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INVESTIGATIONS OF ANALGESIC, ANTIDIARRHEAL AND CNS EFFECTS OF *SCOPARIA DULCIS.*

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ABSTRACT

Synthetic drugs are widely used for the management of pain, inflammation, diarrhea and anxiety that carry severe toxic effects. Globally research and trials are ongoing to establish novel medicinal plants to introduce effective and economic drugs. The study was focused to investigate the analgesic, antidiarrheal and CNS effects of ethanolic leaf extract of *Scoparia dulcis* (Family: Scrophulariaceae) in Swiss albino mice. The analgesic activity was investigated by using acetic acid induced writhing, tail immersion and eddy's hot plate method. Castor oil induced diarrheal models were used to evaluate antidiarrheal property. CNS effects were observed by conducting hole cross, open field, hole board and rota rod methods. All studies were carried out in mice at the doses of 50mg/kg and 100mg/kg body weight. The results of the present investigation indicate that the extract displayed significant ($P < .001$) analgesic activity and showed maximum writhing inhibition (58.33%) at the dose of 100 mg/kg body weight compared to standard drug indomethacin in acetic acid induced writhing method. The leaf extract also showed statistically significant ($P < .001$) dose dependent reduction of pain in both tail immersion and eddy's hot plate method with 49.28% and 100% pain inhibition at 1 hour compared to standard drug. In castor oil induced diarrhea method, the extract showed significant ($P<.001$) antidiarrheal activity (100%) at the dose of 100mg/kg body weight compared to standard drug loperamide. The extract also showed sedative effects in hole cross, open field and hole board methods with 52.5%, 47.93% and 73.85% of movement inhibition respectively whereas in rota rod falling time decreases with 30.44% at 100mg/kg dose compared to standard drug. The investigated study concludes that the leaf extract has central as well as peripheral analgesic, antidiarrheal and sedative effects which support a significant scope to develop its medicinal practice.

KEYWORDS: *Scoparia dulcis*, analgesic, antidiarrheal.

I. INTRODUCTION

Life threatening side effects or adverse drug reactions of synthetic drugs have aggravate the use of medicinal plants or herbs day by day. Plants synthesize hundreds of chemical compounds for functions including defense against insects, fungi, diseases, and herbivorous mammals. Drug research makes use of ethno botany to search for pharmacologically active substances in nature, and has in this way discovered hundreds of useful compounds like aspirin, digoxin, quinine, and opium. Alkaloids, glycosides, polyphenols, and terpenes are the major classes of secondary metabolites found in medicinal plants. *Scoparia dulcis Linn* (Scrophulariacae) is an important ethnomedicinal plant, commonly called as sweet broom weed is a perennial herb, widely distributed in tropical and subtropical regions of India, America, Brazil, West Indies, and Myanmar.[1,2] *S. dulcis* is a rich source of flavones, terpenes and steroids, phenols, tannins, saponins, amino acids, coumarins and carbohydrates. The main chemicals include scopadulcic acids A and B, scopadiol, scopadulciol, scopadulin, scoparic acids A – C and betulinic acid. [2,3] Acacetin, amyrin, apigenin, benzoxazin, benzoxazolin, benzoxazolinone, cirsimarin, cirsitakaoside, coixol, coumaric acid, cynaroside, daucosterol, dulcinol, dulcioic acid, gentisic acid, glutinol, hymenoxin, linarin, luteolin, mannitol, scoparinol, scutellarein, scutellarin, sitosterol, stigmasterol, taraxerol, vicenin, and vitexin lhave also been isolated from this plant.[2] The present study was designed to observe analgesic, antidiarrheal and CNS activities of the ethanolic extracts of the plant leaves of *S. dulcis*.

II. MATERIALS AND METHODS

A. Plant material

The fresh leaves of *S. dulcis* were collected from Narshingdi in Bangladesh in January, 2017 and identified by an expert taxonomist of Bangladesh

National Herbarium, Dhaka. A voucher specimen with accession No. 43913 has been deposited in Bangladesh National Herbarium, Dhaka, Bangladesh.

B. Preparation of Plant extracts

After collection of the plants, the leaves were washed properly to remove dirty materials and shade dried for several days with occasional sun drying. After drying, the dried plants grinded into powdered plant materials were extracted with ethanol by cold extraction. The leaves were extracted with about 700 ml of ethanol. Powdered plant materials were taken in reagent bottle and soaked in 700ml ethanol for 10 days at room temperature. During this period extract was shacked for several times daily. The extract was then filtered off through a cotton plug. The filtrate was concentrated using vacuum rotary evaporator at 50-60^{0}C. The concentrated ethanol extract was then placed in a dry and cool place for few days for the evaporation of liquid portion from the extract. Then the extract was stored for further use.

