cm deep into the rectum and fastened to the tail by adhesive tape. Temperature was measured on digital thermometer. After measuring the basal rectal temperature, animals were injected subcutaneously with 10 ml/kg of 20% w/v brewer's yeast in NSS in the dorsum of the mice. Mice were then returned to their housing cages. Eighteen hours after brewer's yeast injection, the animals were again restrained for rectal temperature recording, as described previously.

Only mice that showed an increase in temperature of at least 10°C were used for this study. The extracts at the doses of 200 & 400 mg/kg body weight were administered orally to four groups of animals. The control group received 1ml/kg body weight dose of vehicle (0.9% NaCl solution) and the standard group received paracetamol (50 mg/kg body weight) orally. Rectal temperature was measured at 1hr intervals for 4 hr after the extract/drug administration. The rectal temperature of normal rats (normothermic) was also measured at 1 hr. intervals for 7 hr.[18] The results are expressed as percentage of the pre-drug temperature recorded for the same animals using the formula of Makonnan[19].

Neuropharmacological Study

To check the neuropharmacological effects or side-effects of drug, two types of experiment is carried out which are open field test and swimming test.

Open Field Test (OFT)

According to previous work with slight modification open field test was performed to monitor behavioral responses in mice that were placed in a novel and bright arena[20]. Rodents tend to stay away from brightly illuminated areas. The experiment also assesses a range of anxiety-induced, locomotor activity and exploratory behaviors. The animals were divided into 8 groups of 5 mice each. The first group was given 10ml/kg of 1% Tween 80 orally and served as control. Group 2 was served 2 mg of Clonazepam per kg of body weight and it served as standard. Groups 3, 4 received methanol extract of the leaves of *P. foetida* at 200 and 400 mg/kg of body weight, and groups 5, 6 received ethanol extract of the leaves of *P. foetida* at 200 and 400 mg/kg of body weight. Group 7, 8 received chloroform extracts of the leaves of *P. foetida* at 200 and 400 mg/kg of body weight. The open field apparatus is made of hardboard (60cm x 60cm; 40cm walls). Blue lines drawn on the floor divide the floor into thirty six squares 10cm x 10cm squares alternatively colored black and white and Central Square (10cm x 10cm) in the middle clearly marked. The number of squares visited by the animals was calculated for 2min at 0, 30, 60, 90 and 120min subsequent to oral administration of the experimental crude extracts[20].

Forced Swimming Test (FST)

According to Porsolt swimming test was performed with slight modification[21]. Animals were randomly divided into 8 groups with 5 mice on each group. Group 1 was given 10 ml/kg of 1% Tween 80 which served as control and Group 2 was given 2mg of Clonazepam per kg of body weight which served as standard. Groups 3 and 4 received methanol extracts of the leaf of *P. foetida* at 200 and 400 mg/kg of body weight. Groups 5 and 6 received ethanol extracts of the leaf of *P. foetida* at 200 and 400 mg/kg of body weight. Group 7 and 8 received chloroform extracts of *P. foetida* at 200 and 400 mg/kg of body weight. The forced swim test was carried out on mice individually forced to swim in an open acquire water tank apparatus (29cm x 19cm x 20cm), containing 9 cm of water at 25 ± 1°C. The total duration of immobility during the 4 min test was scored as described. Each mouse was judged to be immobile when it ceased struggling and remained floating motionless in the water, making only those movements necessary to keep its head above water. The duration of immobility was recorded. Decrease in the duration of immobility during the FST was taken as a measure of antidepressant activity[21].

RESULTS AND DISCUSSION

Gastro Intestinal (GI) Motility Test

The gastro-intestinal motility test results are shown in Table 1. In this test methanol, ethanol and chloroform extract at doses of 100 and 200 mg/kg body weight were administered.

The results revealed that the doses of ethanol extract (100 and 200 mg/kg b.w) and higher the dose of chloroform extract (200 mg/kg b.w) showed maximum charcoal defection time, compared with the effect produced by normal saline.

