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EVALUATION OF ANTI-DIARRHOEAL AND ANTI-CONSTIPATION EFFECTS OF SAMBUKADI VATI IN EXPERIMENTALLY INDUCED IRRITABLE BOWEL SYNDROME MODELS IN WISTAR RATS

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ABSTRACT

The therapeutic efficacy of Sambukadi Vati, a classical Ayurvedic formulation, was evaluated for its dual action on Grahani Roga, specifically focusing on Irritable bowel syndrome–Diarrhea predominant (IBS-D) and Constipation predominant (IBS-C). Using experimentally induced disease models in Wistar rats, the study assessed parameters such as Bristol stool scale, Faecal water content, loose stool rate, and faecal pellet count. The results demonstrated that Sambukadi Vati significantly regulates bowel motility and intestinal secretion, validating its traditional use in managing functional bowel disorders.

KEYWORDS: Sambukadi Vati, Grahani Roga, Irritable bowel syndrome, IBS-D, IBS-C, Anti-diarrhoeal activity, Anti-constipation activity, Wistar rats.

INTRODUCTION

Irritable bowel syndrome (IBS) is a chronic functional disorder of the gastrointestinal tract characterized by recurrent abdominal discomfort accompanied by alterations in stool frequency and consistency. Based on predominant clinical features, IBS is commonly categorized into diarrhea-predominant (IBS-D) and constipation-predominant (IBS-C) forms. The pathogenesis of IBS is complex and involves multiple interacting mechanisms, including abnormal gastrointestinal motility, visceral hypersensitivity, low-grade intestinal inflammation, and disturbances in the brain–gut axis.

Although several pharmacological agents are available for symptom-based management, long-term treatment outcomes remain unsatisfactory for many patients due to limited efficacy and the risk of adverse effects. Traditional systems of medicine, particularly Ayurveda, emphasize holistic management of gastrointestinal disorders through herbal and herbo-mineral formulations. Sambukadi Vati is a classical Ayurvedic preparation traditionally prescribed for bowel irregularities; however, its pharmacological properties have not been adequately validated through experimental studies. Therefore, the present study was designed to scientifically evaluate the anti-diarrhoeal and anti-constipation effects of Sambukadi Vati using established experimental models of IBS.

MATERIALS AND METHODS

Experimental Animals

The study was conducted using eighteen healthy adult Wistar rats of either sex, weighing between 200 and 250 g. Animals were maintained under controlled laboratory conditions with a temperature of 25 ± 2°C, relative humidity of 45–55%, and a 12-hour light–dark cycle. Standard pellet diet and water were provided ad libitum. All animals were allowed an acclimatization period of

seven days prior to the initiation of the experimental procedures.

Ethical Considerations

The experimental protocol received approval from the Institutional Animal Ethics Committee (IAEC), Siksha 'O' Anusandhan, Bhubaneswar. All experimental procedures were carried out in strict accordance with the guidelines prescribed by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Government of India.

Drugs and Chemicals

Glacial acetic acid (40 mL/L), phosphate-buffered saline (PBS), ice-cold water (0–4°C), ketamine-xylazine (80:20), and normal saline were used during the study. Sambukadi Vati was employed as the test formulation and administered orally at a dose of 100 mg/kg body weight.

Experimental Design

Anti-Diarrhoeal Activity (IBS-D Model).

Induction of Diarrhoea

Following a 24-hour fasting period, diarrhoea was induced in the animals by intra-colonic administration of 1 mL glacial acetic acid (40 mL/L) under ketamine-xylazine anesthesia. This was followed by the instillation of 1 mL PBS to facilitate uniform dispersion of the irritant.

Grouping and Treatment

Group I: Control group (normal saline)
Group II: Disease control group (acetic acid)
Group III: Test group (Sambukadi Vati, 100 mg/kg)
Sambukadi Vati was administered orally once daily for 14 consecutive days prior to diarrhoea induction.