C. **Experimental Animal**

For this study, Swiss Albino mice (25-35 gm) of either sex were purchased from International center for Diarrhea Disease and Research Bangladesh, icddr'b and housed in animal house of Department of Pharmacy, Southeast University. The animals had free access to pellet feed and tap water ad libitum supplied by icddr'b. The animals were allowed to acclimatize to the environment condition (at 24.0±0°C temperature, 55-65% relative humidity and 12 hour light/12 hour dark cycle) for 7 days prior to experimental session. The animal experimental protocol was conducted in accordance with the guidelines titled as "Ethical Considerations for Animals" prepared by icddr'b.

D. Analgesic Activity

a. Acetic acid induced writhing test

In this method, acetic acid is administered intra peritoneal to the experimental animals to create pain sensation. As a result, the animals squirms their body at regular interval out of pain. This squirm or contraction of the body is termed as "writhing". 20 experimental animals were randomly selected and divided into 4 groups denoted as, Group-I (Normal Control group) 1ml saline per mice, Group-II (Standard Control group) 10mg/kg indomethacin, Group-III (Extract Control group) 50mg/kg of extract, Group-IV (Extract Control group) 100mg/kg of extract consisting of 5 mice in each group. 5 minutes after the administration of acetic acid, number of writhing were counted for each mouse for 30 minutes.

b. Eddy's hot plate method

It was proposed by Eddy and Leimbach in 1953. [4] 20 experimental animals were randomly selected and divided into 4 groups denoted as, Group-I (Normal Control group) 1ml saline per mice, Group-II (Standard Control group) 9mg/kg Diclofenac, Group-III (Extract Control group) 50mg/kg of extract, Group-IV (Extract Control group) 100mg/kg of extract consisting of 5 mice in each group. Mice were placed on the hot plate, which consists of electrically heated surface. Temperature of the hot plate was maintained at 55°C. Responses such as jumping, withdrawal of the paws and licking of the paws were observed. The time period (latency period) when animals were placed and until responses occur was recorded by the stopwatch. The extract was administered orally and latency period was recorded after 0, 30, 60, 90 and 120min.

Tail immersion method

It was first described by D'Amour and Smith in 1941.[5] In this method, the tip of tail of the mice is dipped up to 5 cm in hot water maintained at 58 ^{0}c. As a result, mice will withdraw its tail from the hot water and it is noted as the reaction time. 20 experimental animals were randomly selected and divided into 4 groups denoted as, Group-I (Normal Control group) 1ml saline per mice, Group-II (Standard Control group) 9mg/kg diclofenac, Group-III (Extract Control group) 50mg/kg of extract, Group-IV (Extract Control group) 100mg/kg of extract consisting of 5 mice in each group. Each mouse of all groups was observed individually for 5 seconds to evaluate the reaction time at 0, 30, 60, 90 and 120 minutes after the respective treatment.

E. CNS activity

a. Hole Cross Test

Here we used this method to determine the anxiolytic activity of mice. 20 experimental animals were randomly selected and divided into 4 groups denoted as, Normal Control group 1ml saline per mice, Standard Control group 1mg/kg Clonazepam, Extract Control group 50mg/kg of extract, Extract Control group 100mg/kg of extract consisting of 5mice in each group. Per mice it was given as 0.5ml of prepared extract solution. Each mouse of all groups was observed individually for counting the number of passage they made in 0, 30, 60 & 90 minutes after treatment.

b. Open Field Test

Developed by Calvin S. Hall, the open field test (OFT) is an experiment used to assay general locomotor activity levels and anxiety in rodents in scientific research and willingness to explore in rodents.[6-8] 20 experimental animals were randomly selected and divided into 4 groups and the mice were treated with vehicle, extract or clonazepam 1ml of saline, 50mg/kg and 100mg/kg and 1mg/kg of Clonazepam respectively and were placed in the middle of the open field. Then the number of squares visited by the animals was counted. Each mouse of all groups was observed individually for counting the number of squares they visited in 0, 30, 60 &90 minutes after treatment.

c. Hole Board Test

The HBT was designed in the 1970s.[9] Because of its ability to measure multiple behaviors it is a popular test in behavioral pharmacology but the results are

controversial.[10] 20 experimental animals were randomly selected and divided into 4 groups and the mice were treated with vehicle 1ml of saline, 50mg/kgm,100mg/kg and 1mg/kg of extracts and Clonazepam respectively and each animal was allowed to move on the platform and the number of head dips into the holes was counted. Each mouse of all groups was observed individually for counting the number of dips they made in 0, 30, 60 & 90 minutes after treatment.

d. Rota Rod Test

Rota rod test is performed using a horizontal rotation rod. Each mouse is placed on the rod for 180s after treatment. Then the falling time from the rotating rod is recorded for each mouse. 20 experimental animals were randomly selected and divided into 4 groups and the mice were treated with vehicle 1ml of saline, 50mg/kg, 100mg/kg and 1mg/kg of extracts and Clonazepam respectively and each animal was allowed to move on the Rota rod and each mouse of all groups was observed individually to evaluate time of falling from the platform in 0, 30, 60 & 90 minutes after treatment.

