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PHARMACUETICO-ANALYTICAL & EXPERIMENTAL STUDY OF DHUMAKETU RASA W.S.R. TO ITS ANTIPYRETIC ACTIVITY: A CLASSICAL AYURVEDIC FORMULATION FOR FEVER

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ABSTRACT

Dhumaketu Rasa is a traditional Ayurvedic formulation used to treat fever. This study aimed to evaluate the pharmaceutical and analytical properties of Dhumaketu Rasa, focusing on its antipyretic activity. The formulation was prepared according to Rasayoga sagara[1] and administered to albino rats with artificially induced pyrexia. The results showed that Dhumaketu Rasa exhibited moderate but delayed onset antipyretic activity, especially at higher doses. The analytical study revealed the physical and chemical properties of Dhumaketu Rasa, providing a standard for its characterisation.

INTRODUCTION

Fever is a common symptom of various diseases, and its management is crucial in clinical practice. In Ayurvedic medicine, Dhumaketu Rasa is a traditional formulation used to treat fever. Despite its longstanding history of use, there is a need for scientific evaluation of its pharmaceutical and analytical properties.

Methodology

Table 01: The pharmaceutical study of Dhumaketu Rasa, including the preparation, shodhana (purification), and characterisation of the final product.

Preparation of Ingredients	• Shodhana of Parada[2] (Mercury): Purified using Sudha Churna, Nistusha Lashuna, and Saindhava Lavana. • Shodhana of Gandhaka[3] (Sulphur): Purified using Goghrita (cow's ghee). • Shodhana of Hingula[4] (Cinnabar): Purified using Nimbu Swarasa (lemon juice). • Shodhana of Samudraphena[5] (Cuttlefish bone): Purified using Nimbu Swarasa (lemon juice).
Preparation of Kajjali[6]	Mixed Shodhita Parada and Shodhita Gandhaka in equal proportions.Triturated until a black powder was formed.
Preparation of Dhumaketu Rasa[7]	Mixed Kajjali, Shodhita Hingula, and Shodhita Samudraphena in equal proportions. Added Aardraka Swarasa (ginger juice) and triturated for three days. Dried and preserved the final product in an airtight container.

Result

1. **Pharmacuetical Study:** In the maceutical processing purification of the drugs has been carried out based on the popular,standard procedure,i.e.

- Mercury as per R.T(5/27-29)
- Sulphur as per R.T(8/7-11)
- Hingula as per R.T(9-12)
- Samudraphena, as per R.T (12/111-112)

Parada and Gandhaka are made into Kajjali by triturating them for almost 50 hours. This process took a total of ten days, at the end of which the criteria for Kajjali were obtained. Stepwise observation was recorded during the procedure.

Finally, all the ingredients, i.e. Kajjali, Hingula,& Samudraphena, were added together and ground to a homogenous mixture, later Ardraka swarasa was added & Bhavana given for three days There was a weight gain of thirty grams after the completion of bhavana.

Experimental study

In this study, Albino rats were divided into four groups, each receiving a different treatment: distilled water, paracetamol, Dhumaketu Rasa at a therapeutic dose, and Dhumaketu Rasa at a double therapeutic dose. Fever was induced using 15% Baker's yeast solution, and rectal temperature was recorded regularly.

In this study, the pyrexia was induced by using 15% of Baker's yeast ml/100g body weight dose and the rats with rectal temperature above the basal temperature, i.e 37^0C, were recruited for the study. The Pyrexia was achieved after 18 hours of yeast injection there after the rectal temperature was measured repeatedly at an interval of 1^{st},2^{nd},3^{rd},4^{th}, and 24^{th} hr.

In the pyrexia control group, the temperature rose to 18 hours after the subcutaneous injection of yeast and continued to rise until the 4^{th} hour.At the 24^{th} hour, the temperature also rose compared with the basal temperature.

In Test Group 2, ie. A standard group where paracetamol suspension was administered 1st hr reading shows a statistically significant result in reducing temperature.2^{nd},3^{rd}hr reading shows statistically highly significant results in lowering the temperature,4^{th},

24th hr reading shows statistically moderate significant results in lowering the temperature.

In Test group 3 i.e (DHUAMAKETU RASA SINGLE DOSE) group. A therapeutic dose of dhuamaketu rasa was administered, and from the initial hours of the reading up to the 4th hour, a statistically insignificant reduction in the rectal temperature was observed. However, in the 24th-hour reading, a statistically significant decrease in the rectal temperature was noted.