Parameters Assessed

1. Bristol stool score

Control	Disease	Test
2.5	6.2	4.2
2.8	6.2	4.5
2.6	6.5	4.1
3	7	4.9
2.5	6.9	4.7
2.6	7	4
2.60	6.60	4.40

2. Loose stool rate

Control	Disease	Test
0	25	15
0	28	17
0	25	16
0	29	20
0	27	17
0	30	16
0.0	27.33	16.83

3. Faecal water content

Control	Disease	Test
32	71	55
30	73	58
34	73	62
36	75	60
35	79	53
40	78	56
34.50	74.83	57.33

STATISTICAL RESULTS

Table 1: Bristol Stool Score (Mean ± SD).

Group	n	Score
Control	6	2.60 ± 0.19
Disease Control	6	6.60 ± 0.38
Test (Sambukadi Vati)	6	4.40 ± 0.35

Figure 1. Bristol Stool Score

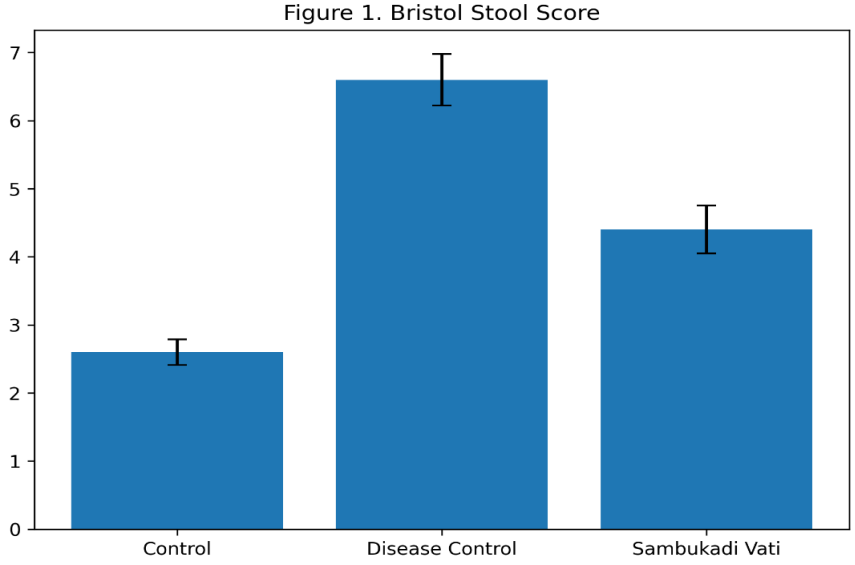

Figure 1: Bristol Stool Score.

Table 1a: Bristol Stool Score – One-way ANOVA.

Source	df	F value	p value
Between Groups	2	186.42	< 0.001
Within Groups	15	-	-
Total	17	-	-

Table 1b: Bristol Stool Score – Tukey's HSD Test.

Comparison	Mean Difference	p value	Significance
Control vs Disease	4.00	< 0.001	Significant
Control vs Test	1.80	< 0.01	Significant
Disease vs Test	2.20	< 0.01	Significant

Effect on Bristol Stool Score

Rats in the disease control group showed a significant elevation in Bristol stool score compared with the normal control group ($p < 0.001$), indicating successful induction of diarrhoea. Treatment with Sambukadi Vati resulted in a statistically significant reduction in stool looseness relative to disease control animals ($p < 0.01$), reflecting appreciable anti-diarrhoeal activity.

Table 2: Loose Stool Rate (%).

Group	n	Rate (%)
Control	6	0.00 ± 0.00
Disease Control	6	27.33 ± 2.06
Sambukadi Vati	6	16.83 ± 1.72