F. Anti-diarrheal activity

This method was undertaken to evaluate the effect of aqueous and ethanolic plant extracts of *S. dulcis* for its antidiarrhoeal potential against castor-oil induced diarrhea in mice. 20 experimental animals were randomly selected and divided into 4 groups denoted as, Normal Control group 1ml saline per mice, Standard Control group 5mg/kg loperamide, Extract Control group 50mg/kg of extract, Extract Control group 100mg/kg of extract consisting of 5 mice in each group. Each mouse of all groups was observed individually for counting the number of feces for 3 hours. Place and noiseless condition was ensured.

III. STATISTICAL ANALYSIS

The statistical analysis of data was done using one-way analysis of variance by using the SPSS software (version 11.5). $P < 0.001$ was considered as highly significant.

IV. RESULTS

A. Analgesic Activity

a. Acetic acid induced writhing test

The acetic acid induced writhing method was used to study the analgesic effects after 30 minutes of treatment. The administration of standard drug indomethacin significantly ($p<0.001$) inhibited the writhing response. Ethanolic extract of *S. dulcis* dose dependently suppressed the frequency of acetic acid induced writhing in experimental mice. At the dose 50mg/kg and 100mg/kg body weight the extract gives significant 46.53% and 58.33% writhing inhibition respectively, which is comparable to the result of standard drug is 82.63%.

Table I: Effects of *S. dulcis* leaves on acetic acid induced writhing model.

Treatment	Avg. no. of writhing
Control	28.8±0.66
Standard	5±0.98**
Extract 50mg/kg	15.4±3.48**
Extract 100mg/kg	12±3.65**

Values are expressed as mean ± SEM; significance at **p<0.001 as compared to control.

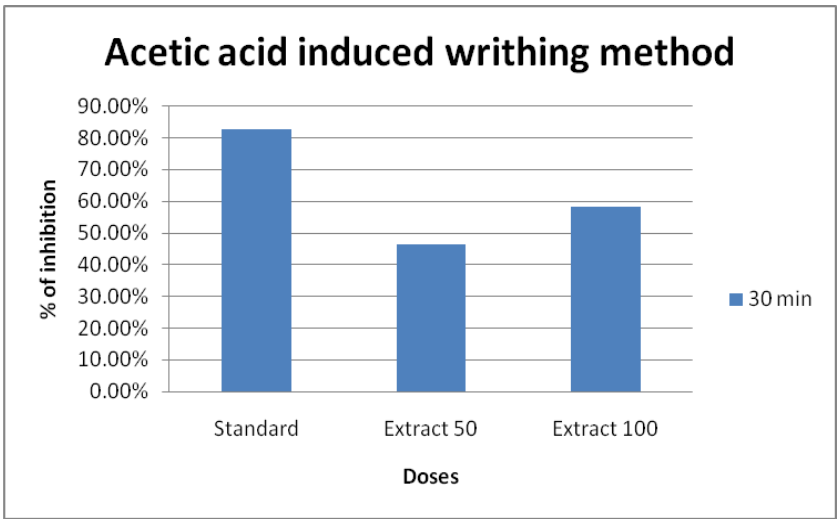

Fig. I: Effects of *S. dulcis* leaves on Acetic acid induced writhing models.

b. Eddy's hot plate method

In the hot plate method of analgesic activity the extract exhibited potent activity. The response time observed was significantly increased when compared to normal control. However, the dose 100mg/kg was found to be equally active as the standard diclofenac sodium during 1hr and 2hr response and 50mg/kg during 1hr. The maximum protection for diclofenac sodium was 100% where 100mg/kg and 50mg/kg dose also gives maximum 100% pain inhibition. The extract was found to be significant at the level of p<.001.

Table II: Effects of *S. dulcis* leaves on Eddy's hot plate method.

Treatment	Reaction Time				
	o min	30min	60min	90min	120min
Control	14±1.82	15.4±1.33	17.2±0.58	17.8±0.95	18±1.44
Standard	0**	0**	0.2±0.26**	0**	0.8±0.48**
Extract 50mg/kg	0**	0.6±0.77**	1.8±1.44**	4.4±1.13**	7±1.08**
Extract 100mg/kg	0**	0.4±0.32**	1.4±0.66**	3.4±1.76**	6.6±1.90**

Values are expressed as mean ± SEM; significance at **p<0.001 as compared to control.