Table 1: GI motility investigation through charcoal defection time (min)

Group	Doses (mg/kg)	Charcoal defection time (min)
Control (0.9% Nacl)	5 ml/kg	90.2 ± 3.70
STD (Butapan)	5 mg/kg	130 ± 4.53
Methanol extract	100	97.8 ± 8.61
	200	109.2 ± 6.11
Ethanol extract	100	125.6 ± 13.94**
	200	136.4 ± 9.10***
Chloroform extract	100	96.8 ± 8.58
	200	113.8 ± 3.21*

(Values are expressed as mean ± S.D. (n=6), *p<0.05; ** p<0.01; *** p<0.001 significant when compared with the corresponding value of control group)

DISCUSSION

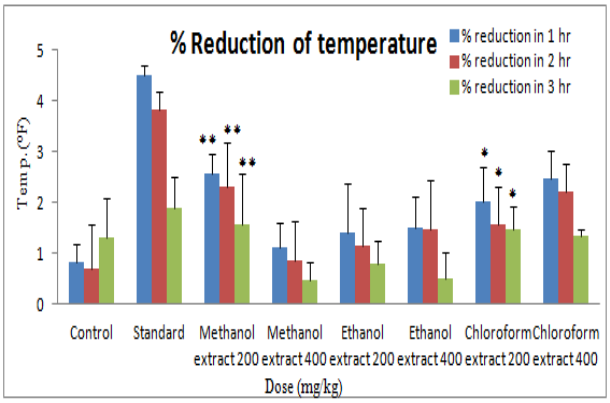
Abdominal cramping and pain is a frequent problem in the adult population of Western countries, with an estimated prevalence of ≤30%. Pharmacological studies have revealed that hyoscine butyl bromide is an anti-cholinergic drug with high affinity for muscarinic receptors located on the smooth-muscle cells of the GI tract. Its anti-cholinergic action exerts a smooth-muscle relaxing/spasmolytic effect.

Blockade of the muscarinic receptors in the GI tract is the basis for its use in the treatment of abdominal pain secondary to cramping. However, because of its high tissue affinity for muscarinic receptors, hyoscine butyl bromide remains available at the site of action in the intestine and exerts a local spasmolytic effect[22].

As remarkable antimotility effect of ethanol extract 100 & 200 mg/kg b.w and chloroform extract 200 mg/kg b.w revealed that this drug caused a significant decrease (*p<0.05; **P<0.01; ***P<0.01) in gut motility, compared with the effect produced by normal saline (control).

Anti-pyretic activity

From the Table 2 the present study revealed that methanol and chloroform extracts of the doses (200 mg/kg b.w and 200 & 400 mg/kg b.w) showed a quite satisfactory results compared to standard drug paracetamol (50 mg/kg b.w). In Figure 1 it is showed that the lower dose of methanol (200 mg/kg b.w) and the lower dose of chloroform extract (200 mg/kg b.w) showed maximum reduction of temperature.



(Values are expressed as mean ± S.D. (n=6), *p<0.05; ** p<0.01; *** p<0.01 significant when compared with the corresponding value of standard group, done by independent sample t-test)

Figure 1: Comparative study of % reduction of temperature using leaf extracts of *P. foetida*.

In the present study methanol and chloroform extract (200 mg/kg b.w) showed significant (*p<0.05; **P<0.01) antipyretic activities in mice, so it can be said that more of active principles responsible for the antipyretic activity might be available in these three extracts. Brewer's Yeast induced fever is called pathogenic fever. Its etiology includes production of prostaglandins, which set the thermo-regulatory center at a lower temperature[23]. So inhibition of prostaglandin synthesis could be possible mechanism of antipyretic action as that of acetylsalicylic acid.

Morimoto suggested that there are several mediators may bring about anti-pyresis[24]. As to how they interfere with prostaglandin synthesis, further studies need to carry out.

Though this study could hint about the onset and duration of action of the extract of the plants studied, further investigation is required to determine their pharmacokinetic profiles. The fact that neither toxicity nor lethality was observed at any dose of both extracts explains the wide safety margin of the extracts within the doses range. This observation also hints that the LD_{50} of the extracts is much higher than the highest dose level employed[25].

