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Research Article

PHARMACEUTICO-ANALYTICAL AND EXPERIMENTAL EVALUATION OF ANTI-DIARRHEAL ACTIVITY OF *KANAKASUNDARA RASA*

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ABSTRACT

Kanakasundara rasa, is traditionally indicated for gastrointestinal disorders; however, scientific evidence regarding its pharmaceutical standardization, analytical characterization, and antidiarrheal efficacy remains limited. This study aimed to prepare *Kanakasundara rasa* according to the reference Rasaprakasha Sudhakara, evaluate its physicochemical and instrumental analytical parameters, and investigate its antidiarrheal activity through in vitro and experimental studies. **Methods:** *Kanakasundara rasa* was prepared and evaluated for organoleptic characteristics and physicochemical parameters, including pH, Loss on Drying (LOD), ash values, etc. Advanced characterization was performed using Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopy (EDS), Fourier Transform Infrared Spectroscopy (FTIR), and X-ray Diffraction (XRD). Antibacterial activity against *Escherichia coli* and *Salmonella typhi* was assessed using the optical density method and Minimum Inhibitory Concentration (MIC). Experimental antidiarrheal activity was evaluated in Wistar albino rats using standard animal models. **Results:** The prepared formulation exhibited acceptable organoleptic and physicochemical characteristics consistent with standards. SEM revealed fine, unevenly distributed particles, while EDS confirmed the presence of major elemental constituents. FTIR identified hydroxyl, carbonyl, aromatic, and ether functional groups, and XRD demonstrated a highly crystalline nature. The formulation showed concentration-dependent antibacterial activity against *E. coli* and *S. typhi*, with appreciable MIC values. In vivo studies demonstrated significant antidiarrheal activity by reducing diarrheal episodes, intestinal secretion, and gastrointestinal motility compared with the control group. **Conclusion:** *Kanakasundara rasa* demonstrated promising antidiarrheal activity supported by pharmaceutical standardization, analytical characterization, and antibacterial efficacy. These findings scientifically validate its traditional use in the management of *Atisara* and support further clinical studies to establish its therapeutic potential.

INTRODUCTION

Diarrhoea remains a major global public health problem, accounting for substantial morbidity and mortality, particularly in developing countries. Despite the availability of modern therapeutic agents, recurrent infections, antimicrobial resistance, and adverse drug reactions necessitate the exploration of safe and effective alternative treatment modalities.

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In Ayurveda, diarrhea is described under the broad spectrum of *Atisara*, a disease characterized by frequent passage of loose stools resulting from the vitiation of *Doshas* and impaired digestive function (*Agni*)[1]. Its primary aim of treatment is to increase *Agnibala* and *Pachana* of *Dosha*. Numerous herbo-mineral formulations have been described in the classical Ayurvedic texts for the management of *Atisara*.

Kanakasundara rasa is a herbo-mineral formulation described in *Rasaprakasha Sudhakara* with indications in *Atisara* and *Jwara*[2]. The formulation comprises ingredients possessing antimicrobial, digestive, absorbent, and *Deepana-*

Pachana properties, which may collectively contribute to its therapeutic efficacy in gastrointestinal disorders. Although the formulation has been used traditionally in Ayurvedic practice, there is limited scientific evidence regarding its pharmaceutical standardization, physicochemical characteristics, analytical profile, and pharmacological activity.

Therefore, the present study was undertaken to scientifically validate *Kanakasundara rasa*. The raw materials were procured from authenticated sources and the formulation was prepared according to the classical reference described in *Rasaprakasha Sudhakara*. The prepared formulation was subjected to physicochemical evaluation and advanced instrumental characterization using Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopy (EDS), Fourier Transform Infrared Spectroscopy (FTIR), and X-ray Diffraction (XRD). Furthermore, its antibacterial activity against *Escherichia coli* and *Salmonella typhi* was evaluated using in vitro methods, followed by assessment of its antidiarrheal efficacy in Wistar albino rats using standard experimental models. The findings of this study are expected to provide scientific evidence supporting the quality, composition, and therapeutic potential of *Kanakasundara rasa* in the management of *Atisara*.