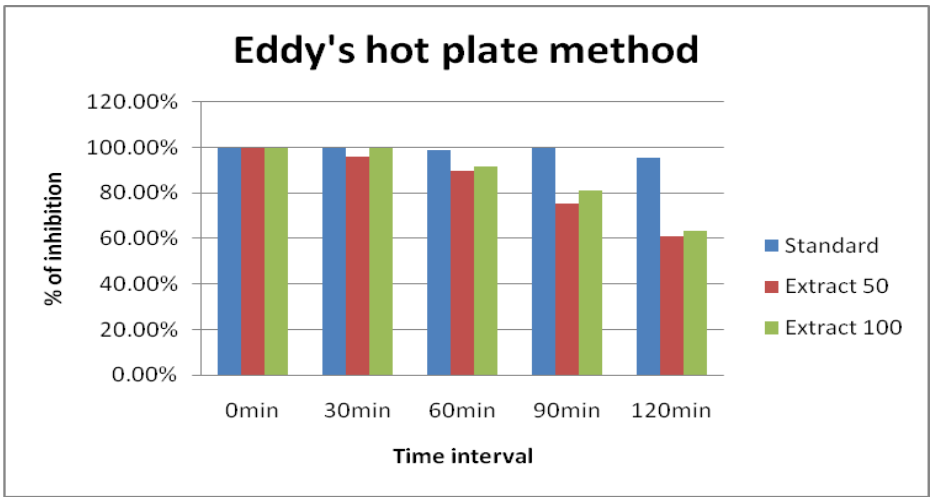

Fig. II: Effects of *S. dulcis* leaves on Eddy's hot plate method.

c. Tail immersion method

In the tail immersion method of analgesic activity the extract showed potency. The response time was significantly decreased when compared to normal control. The standard Diclofenac sodium showed better activity than the extract during 2hr response. The maximum percentage protection for standard was 71.01% where maximum percentage of pain inhibition extract 100mg/kg dose was 49.28% of pain inhibition. The extract was found to be significant at the level of p<.05.

Table III: Effects of *S. dulcis* leaves on Tail immersion method.

Treatment	Reaction Time				
	0min	30min	60min	90min	120min
Control	13.8±0.11	15±0.91	17±0.91	17.8±0.75	18.6±0.32
Standard	4±0.91*	5.4±1.3*	11.4±0.65*	11.6±0.52*	11.8±3.54*
Extract 50mg/kg	12±0.91	14.6±1.05	16.6±0.66	17.2±0.75	18.2±0.48
Extract 100mg/kg	7±2.06	14.2±0.75	16.4±1.13	17.2±0.48	18±1

Values are expressed as mean ± SEM; significance at *p<0.05 as compared to control.

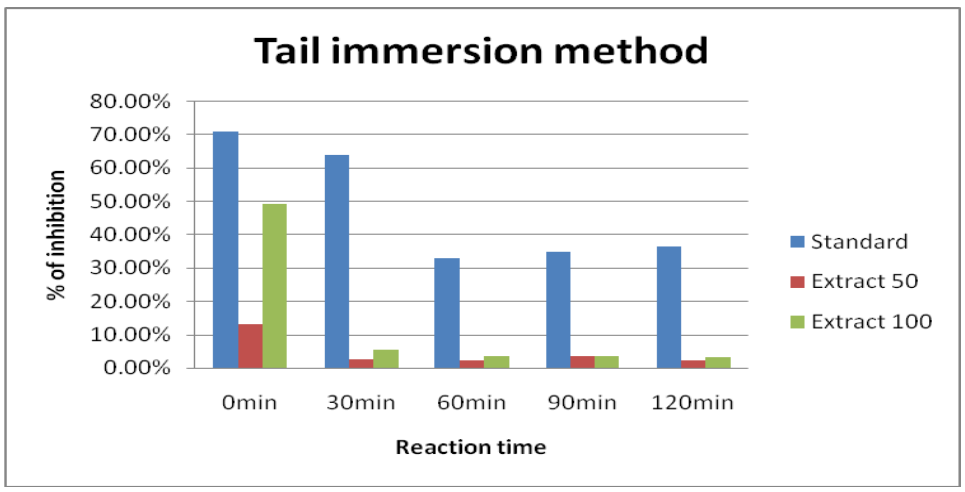

Fig. III: Effects of *S. dulcis* on Tail immersion method.