Neuropharmacological Study: *Open Field Test* (OFT)

Test results for different extracts of *Paederia foetida* for open field test (movement), open field test (standing), open field test (center) and open field test (Stool) are presented in Table 3, 4, 5 and 6 respectively.

Table 2: Result of Antipyretic test

Group	Treatment	Dose mg/kg b.w	Normal Temp, °F	Temp after 18 hours of Brewer's yeast injection, °F	Temp after doses, °F		
					1 hr	2 hr	3hr
1	Control (0.9% NaCl)	1 ml/100gm	96.5 ± 1.80	99.32 ± 0.89	98.48 ± 0.65	98.62 ± 0.45	98.14 ± 1.55
2	(Std) Paracetamol	50	97.63 ± 1.40	99.18 ± 0.61	94.72 ± 1.31	95.38 ± 1.58	97.32 ± 1.15
3	Methanol extract	200	96.83 ± 0.66	99.7 ± 0.64	97.14 ± 0.81*	97.38 ± 0.51*	98.12 ± 0.77*
4		400	97.87 ± 0.77	99.44 ± 0.90	98.32 ± 0.89	98.58 ± 0.76	98.96 ± 0.52
5	Ethanol extract	200	98.13 ± 0.37	99.96 ± 0.30	98.54 ± 0.92	98.82 ± 0.75	99.16 ± 0.24
6		400	96.07 ± 0.42	99.6 ± 0.57	98.12 ± 0.88	98.14 ± 0.74	99.08 ± 0.24
7	Chloroform extract	200	95.60 ± 2.15	100.18 ± 0.52	98.14 ± 1.45	98.6 ± 1.03	98.72 ± 0.93
8		400	97.73 ± 4.86	99.64 ± 0.69	97.18 ± 0.95*	97.44 ± 0.82*	98.3 ± 1.56*

(Values are expressed as mean ± S.D. (n=6), *p<0.05; ** p<0.01; *** p<0.01 significant when compared with the corresponding value of standard group, done by independent sample t-test)

Table 3: Effect of different extracts of *Paederia foetida* in open field test (Movement)

Group	Doses (mg/kg)	-30 mins	+30 mins	+60 mins	+90 mins	+120 mins
Control (1% Tween 80)	10 ml/kg	119.6 ± 9.91	106.4 ± 6.51	97.4 ± 8.66	80.4 ± 1.00	68.00 ± 2.65
STD (Clonazepam)	2mg/kg	93.6 ± 3.40	80 ± 7.78	66.4 ± 6.08	54.2 ± 5.57	46.0 ± 9.07
Methanol Extract	200	96.0 ± 2.65	81.4 ± 3.00	70 ± 12.14	52.2 ± 2.00	39.0 ± 1.00
	400	101.0 ± 6.11	89.4 ± 1.53	76.4 ± 7.09	63.4 ± 5.77	44.6 ± 1.53
Ethanol Extract	200	87.8 ± 3.06*	73.8 ± 7.32*	62.6 ± 5.32*	48.0 ± 5.52*	34.8 ± 3.61*
	400	92.6 ± 1.00*	72.2 ± 6.99*	56.4 ± 3.61*	41.2 ± 3.70*	28.2 ± 5.07*
Chloroform Extract	200	87.5 ± 4.58*	75.2 ± 11.52*	62.6 ± 3.21*	50 ± 5.00*	38.6 ± 5.51*
	400	80.6 ± 13.01**	64.4 ± 4.93**	57.6 ± 5.57**	45.6 ± 2.08**	35.2 ± 2.71**

(Values are expressed as mean ± S.D. (n=5), *p<0.05; ** p<0.01; *** p<0.001 significant when compared with the corresponding value of control group, done by independent sample t-test)

Table 4: Effect of different extracts of *P. foetida* in open field test (standing)