In the Test group 4, i.e (DHUAMAKETU RASA DOUBLE DOSE) group, double the therapeutic dose was administered. There were statistically insignificant results in reducing temperature during the 1st,2nd, and 3rd hr reading. In the 4th-hour reading, there was a statistically significant reduction in temperature compared with that of the control group. The 24th-hour reading shows a highly significant result in reducing temperature.

TABLE 02: REDUCTION IN THE MEAN TEMPERATURE AMONG ALL GROUPS

Reduction in Mean temp.	**GROUP 1**	**GROUP 2**	**GROUP 3**	**GROUP 4**
1h	-0.07	0.53	0.02	0.10
2nd h	-0.02	0.80	0.05	0.02
3rd h	0.03	0.72	0.12	0.20
4th h	0.07	0.72	0.17	0.48
24th h	0.12	0.78	0.60	0.90

CHART 01: REDUCTION IN THE MEAN TEMPERATURE AMONG ALL GROUPS

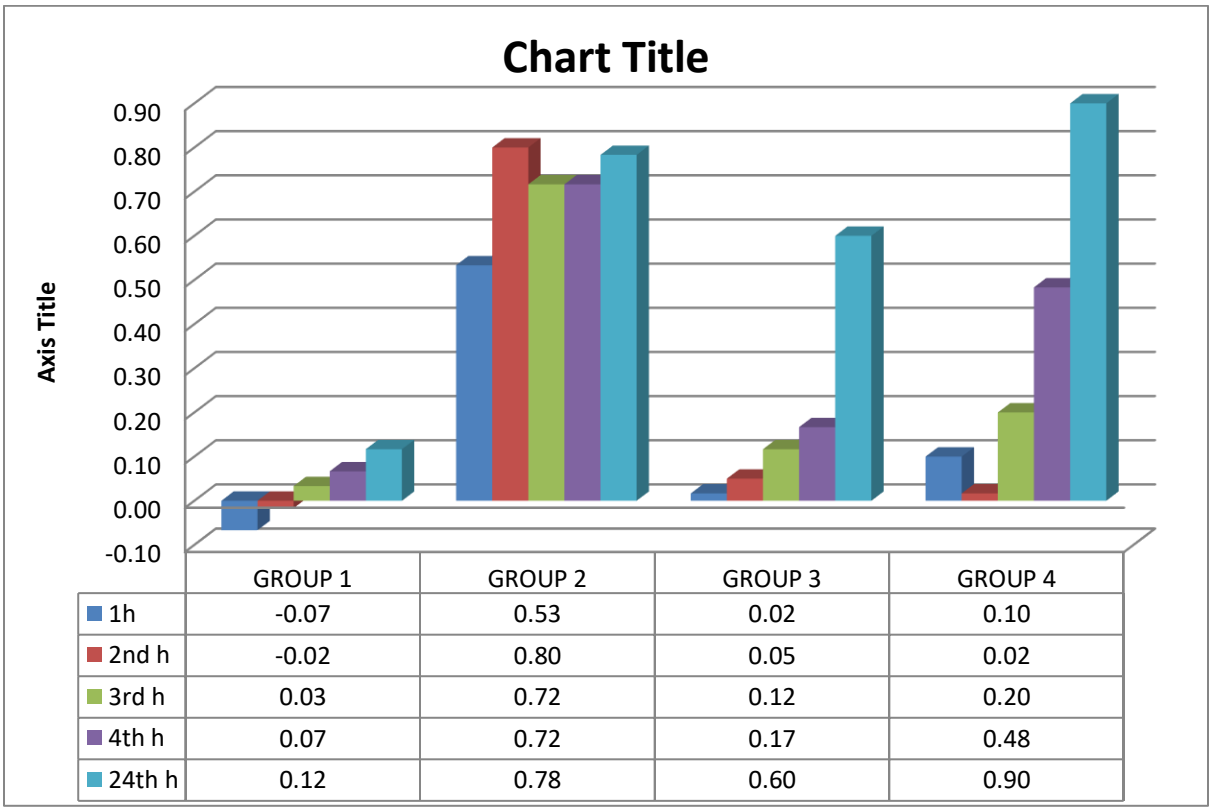
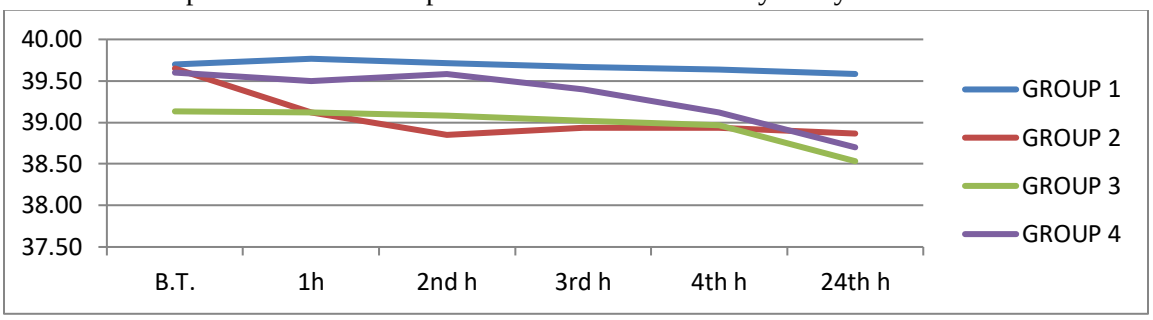