B. CNS activity

a. Hole Cross Test

In the hole cross method of CNS activity the extract showed sedative activity. The doses of extract significantly decreased ($p<0.05$) the total number of movement. The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 42.5% and 52.5% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 87.5%. So the doses of extract showed low potency compared to the standard.

Table IV: Effects of *S. dulcis* leaves on Hole Cross method.

Treatment	Number of Movement			
	0min	30min	60min	90min
Control	13.6±2.6	10.8±1.84	9±1.41	8±2.86
Standard	9±1.68	5.8±1.44	3.2±0.75*	1±0.58*
Extract 50mg/kg	11.4±4.42	8±2.16	7.8±1.89	4.6±1.20
Extract 100mg/kg	8±2.43	7.4±3.28	5±1.41	3.8±1.49

Values are expressed as mean ± SEM; significance at *$p<0.05$ as compared to control.

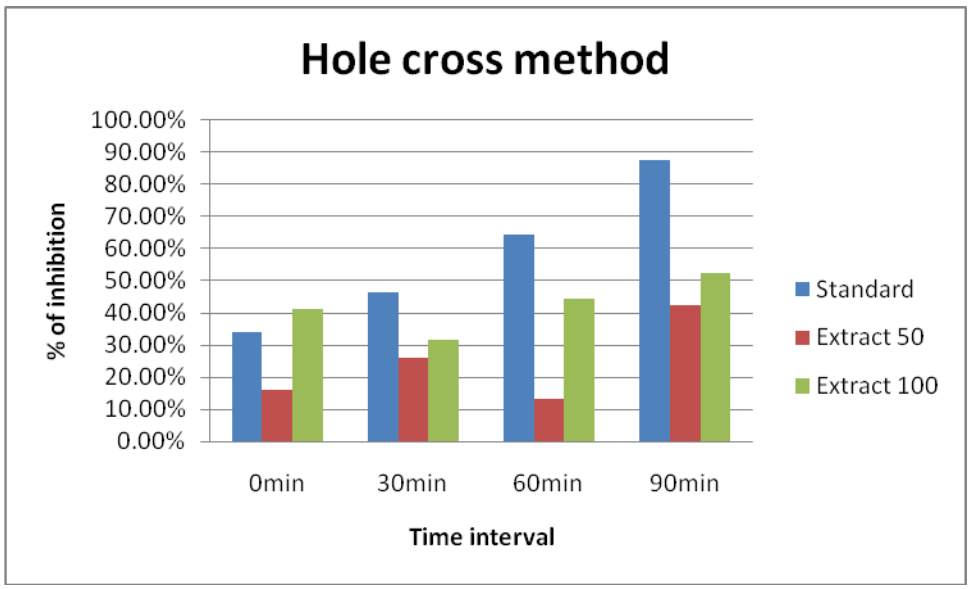

Fig. IV: Effects of *S. dulcis* leaves on Hole Cross method.

b. Open Field Test

In the open field method of CNS activity the extract showed sedative activity. The doses of extract significantly decreased ($p<0.05$) the total number of movement .The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 47.93% and 37.86% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 97.04%. So the doses of extract showed very low potency compared to the standard.

Table V: Effects of *S. dulcis* leaves on Open Field method.

Treatment	Number of movement			
	0min	30min	60min	90min
Control	68.8±10.33	62.6±5.66	49.6±10.09	33.8±4.73
Standard	29.6±13.25*	7.4±2.40*	4±1.78*	1±0.57*
Extract 50mg/kg	68±9.92	51.2±1.11*	38.4±9.15	17.6±9.24
Extract 100mg/kg	55.2±7.31	42.8±2.14*	35.4±7.19	21±6.15

Values are expressed as mean ± SEM; significance at *$p<0.05$ as compared to control.