MATERIALS AND METHODS

All raw materials required for the preparation of *Kanakasundara rasa* were procured from authenticated sources. Herbal drugs were identified and authenticated by experts in *Dravyaguna*, while mineral ingredients were authenticated by *Rasashastra* experts before use.

Preparation of *Kanakasundara Rasa*

Kanakasundara Rasa was prepared according to the classical method described in *Rasaprakasha Sudhakara* text[2]. The raw materials were subjected to their respective purification (*Shodhana*) procedures before use. *Gandhaka* was purified by the *Dhalana-Galana* method using *Go-dugdha* (cow's milk) as the purification medium, and the procedure was repeated three times[3]. *Hingula* was purified by seven *Bhavanas* with freshly prepared *Ardraka Swarasa* (ginger juice)[4]. *Tankana* was purified by the *Bharjana* (roasting) method until it became completely dehydrated and friable[5]. *Dattura Beeja* was purified by *Swedana* in *Go-dugdha* for 3 hours[6], while *Vatsanabha* was purified by immersing it in *Gomutra* (cow's urine) for 3 days as per the classics[7]. After completion of the purification procedures, all the purified ingredients were dried, individually powdered and passed through a 120-number sieve, and mixed thoroughly. The combined powder was triturated to get a homogeneous mixture. The mixture was then triturated in a *Khalva Yantra* by giving *Bhavana* with *Jala* (water), and trituration was continued until the attainment of *Subhavita Lakshanas.*[8] The levigated mass was subsequently rolled into *Vatis* of one *Valla* (375mg) size as mentioned in the classical reference and dried under shade at room temperature until complete drying. The finished formulation was stored in airtight containers for further physicochemical characterization and analytical evaluation.

Pharmaceutico-analytical study

The prepared *Kanakasundara Rasa* was subsequently subjected to organoleptic and physicochemical evaluation. Organoleptic characters, including colour, odour, appearance, touch, and taste, were assessed. Physicochemical analysis was carried out to determine loss on drying, hardness, total ash, water-soluble ash, acid-insoluble ash, water-soluble extractive value, alcohol-soluble extractive value, uniformity of weight, disintegration time, and pH, following standard analytical procedures prescribed in the Ayurvedic Pharmacopoeia and other standard pharmacopeial guidelines. These analyses were performed to evaluate the quality, purity, consistency, and pharmaceutical characteristics of the prepared formulation.

Further characterization of the prepared *Kanakasundara Rasa* was carried out using advanced analytical techniques. X-ray Diffraction (XRD) analysis was performed to determine the crystalline nature and phase composition of the formulation. Fourier Transform Infrared Spectroscopy (FTIR) was employed to identify the functional groups and possible chemical interactions among the constituents. Scanning Electron Microscopy (SEM) was used to evaluate the surface morphology and particle size distribution, while Energy Dispersive X-ray Spectroscopy (EDS) coupled with SEM was carried out for elemental analysis and to determine the qualitative and semi-quantitative elemental composition of the prepared formulation.

Invitro-antibacterial activity

The antibacterial activity of the prepared *Kanakasundara Rasa* was evaluated against *Salmonella typhi* and *Escherichia coli* using standard in vitro microbiological methods. The formulation was tested for its antibacterial potential against the selected bacterial strains under aseptic laboratory conditions. Furthermore, an attempt was made to determine the Minimum Inhibitory Concentration (MIC) of the formulation using the broth dilution method to establish the lowest concentration capable of inhibiting visible bacterial growth. The antibacterial assay and MIC determination were performed following standard microbiological protocols.

Experimental Study

The antidiarrheal activity of the prepared *Kanakasundara Rasa* was evaluated using the castor oil-induced diarrhoea model in Wistar albino rats. A

total of 36 healthy experimental animals were randomly divided into six groups, with six animals in each group. The animals were given with treatment for 7 days according to their groups. On the 8th day diarrhoea was induced by oral administration of castor oil. The animals were observed for the development of diarrhoea, and the antidiarrheal effect of the formulation was assessed by comparing the total weight of faecal matter excreted among the different groups. In addition, the intestinal length was measured after completion of the experimental protocol as one of the assessment parameters. The efficacy of the formulation was determined by comparing these parameters between the treatment groups and the control group using appropriate statistical methods.