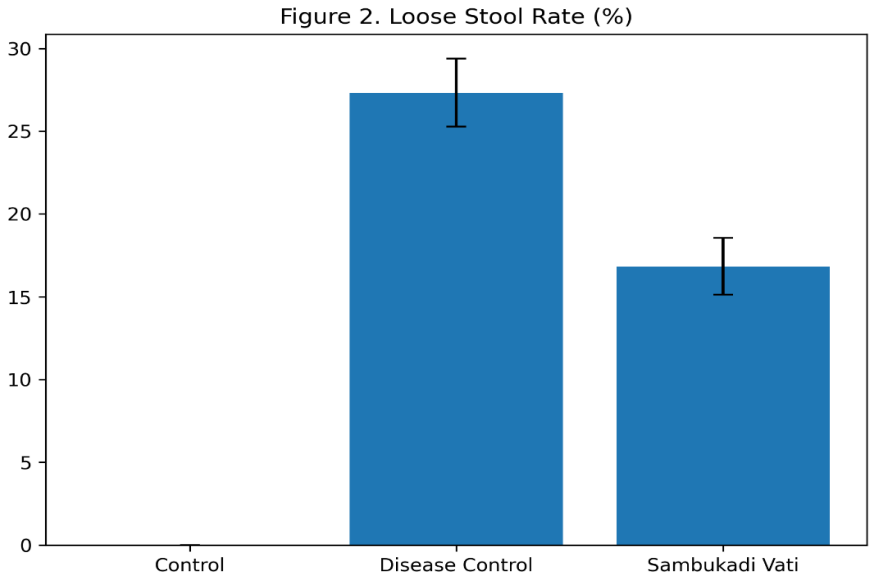

Figure 2: Loose Stool Rate (%).

Table 2a: Loose Stool Rate – One-way ANOVA.

Source	df	F value	p value
Between Groups	2	473.11	< 0.001
Within Groups	15	-	-
Total	17	-	-

Table 2b: Loose Stool Rate – Tukey's HSD Test.

Comparison	Mean Difference	p value	Significance
Control vs Disease	27.33	< 0.001	Significant
Control vs Test	16.83	< 0.001	Significant
Disease vs Test	10.50	< 0.001	Significant

Effect on Loose Stool Rate

The frequency of loose stools was markedly higher in disease control rats (27.33 ± 2.06%) than in the control group ($p < 0.001$). Administration of Sambukadi Vati significantly reduced the loose stool rate to 16.83 ± 1.72% ($p < 0.001$).

Table 3: Faecal Water Content (%).

Group	n	Water Content (%)
Control	6	34.50 ± 3.40
Disease Control	6	74.83 ± 3.12
Sambukadi Vati	6	57.33 ± 3.32

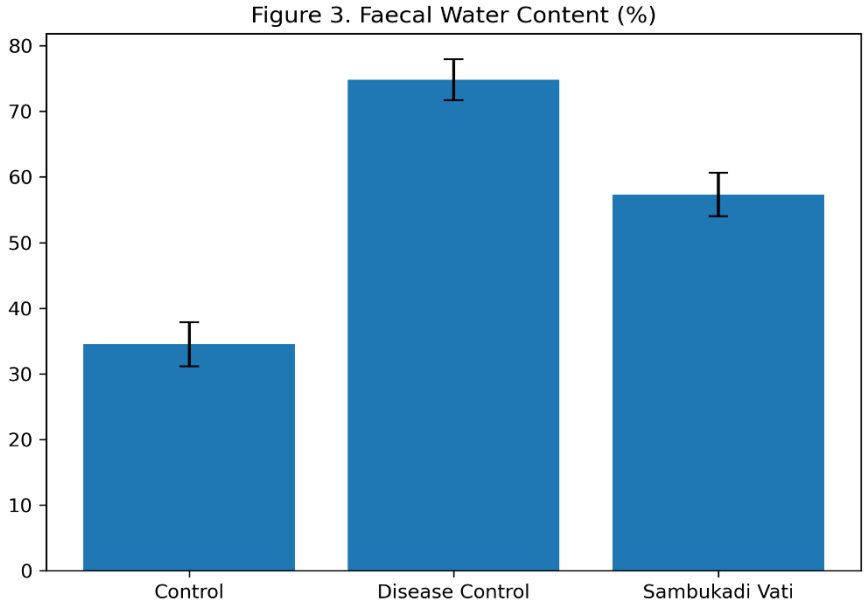

Figure 3: Faecal Water Content (%).