Group	Doses (mg/kg)	-30 mins	+30 mins	+60 mins	+90 mins	+120 mins
Control (1% Tween 80)	10 ml/kg	22.1 ± 1.54	12.2 ± 1.20	15.9 ± 0.89	18.2 ± 2.1	10.2 ± 0.81
STD (Clonazepam)	2	21.2 ± 1.54	19 ± 0.55	11.9 ± 1.99	20.32 ± 2.01	17.6 ± 1.29
Methanol extract	200	17.6 ± 1.66	19.0 ± 0.5	17.8 ± 2.15	15.2 ± 2.44	15.3 ± 0.43
	400	21.8 ± 1.16	20.2 ± 2.35	21.4 ± 1.94	19 ± 1.11	17 ± 1.97
Ethanol extract	200	17.0 ± 2.43*	16.0 ± 2.79*	13.4 ± 2.80*	11.2 ± 3.14*	9.4 ± 3.01*
	400	13.6 ± 0.93**	19.8 ± 2.8**	14.4 ± 5.07**	11.2 ± 3.71**	10.8 ± 3.25**
Chloroform extract	200	15.5 ± 1.43*	16.0 ± 2.1*	19.9 ± 0.76*	14.2 ± 0.65*	10.2 ± 3.10*
	400	16.2 ± 0.49	18 ± 1.34	16.8 ± 3.04	12.8 ± 1.32	11.4 ± 2.69

(Values are expressed as mean ± S.D. (n=6), *p<0.05; ** p<0.01; *** p<0.001 significant when compared with the corresponding value of control group, done by independent sample t-test)

Table 5: Effect of different extracts of *Paederia foetida* in open field test (Center)

Group	Doses (mg/kg)	-30 mins	+30 mins	+60 mins	+90 mins	+120 mins
Control (1% Tween 80)	10 ml/kg	5 ± 1.22	3.8 ± 2.42	3 ± 1.64	4 ± 2.61	1.2 ± 0.58
STD (Clonazepam)	2	2.2 ± 0.66	2.6 ± 0.87	0.4 ± 0.4	1.6 ± 0.81	0.2 ± 0.2
Methanol extract	200	2 ± 0.55	0.8 ± 0.8	0.8 ± 0.49	0.8 ± 0.58	3.2 ± 1.98
	400	2.4 ± 0.69	2.4 ± 1.17	1 ± 0.45	0.4 ± 0.24	0 ± 0
Ethanol extract	200	3 ± 1.58	2 ± 2	3.8 ± 2.22	0 ± 0	1 ± 0.77
	400	2.6 ± 1.4	1.2 ± 1.2	0 ± 0	0.8 ± 0.49	0 ± 0
Chloroform extract	200	4 ± 2.17*	2.4 ± 1.17*	1.2 ± 0.58*	0.8 ± 0.8*	1.2 ± 0.8*
	400	6 ± 0.77	0 ± 0	3 ± 0.84	2.6 ± 1.43	0 ± 0

(Values are expressed as mean ± S.D. (n=6), *p<0.05; ** p<0.01; *** p<0.001 significant when compared with the corresponding value of control group, done by independent sample t-test)

Table 6: Effect of different extracts of *Paederia foetida* in open field test (Stool)

Group	Doses (mg/kg)	-30 mins	+30 mins	+60 mins	+90 mins	+120 mins
Control (1% Tween 80)	10 ml/kg	0.83 ± 0.83	0 ± 0	0 ± 0	0 ± 0	0 ± 0
STD (Clonazepam)	2	1 ± 1	0 ± 0	0 ± 0	0 ± 0	0.17 ± 0.37
Methanol extract	200	1.12 ± 0.98	0.17 ± 0.37	0.17 ± 0.37	0.33 ± 0.47	0 ± 0
	400	1 ± 1.14*	0.17 ± 0.37*	0.17 ± 0.37*	0.33 ± 0.47*	0.67 ± 1.49*
Ethanol extract	200	0.66 ± 0.47	0.33 ± 0.47	0 ± 0	0 ± 0	0.33 ± 0.47
	400	0.83 ± 0.68	0 ± 0	0 ± 0	0 ± 0	0.17 ± 0.37
Chloroform extract	200	1.33 ± 1.11	0.17 ± 0.37	0.33 ± 0.47	0.83 ± 0.68	0 ± 0
	400	0.5 ± 0.76	0.33 ± 0.47	0 ± 0	1.12 ± 0.98	0.33 ± 0.47

(Values are expressed as mean ± S.D. (n=6), *p<0.05; ** p<0.01; *** p<0.001 significant when compared with the corresponding value of control group, done by independent sample t-test)

From Table 3, it is observed that both the doses of ethanol and chloroform extracts 200 & 400 mg/kg b.w significantly (*P<0.05, **P<0.01) decreased the rate of movement with me in a dose dependent manner when compared with corresponding value of control. It is also showed in table 4, 5 and 6 that these extracts decreased the frequency of standing, entrance into center and stool count at the same me. So it can be said that ethanol extract and chloroform extract of *Paederia foe da* have the ability to relieve stress and had an anxiolytic effect on the rodents.