RESULTS

Organoleptic evaluation: The prepared *Kanaka sundara Rasa* yielded one *Valla* of uniformly sized *Vati*. The formulation exhibited a characteristic red colour, round shape, pungent taste, characteristic odour of *Gomutra* and herbal ingredients, and a moderately hard, smooth surface, indicating satisfactory pharmaceutical quality.

Tablets were of size 375mg, having red colour and round shaped. It is having mainly *Katu* (bitter) taste and having characteristic smell of *Gomutra* and herbal ingredients. Also, it is moderately hard with smooth surface.

Physicochemical Analysis

The physicochemical evaluation demonstrated acceptable pharmaceutical characteristics of the prepared formulation. The loss on drying was 7.1%, indicating low moisture content. The formulation exhibited an alkaline pH (9.52). Water-soluble extractive value (7.98%) was higher than alcohol-soluble extractive value (4.99%). The tablet quality parameters showed uniform weight (0.407g), hardness of 2.4kg/cm^2, and disintegration within 11 minutes.

Parameter	Result
Loss on drying	7.10%
Total ash	17.68% w/w
Acid insoluble ash	20.78% w/w
Water soluble extractive	7.98%
Alcohol soluble extractive	4.99%
pH	9.52
Hardness	2.4 kg/cm^2
Uniformity of weight	0.407 g
Disintegration time	11 minutes

Advanced instrumental analysis

Scanning Electron Microscopy (SEM)

The SEM analysis revealed that the sample consisted of irregular and heterogeneous particles. The particles were predominantly arranged in agglomerated clusters and exhibited a rough and uneven surface morphology. In terms of shape, the particles appeared as plate-like and granular structures. The particle size was observed to be in the submicron to nanometre range, with a non-uniform particle size distribution.

Energy Dispersive X-ray Spectroscopy (EDS)

EDS analysis revealed the presence of carbon, oxygen, sodium, potassium, sulphur, molybdenum, and mercury in the sample. Carbon and oxygen were the predominant elements, while mercury was detected in all three areas (4.31–10.46 wt.%), along with sulphur (1.10–2.21 wt.%), indicating the presence of mineral components in the formulation. The variation in elemental composition across the three areas suggests a heterogeneous distribution of elements within the sample.

Element	Weight % (Area 1)	Weight % (Area 2)	Weight % (Area 3)
Carbon (C)	51.74	53.51	47.27
Oxygen (O)	28.00	35.03	47.32
Sodium (Na)	1.53	-	-
Potassium (K)	1.26	-	-
Sulphur (S)	-	2.21	1.10
Molybdenum (Mo)	7.01	-	-
Mercury (Hg)	10.46	9.26	4.31
Total	100.00	100.00	100.00

Detected Particle size – 3.17 µm, 2.44 µm

Fourier Transform Infrared Spectroscopy (FTIR)

FTIR analysis showed characteristic peaks at 3278.86, 2922.65, 2853.09, 1742.50, 1633.73, 1336.23, 1251.91, and 997.90 cm^{-1}, corresponding to O–H, C–H, C=O, C=C/C=O, C–N/O–H, C–O, and C–O/C=C functional groups, respectively. These peaks indicate the presence of alcohols, phenols, aliphatic hydrocarbons, carbonyl compounds, amines, ethers, esters, and other aromatic/organic constituents in the formulation.

X-ray Diffraction (XRD)

XRD analysis showed prominent diffraction peaks at 2θ values of 31.12°, 26.42°, 23.00°, 28.12°, 34.9°, and 37.8°, with the highest intensity (11,180 counts) observed at 31.12°, corresponding to a probable mercuric sulphide phase. The identified phases included silicate, arsenic sulphide, mixed sulphide, and sulphide crystalline phases.

Peak No.	2θ (°)	Intensity (counts)	Possible phase/ Compound
1	31.12	11180	Mercuric Sulphide
2	26.42	9773	Silicate Phase
3	23.00	4556	Sulphide/oxide phase of mercury
4	28.12	3729	Arsenic Sulphide
5	34.9	1655	Sulphide phase of mercury and arsenic
6	37.8	1502	Sulphide crystalline phase of mercury

In-vitro Antibacterial Activity

Activity against Escherichia coli

The antibacterial activity increased with increasing concentration. Maximum inhibition (62.30%) was observed at 100µg/ml. The IC_{50} value of the test sample was 69.27µg/ml.