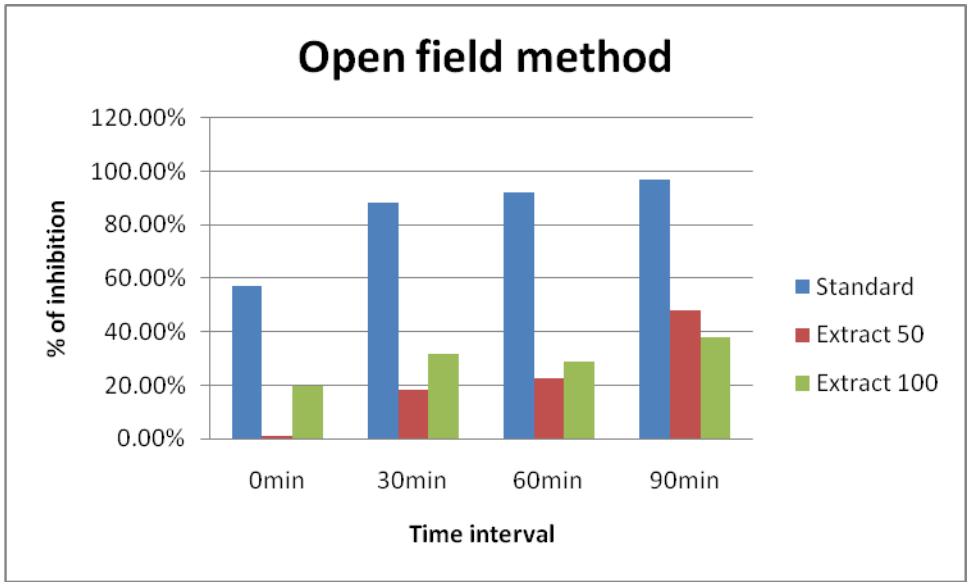

Fig. V: Effects of *S. dulcis* effect on Open Field method.

c. Hole Board Test

In the hole board method of CNS activity the extract showed sedative activity. The doses of extract significantly decreased ($p<0.05$) the total number of head dipping .The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 58.46% and 73.85% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 100%. So the doses of extract showed potency compared to the standard.

Table VI: Effects of *S. dulcis* leaves on Hole Board method.

Treatment	Number of Head Dipping			
	0min	**30min**	**60min**	**90min**
Control	21±3.24	19.4±2.93	13.8±1.80	13±1.96
Standard	13.8±3.84	0.2±0.25*	0.4±0.51*	0*
Extract 50mg/kg	16±4.65	14.5±2.60	9.6±2.33	5.4±2.11*
Extract 100mg/kg	19.8±3.15	10.6±1.71*	9.2±4.57	3.4±1.85*

Values are expressed as mean ± SEM; significance at *$p<0.05$ as compared to control.

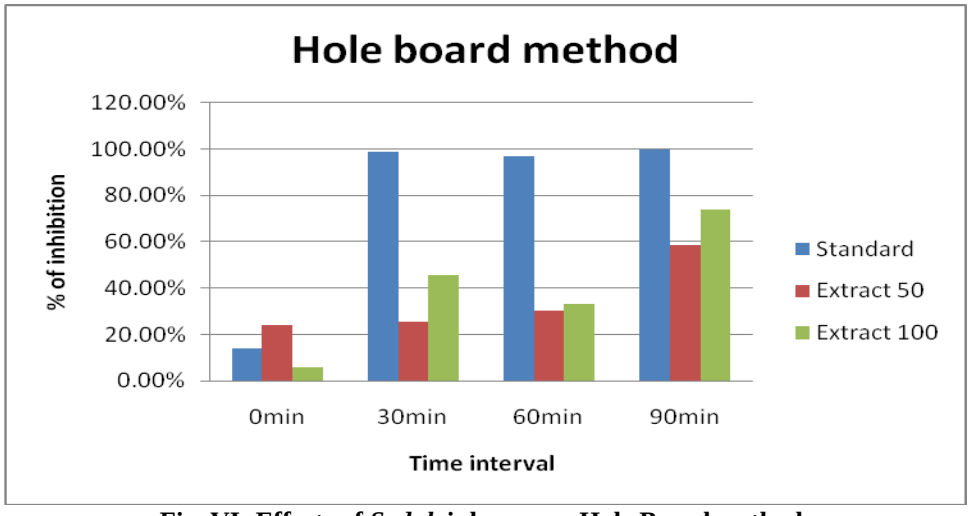

Fig. VI: Effects of *S. dulcis* leaves on Hole Board method.

d. Rota Rod Test

In the rota rod method of CNS activity the extract showed sedative activity. The doses of extract significantly decreased ($p<0.05$) the duration of falling time .The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 23.13% and 30.44% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 100%. So the doses of extract showed very low potency compared to the standard.

Table VII: Effects of *S. dulcis* leaves on Rota Rod method.

Treatment	Duration of Falling Time			
	0min	30min	60min	90min
Control	44.6±7.26	36.8±8.69	29.4±3.93	23±6.26
Standard	0.2±0.25*	0.2±0.25*	0*	0*
Extract 50mg/kg	41.6±7.13	32.6±6.98	22.6±4.12	18±2.58
Extract 100mg/kg	41.2±5.62	29.6±7.87	22.4±3.64	16±2.52

Values are expressed as mean ±SEM; significance at *p<0.05 as compared to control.

C. Anti-diarrheal activity

In the castor oil induced method of antidiarrheal activity the extract showed potent activity. The doses of extract significantly decreased (p<0.001) the total number of diarrheal feces produced by administration of castor oil. The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 93.33% and 100% respectively. The maximum percentage of inhibition for the standard drug loperamide was 100%. So the dose of 100mg/kg has same potency as the standard.