Table 3a: Faecal Water Content – One-way ANOVA.

Source	df	F value	p value
Between Groups	2	224.94	< 0.001
Within Groups	15	-	-
Total	17	-	-

Table 3b: Faecal Water Content – Tukey's HSD Test.

Comparison	Mean Difference	p value	Significance
Control vs Disease	40.33	< 0.001	Significant
Control vs Test	22.83	< 0.001	Significant
Disease vs Test	17.50	< 0.001	Significant

Effect on Faecal Water Content

Faecal water content was significantly elevated in the disease control group (74.83 ± 3.12%), indicating excessive intestinal secretion. Treatment with Sambukadi Vati significantly lowered faecal water content to 57.33 ± 3.32% ($p < 0.001$), although complete normalization was not observed.

Phase 2 Anti-Constipation Activity (IBS-C Model)

Induction of Constipation

Constipation-predominant IBS was induced by administering 2 mL of ice-cold water (0–4°C) orally once daily for 14 days.

Grouping

Group I: Control group (normal saline)

Group II: Disease control group (ice-cold water)

Group III: Test group (ice-cold water + Sambukadi Vati)

Parameters Evaluated

Number of faecal pellets

Control	Disease	Test
5	1	2
7	0	4
8	1	3
8	1	4
6	1	4
7	0	2
6.83	0.66	3.16

Weight of faecal pellets

Control	Disease	Test
4	1	2
3	1	3
5	0	2
5	1	2
3	0	3
4	0	3
4	0.5	2.5

STATISTICAL RESULTS

Table 4: Faecal Pellet Number.

Group	n	Pellet Number
Control	6	6.83 ± 1.16
Disease Control	6	0.66 ± 0.51
Test (Sambukadi Vati)	6	3.16 ± 0.98

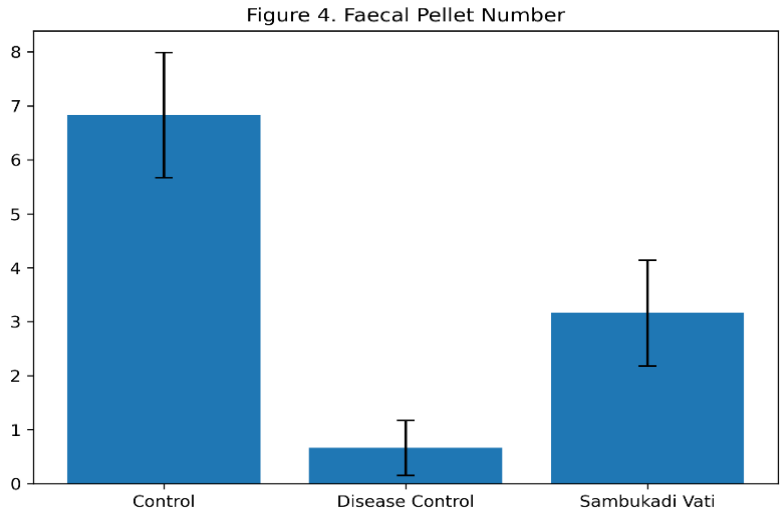

Figure 4: Faecal Pellet Number.

Table 4a: Faecal Pellet Number – One-way ANOVA.

Source	df	F value	p value
Between Groups	2	66.60	< 0.001
Within Groups	15	-	-
Total	17	-	-

Table 4b: Faecal Pellet Number – Tukey's HSD Test.

Comparison	Mean Difference	p value	Significance
Control vs Disease	6.17	< 0.001	Significant
Control vs Test	3.67	< 0.001	Significant
Disease vs Test	2.50	< 0.001	Significant

Faecal Pellet Number- A significant reduction in faecal pellet count was observed in disease control rats (0.66 ± 0.51) compared with control animals (6.83 ± 1.16; $p < 0.001$). Sambukadi Vati treatment significantly increased pellet number to 3.16 ± 0.98 ($p < 0.001$).

Table 5: Faecal Pellet Weight (g).