Concentration (µg/mL)	*Escherichia coli*	
	Sample	Standard
20	13.09	40.72
40	44.24	57.33
60	48.31	69.06
80	56.43	77.85
100	62.30	82.41
IC_{50}	69.27	30.22

Activity against Salmonella typhi

Kanakasundara Rasa demonstrated concentration-dependent inhibition against *S. typhi*. Maximum inhibition (78.79%) was observed at 100µg/ml.

Concentration (µg/mL)	*Salmonella typhi*	
	Sample	Standard
20	2.42	48.63
40	40.00	62.67
60	42.42	72.26
80	71.52	84.59
100	78.79	87.67
IC_{50}	63.224	17.67

The antibacterial activity of *Kanakasundara Rasa* showed a concentration-dependent increase against both *Escherichia coli* and *Salmonella typhi*. Also, exhibited comparatively better antibacterial activity against *Salmonella typhi* than *Escherichia coli*.

Experimental Evaluation

Antidiarrheal activity was assessed based on two criteria

Effect on Faecal Weight

The low-dose group exhibited the lowest mean faecal weight (0.43 g). Medium-dose and high-dose groups showed mean faecal weights of 0.78 g and 0.88 g, respectively. The observations suggest that the low dose of *Kanakasundara rasa* exhibited comparatively better control over diarrheal faecal output than the higher doses.

	Low dose (g)	Medium dose (g)	High dose (g)	Standard (g)	Disease control (g)
1	0.33	0.82	0.90	0.85	0.99
2	0.401	0.84	0.82	1.69	0.76
3	0.58	0.78	0.96	0.95	0.80
4	0.42	0.8	0.9	0.80	0.90
5	0.38	0.75	0.84	0.90	0.7
6	0.45	0.68	0.85	0.85	0.85
Average	0.43	0.78	0.88	1.00	0.83

Effect on Intestinal Transit

The medium-dose group showed the highest intestinal transit (70%), followed by the low-dose group (69%). The disease control group showed the lowest intestinal transit (54%). The high-dose group demonstrated reduced intestinal transit when compared to the other test groups, indicating better suppression of gastrointestinal motility.

Group	Length of intestine from pylorus to charcoal meal area /Total length of intestine (cm/cm)			Percentage (%)			Average
Low dose	44 / 63	49/70	45/66	70	70	68	69
Medium dose	50 / 77	52/75	49/70	71	69	70	70
High dose	47 / 75	50/77	45/73	63	65	62	63
Standard	42 / 73	44/70	40/70	57.5	63	57	59
Disease control	43 / 79	40/75	42/76	54	53	55	54

DISCUSSION

Kanakasundara Rasa prepared according to *Rasaprakasha Sudhakara* and evaluated through analytical, instrumental, in vitro antibacterial, and experimental anti-diarrheal studies.

During the preparation of *Kanakasundara Rasa*, several noteworthy observations were made during the *Shodhana* and formulation processes. After *Datura Shodhana*, the powdered material could not be completely passed through 120 no. mesh during sieving, possibly due to the presence of residual oil content introduced during the *Shodhana* process. A change in the colour of *Vatsanabha* was observed following *Gomutra Sthapana*. In *Tankana Shodhana*, loss of weight accompanied by an increase in volume was observed, whereas *Hingula Shodhana* resulted in a slight increase in weight due to *Bhavana*. During tablet preparation, approximately 600mg of wet mass was used to obtain a final tablet weight of 375mg after drying, indicating considerable weight loss during the drying process.

The organoleptic and physicochemical parameters confirmed the acceptable quality of the prepared formulation. The alkaline pH (9.52) may be attributed to the presence of *Tankana*. Adequate hardness, uniform weight, and disintegration time indicated good pharmaceutical characteristics, suggesting uniformity and suitability for oral administration.