Table VIII: Effects of *S. dulcis* leaves on Castor oil induced diarrheal models.

Treatment	Total number of Feces		
	1st hour	2nd hour	3rd hour
Control	3±0.57	3.8±0.75	3.4±0.65
Standard	0*	0*	0.6±0.51*
Extract 50mg/kg	0.2±0.25*	0.8±0.48*	2±0.91
Extract 100mg/kg	0*	0*	1.2±0.26

Values are expressed as mean ±SEM; significance at **p<0.001 as compared to control.

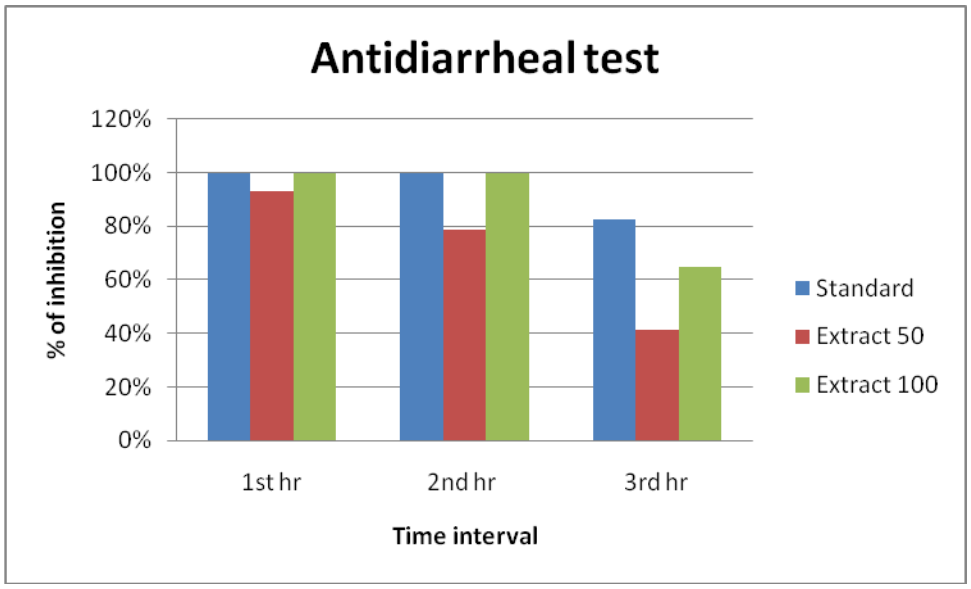

Fig. VIII: Effects of *S. dulcis* leaves on Castor oil induced diarrheal models.

III. DISCUSSION

Present study was focused to investigate the analgesic, antidiarrheal and CNS depressant potentials of ethanolic extract of *S. dulcis* leaves. Analgesic potential was investigated by 3 methods – acetic acid induced writhing method, Eddy's hot plate method and tail immersion method. CNS depressant activity was determined by using these 4 methods – Hole Cross, Open Field, Hole Board and Rota Rod methods. And Antidiarrheal effect was tested by castor oil induced diarrhea method. Acetic acid induced writhing method has selectivity for peripheral acting action.[11] Acetic acid causes an increase in peritoneal fluids of PGE2 and PGF2 α, serotonin and histamine involved and produces severe pain like writhing that is used to evaluate used peripheral analgesia. The extract decreased the acetic acid induced writhing at both the doses (50mg/kg and 100mg/kg) indicating their potent activity by peripheral antinociceptic action. It shows the significant (p<.001) at the dose 100mg/kg compared with the standard drug indomethacin. At the dose 50mg/kg and 100mg/kg body weight the extract gives significant 46.52% and 58.34% writhing inhibition respectively, which is comparable to the result of standard drug is 82.63%. This result indicates that the crude ethanolic extract of *S. dulcis* leaves might have peripheral effects of inhibiting the