Chart 02: Comparison of mean temperature in each hour is analysed by ANOVA



Analytical Study

The analytical study revealed Dhumaketu Rasa's physical and chemical properties, including its XRD, XRF, and FTIR values. It also provided a standard for characterising Dhumaketu Rasa.

- This study revealed that Dhumaketu ras is a Black coloured amorphous powder,

The loss on drying at 105c temp is 1.451%

Total ash is 26.79%

Acid insoluble ash is 1.576%

Ph value is 7.54

- XRD study revealed a qualitative concentration of mercuric sulphide
- The XRF study's primary ingredients were

SULPHUR, MERCURY, CALCIUM, and ARSENIC in the oxide form in the concentration of 45.59%,31.20%,16.69%, and 3.79%, respectively.

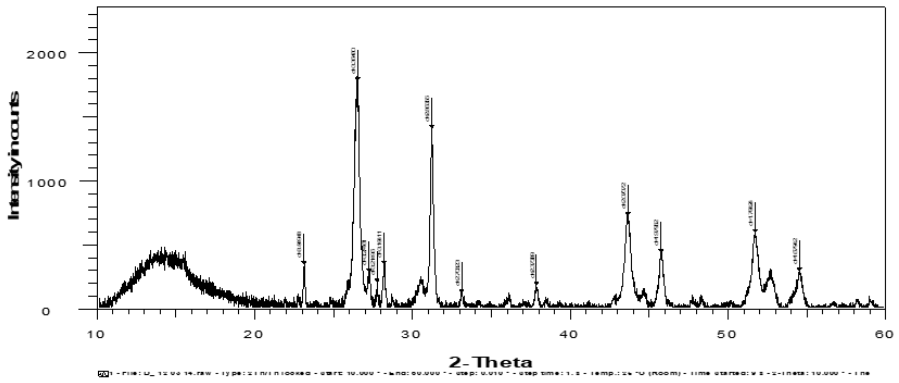
Potassium, silica, sodium, etc., were also present and were less than 1%.

The concentrations of SULPHUR, mercury, calcium, and arsenic in element form were 64.98%,18.26%,11.93%, and 2.87%, respectively.

- FTIR Reaveals, organic functional groups Show Peaks -1538.43, Frequency at 6.5µ & compounds NO_2 Nitro Asymmetrical stretch Shows Peaks -3399.10, Frequency 2.94µ & compounds N-H Amines, O-H Hydrogen bonded Alchohols, Phenols, O-H Monomeric-Alchohols, Phenols, C-H Alkynes.

Experimental study Among all four groups, the control group shows insignificant results that indicate without treatment, pyrexia will not be reduced. Standard group shows significant to highly significant results in lowering temperature. Compared to the standard group, the dhuamaketu rasa single dose group shows insignificant results in reducing temperature & the dhuamaketu rasa double dose group shows the significant results in the 4th hr, 24th hr, it shows highly significant results, i.e. it shows marginal to the moderate antipyretic activity profile. No mortality occurred within 24 hours of observation within trial drug groups. So, it was found that safe.

Chart 03 - X-Ray Diffraction Analysis of Dhumaketu Rasa



DISCUSSION

Pharmaceutical study;-

In pharmaceutical processing, the purification of drugs is carried out based on popular, standard procedures, i.e.

- Mercury as per R.T(5/27-29)
- Sulphur as per R.T(8/7-11)
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Parada and Gandhaka are made into Kajjali by triturating them for almost 50 hours over ten days. At the end of this period, the criteria for Kajjali were obtained, and stepwise observation was recorded during the procedure.

Finally, all the ingredients, i.e. Kajjali, Hingula,& Samudraphena, were added together and ground to a homogenous mixture. Later, Aardraka swarasa was added & bhavana was given for three days, and there was a weight gain of thirty grams after completion of bhavana.