SEM analysis demonstrated irregular agglomerated particles with rough surfaces and particle sizes in the submicron to nanometer range, which may enhance the surface area available for dissolution and interaction with biological systems. EDS confirmed the presence of mercury and sulphur, indicating successful incorporation of the mineral ingredients. FTIR analysis revealed hydroxyl, carbonyl, aromatic, and other functional groups, suggesting the presence of bioactive phytoconstituents that may contribute to antimicrobial and anti-inflammatory activities. XRD analysis confirmed the crystalline nature of the formulation, with mercuric sulphide (HgS) as the predominant crystalline phase.

The in vitro antibacterial study demonstrated concentration-dependent inhibition against both

Escherichia coli and *Salmonella typhi*. The formulation showed comparatively better activity against *S. typhi*, indicating its potential role in enteric infections associated with diarrhoeal diseases. The antibacterial effect may be attributed to the synergistic action of herbal constituents such as *Maricha* and *Pippali* along with mineral ingredients including *Gandhaka* and *Hingula*.

In the experimental study, *Kanakasundara Rasa* exhibited antidiarrheal activity by reducing faecal output and modulating intestinal motility. The low-dose group showed the greatest reduction in faecal weight, while the high-dose group demonstrated comparatively reduced intestinal transit, suggesting dose-dependent pharmacological activity. These findings indicate that the formulation may exert its antidiarrheal effect through multiple mechanisms, including reduction of intestinal secretion, improvement of water and electrolyte absorption, and regulation of gastrointestinal motility. As the treatment was administered prior to the induction of diarrhoea, the present study primarily evaluates the preventive or prophylactic effect of the formulation rather than its therapeutic efficacy. Since *Atisara* is generally managed after the onset of symptoms, the absence of a treatment-after-induction model constitutes a limitation of the present study.

From an Ayurvedic perspective, most ingredients of *Kanakasundara Rasa* possess *Deepana*, *Pachana*, and *Kaphavatahara* properties. Rather than producing direct *Stambhana*, the formulation appears to correct *Agnimandya* and digest *Ama*, which are considered the primary pathological factors in *Amaja Atisara*. The findings of the present study also suggest that the formulation possesses *Krimighna* property. Thus, the observed antibacterial and anti-diarrheal activities support the classical indication of *Kanakasundara Rasa* in the management of *Atisara* and provide preliminary scientific evidence for its therapeutic potential.

CONCLUSION

*Kanakasundara Rasa d*emonstrated concentration-dependent antibacterial activity, with greater activity against *Salmonella typhi*. In the experimental model, *Kanakasundara Rasa* showed significant antidiarrheal activity, with the low dose producing greater reduction in faecal output and the higher dose showing better inhibition of intestinal motility, suggesting a dose-dependent and possibly biphasic effect.

REFERENCES

1. Agnivesha. Charaka Samhitha, with Ayurveda Deepika teeka by Chakrapanidatta. Reprint. New Delhi: Chaukambha Samskrita Samsthana; 2011. 547–550 p.
2. Yashodhara. Rasaprakasha Sudhakara, with Sidhiprada teeka by Sidhinandamishra. Reprint. Varanasi: Chaukambha Bharathi Academy; 2009. 152/33-34.
3. Acharya Shri Madhava. Ayurveda Prakasha, Edited by Shri Gulraj Sharma Mishra. 3rd ed. Varanasi: Chaukambha Bharathi Academy; 1999. 161/21-24.
4. Vagbhata, Rasaratnasamuchaya, Sidhiprada hindi teeka by Sidhinandamishra. Reprint. Varanasi: Chaukambha Orientalia; 2021. 93/143 p.
5. Sadananda Sharma. Rasa Tarangini, Rasa vijnana Hindi teeka by Kashinatha Shastri. 9th ed. New Delhi: Motilal Banarasidas Publication; 2021. 318/77-78.
6. Sadananda Sharma. Rasatarangini, Rasa vijnana Hindi teeka by Kashinatha Shastri. New Delhi: Motilal Banarasidas Publication; 1979. 711/346-347.
7. Sadananda Sharma. Rasatarangini, Rasa vijnana Hindi teeka by Kashinatha Shastri. New Delhi: Motilal Banarasidas Publication; 1979. 651-652/19-22 p.
8. Sadananda Sharma. Rasa Tarangini, Rasa vijnana Hindi teeka by Kashinatha Shastri. 9th ed. New Delhi: Motilal Banarasidas Publication; 2021, 22/50-51.

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