Measuring aspects of mice behavior in a contained arena would indicate the emotional reactivity of the subjects. Many reports have validated open field tests as useful measures of emotional activity for Turku aggressive mice; others have not found differences in open field activity despite difference in other anxiety measures e.g. MHC-congenic mice[26]. Nevertheless, the open field test remains a standard behavioral assay reported in the literature[27]. The standard open field test is commonly used to assess locomotor, exploratory and anxiety like behavior in laboratory animals (rats/mice)[28]. The open field test is designed to examine responses of mice or rats to a new and unfamiliar environment. Rodents demonstrate anxiety, fear and curiosity when placed in a new environment. In response to the novel environment the rodents tend to explore the surrounding. The exploratory capacity might be considered to be an index of anxiety although it is difficult to separate it from motor anxiety. However, rodents are also fear to go to the open and illuminated space which is clearly demonstrated by their rearing, grooming, defecation, locomotors and so on. These parameters are well utilized to assess anxiety and fear in rodents[29].

Forced Swimming Test (FST)

The result of different leaf extracts of *Paederia foetida* in mice in forced swimming test is represented by Table 7. During the test only the methanol extract at doses of 400 mg/kg of body weight shortened the immobility period in comparison with control & exhibited a dose dependent antidepressant activity. A significant (*p<0.05) decrease in duration of immobility was observed as compared to that of control.

Table 7: Effect of different extracts of *Paederia foetida* in Forced Swimming Test

Group	Doses (mg/kg)	Duration of immobility (Sec)
Control (1% Tween 80)	10 ml/kg	104 ± 5.29
STD (Diazepam)	2 mg/kg	84 ± 3.06***
Methanol extract	200	100.8 ± 6.08
	400	84.8 ± 1.15**
Ethanol extract	200	99.6 ± 2.52
	400	105.4 ± 3.46
Chloroform extract	200	93.2 ± 1.52
	400	97.2 ± 1

(Values are expressed as mean ± S.D. (n=6), *p<0.05; **p<0.01; *** p<0.001 significant when compared with the corresponding value of control)

FST was designed by Porsolt, 1977 as a primary screening test or antidepressants[21]. It is still one of the best models for this procedure. It is a low cost, fast and reliable model to test potential antidepressant treatments with strong predictive validity. It has a great sensitivity with all antidepressant classes and all mechanisms of action of treatments could be determined, but clinical correlations should be considered very carefully. When rodents are forced to swim to in a confined place, they tend to become immobile after vigorous activity (Struggling). This stressful inescapable situation can be evaluated by assessing different stress. The development of immobility when the rodents are placed in an inescapable container of water reflects the cessation of persistent escape directed behavior[30].

The CNS depressant effect of the extracts may be attributed to chemical constitutes other than flavonoids and alkaloids because flavonoids are responsible for the decrease in immobile phase in the swim test and so does alkaloids as well.

CONCLUSION

P. foetida is widely used as a medicinal plant but studies strongly support its use as food as well as medicine. It is one of the popular vegetables used by tribal communities

of India. The plant extract is used in many polyherbal formulations especially those meant for arthritis patients.

There are many scientific and traditional claims documenting the benefits of *P. foetida*, with various therapeutic effects mainly concerned with gastrointestinal tract disorders including ulcer. Other therapeutic properties are hepatoprotective, anti inflammatory, antitussive, anti arthritics, antioxidant, analgesic and many others.

P. foetida can serve as a good candidate plant for further evaluation since effective medicines are not available or where available, do not provide long-term relief.

The present study found that GI motility, antipyretic & neuropharmacological activity when applied in animal model.

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