Group	n	Weight (g)
Control	6	4.00 ± 0.89
Disease Control	6	0.50 ± 0.54
Test (Sambukadi Vati)	6	2.50 ± 0.54

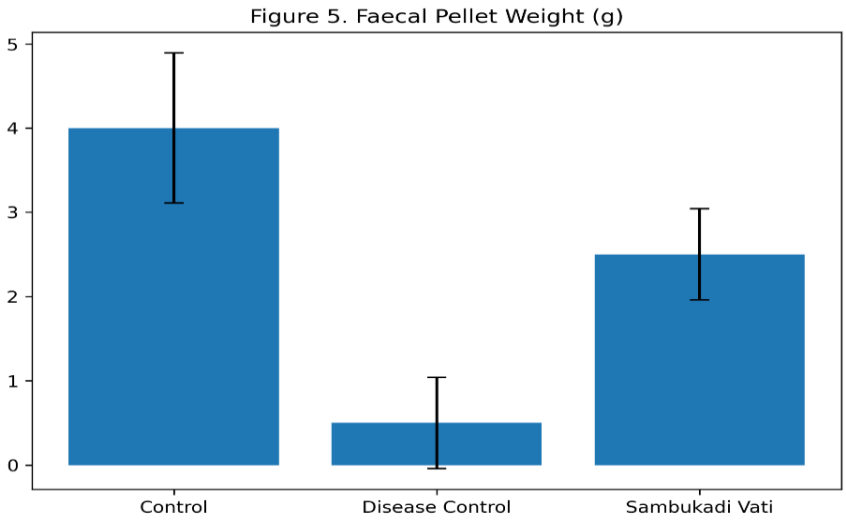

Figure 5: Faecal Pellet Weight (g).

Table 5a: Faecal Pellet Weight – One-way ANOVA.

Source	df	F value	p value
Between Groups	2	39.64	< 0.001
Within Groups	15	-	-
Total	17	-	-

Table 5b: Faecal Pellet Weight – Tukey's HSD Test.

Comparison	Mean Difference	p value	Significance
Control vs Disease	3.50	< 0.001	Highly Significant
Control vs Test	1.50	< 0.001	Highly Significant
Disease vs Test	2.00	< 0.001	Highly Significant

Faecal Pellet Weight

Disease control animals also exhibited a significant decrease in faecal pellet weight (0.50 ± 0.54 g). Administration of Sambukadi Vati significantly improved pellet weight to 2.50 ± 0.54 g when compared with the disease control group ($p < 0.001$).

Photographic Documentation of Experimental Study in Animal Laboratory

Animal house

Housing & Feeding

Induction of constipation by ice water through oral route

Feeding of trail drug

Induction of diarrhoea by glacial acetic acid through anal canal

DISCUSSION

The results of the present investigation clearly demonstrate that Sambukadi Vati exerts significant protective effects in both diarrhoea- and constipation-predominant models of IBS. In the acetic acid-induced IBS-D model, the observed reduction in stool looseness, loose stool frequency, and faecal water content suggests improved intestinal absorption and attenuation of mucosal irritation.

In the IBS-C model, repeated exposure to ice-cold water resulted in suppressed bowel motility and reduced stool output. Sambukadi Vati treatment significantly reversed these effects, as evidenced by increased faecal pellet number and weight, indicating restoration of gastrointestinal motility.

The ability of Sambukadi Vati to improve opposing pathological conditions highlights its regulatory influence on bowel function rather than a unidirectional pharmacological action. This dual activity is particularly relevant in IBS, a disorder characterized by fluctuating bowel patterns.

CONCLUSION

The present experimental study confirms that Sambukadi Vati possesses significant anti-diarrhoeal and anti-constipation activities in experimentally induced IBS models in Wistar rats. The formulation effectively reduced diarrhoeal severity while simultaneously improving constipation-associated parameters, demonstrating its dual modulatory effect on bowel function. These findings provide strong scientific support for the traditional use of Sambukadi Vati and suggest its potential utility in the management of irritable bowel syndrome.

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