synthesis or action of prostaglandins as it is consist of flavonoids and steroids which give anti-inflammatory action.[12,13] Hot plate test and Tail immersion test have selectivity for opioid derived centrally mediated analgesics .[14] The Hot plate and tail immersion tests are useful in the elucidating centrally mediated antinociceptive responses that focused mainly on changes above the spinal cord level. Animals treated with the extract of *S. dulcis* showed significant ($p<.001$) at the dose 100mg/kg and 50mg/kg both compared with the standard drug diclofenac. For hot plate method the maximum protection for diclofenac sodium was 100% of inhibition where 100mg/kg and 50mg/kg dose also gives maximum 100% inhibition. For Tail immersion method the maximum percentage of protection for standard was 71.02% where maximum percentage of protection for extract 100mg/kg dose was 49%. Those effects are related mainly to the presence of glutinol and flavonoids, which exert their action on the early phase of the acute inflammatory process through central and peripheral mechanism.[15,16] The Hole cross and Open field tests were used to investigate the CNS effects of ethanolic extract of *S. dulcis* by recording spontaneous locomotor activity of mice. Presence of scoparinol in *S. dulcis* is responsible for creating sedation action in mice.[17] Due to inactivation of GABA receptor hyperpolarization of cell occurs. This causes anxiety. Our result demonstrated that the oral administration of ethanolic extract at 100mg/kg body weight caused a marked reduction in number of Holecross. But in the open field test activity of the extract at dose 50mg/kg showed better activity than 100mg/kg with time. The extract at all tested doses produced significant ($p<.05$) inhibition of locomotion that was maintained from 30 min to 90 min of observation period compared with standard drug clonazepam. For hole cross method the maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 42.50% and 52.50% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 88%. For open field method the maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 47.93% and 37.86% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 97.04%. This ability of the extract to suppress the locomotor activity suggests that the extract is endowed with CNS depressant activity. Another important observation was achieved in the Hole board test. This test is well established as a means to assay potential anxiolytic and sedative effects of any agents by observing the exploratory behavior. This experiment is advantageous due to its methodological simplicity and several behavioral responses of an animal can be readily observed and qualified when exposed to an unfamiliar environment. It was found that the head-dipping behavior of the animals is directly related to their emotional state.[18] Based on this observation, it was suggested that the expression of an anxiolytic state in animals might be reflected by an increase in head-dipping behavior, while a decrease in the number of head dips was found to be correlated with the depressant effect.[19] Our results revealed that the ethanolic extract of *S. dulcis* caused a dose-dependent reduction in head-dip response in the animals. The observed effects in the treated groups were significantly different ($p<.05$) from that of the control group. The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 58.46% and 73.85% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 100%. The Rota rod test is a widely used method to evaluate the motor coordination or muscle relaxant effect in rodents. It is well established that some benzodiazepines like clonazepam cause muscle weakness, decrease of ambulatory activity and sedation thus impairing the performance of animals in the rota rod.[20] Our results demonstrated that at 50mg/kg and 100mg/kg doses of extracts markedly reduced the falling latency of the animals from the rotating rod. The effect produced by the two doses were significant ($p<.05$). The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 23.13% and 30.44% respectively. The maximum percentage of inhibition for the standard drug clonazepam was 100%. From all these tests it can be said that the extract might have the activity to activate the GABA receptor and opening of chloride ion channel. So that it can hyperpolarize the cells and reduce anxiety. The effect produced by the two doses were significant ($p<.05$). Further studies are required to investigate the exact mechanism of CNS depressant activity of the plant. As a laxative, castor oil increase bowel movement, changes the intestinal permeability and the histology.[21] The result of this study show that there is a significant reduction in the severity of diarrhea with the ethanolic extract of *S. dulcis* in experimental animals as the plant contains flavonoids which are thought to be responsible for Anti-diarrheal activity by increasing colonic water and electrolyte reabsorption. At the doses 50mg/kg and 100mg/kg body weight it significantly ($p<.001$) lowered the several typical parameters of diarrhea compared with the standard drug loperamide. The maximum percentages of inhibition for the 50mg/kg and 100mg/kg doses were 93.33% and 100% respectively. The maximum percentage of inhibition for the standard drug loperamide was 100%. So the extract might have the potency to reduce bowel movement and intestinal permeability.

IV. ACKNOWLEDGEMENTS

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V. CONCLUSION

From the previous studies presence of many chemical compounds were found in *S. dulcis*. It has so many traditional uses. It works as a remedy of many diseases. *S.*

dulcis is an annual erect herb distributed throughout tropical and subtropical regions of India, America, Brazil, West Indies, Myanmar and Bangladesh.[22] The whole plant is used for ailments like diarrhea, stomach-ache, kidney stones, kidney problems, and fever. *S. dulcis* is a rich source of flavones, terpenes and steroids. [23,24] The present study was as a verification study of analgesic, antidiarrheal and CNS activities of the plant extract. The present investigated study is done to authenticate the central as well as peripheral analgesic effects, antidiarrheal potentials, sedative and anxiolytic properties of *S. dulcis* which supports a significant scope to develop its medicinal practice. Previously various important chemical compounds has been isolated from *S. dulcis*. As this plant is consist of many important chemicals it can further be used in medicinal purpose. Further studies should also evaluate the mechanisms of activity of the identified chemical compounds.

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