Analytical study

A) This study revealed that Dhumaketu rasa is a
- Black-coloured amorphous powder,
- The loss on drying at 105c temp is 1.451%
- ash is 26.79%
- insoluble ash is 1.576%
- Ph value is 7.54

B) The XRD study report is attached to the analytical study.

C) The XRF study's primary ingredients were

• SULPHUR, MERCURY, CALCIUM, and ARSENIC in the oxide form in the concentration of 45.59%,31.20%,16.69%, and 3.79%, respectively. POTASSIUM, SILICA, SODIUM etc were also present, which were less than 1%.

• The concentrations of SULPHUR, mercury, calcium, and arsenic in element form were 64.98%,18.26%,11.93%, and 2.87%, respectively.

• FTIR Reaveals,

• organic functional groups ShowPeaks -1538.43, Frequency at 6.5µ & compounds NO_2 Nitro Asymmetrical stretch Shows Peaks -3399.10, Frequency 2.94µ & compounds N-H Amines, O-H Hydrogen bonded Alcohols, Phenols, O-H Monomeric-Alchohols, Phenols, C-H Alkynes.

Probable Mode of Action

Ama is the root cause of war. Swedavarodha and santhapa are the result of the pathogenesis of Jwara which is, caused due to ama. Irregular habits in ahara and vihara first affect amashaya and get mixed up with jataragni. The resulting rasadhatu, which is vikrutha, obstructs the channels of its own and that of Sweda and suppresses the activity of agni, thus dispelling heat from the site of digestion.

All the drugs in Dhumaketu rasa yoga have Jwaraghna properties. The main ingredients of Dhumaketu rasa are parada, gandhara,hingula, and samudraphena.

- **Hingula** has Tiktha, Kashaya Katu rasa Paritapanasha, agnijanana, pachana karma. So, it acts as jwaragna.
- **Kajjali,** as Rasayana, is used as a base for formulation.
- **Gandhaka** has madura rasa ,amomnmochana, deepana, vishahara, krimihara, and pachana karma.; it acts as guarana. The antipyretic action of Gandhaka may be due to its antibiotic,anti-infective, anti-microbial properties.
- **Samudraphena** has Guna: Laghu and Rooksha, Veerya: Sheeta, Vipaka: Katu, and Karma: Lekhana, Pachaka, Agnideepak, and Antrauttejaka so that it can act as jwarghna.

Dhumaketu rasa yoga is not much used in present practice, even after it is a proven Jwaraghna formulation in classics. For that purpose, an experimental study was conducted to evaluate its antipyretic effect. Based on the survey, double the therapeutic dose of Dhumaketu rasa yoga showed better results than a single dose, i.e therapeutic dose mentioned in the classics. This may be due to the trial drug's slow action and the dosage's insufficiency.

Since the dhumaketu rasa combination has been shown to possess antipyretic activity, it would be interesting to elucidate the probable mechanism of action. Among the likely mechanisms are inhibiting the formation of endogenous pro-inflammatory molecules like PGE and cytokines or blocking their recep-

tors. The drug may also act by downregulating the thermoregulatory circuits or enhancing the formation and release of endogenous antipyretic factors.

CONCLUSION

Dhuamaketu rasa is 1st mentioned in rasendra chintamani of aacharya dhundhukanth & rasa pradip of aachchrya pranantah both belonging to 16 th century

Hingula is the main ingredient with direct antipyretic properties; the other ingredients are to be considered augmenting & catalytic agents.

Dhuamaketu rasa is a khalwiya rasaayana, a homogenous mixture of Parada, gandhaka, hingula, samudraphena, with aardraka swarasa the physical properties of this compound found in the study can be taken as standard for the further processing of this drug.

This project's XRD,XRF, and FTIR values can be used as a standard for characterising dhumaketu rasa.

Though the experimental study was not encouraging with a single dose, it gave somewhat significant results with a double dose, as this medicine is considered a safe antipyretic.

Thus, in conclusion, Dhumaketu rasa doubles the therapeutic dose possess antipyretic activity. Dhumaketu rasa therapeutic dose is slow-acting, and its effect is less intense. Double the therapeutic dose shows effectiveness as an antipyretic. Still, its onset of action is a little delayed compared to standard drugs and is only slightly less active.

The study's results indicate Dhumaketu Rasa is a safe and effective antipyretic agent. The formulation's slow absorption may account for the delayed onset of action. The absence of toxic effects during the study suggests that Dhumaketu Rasa is safe for clinical practice.

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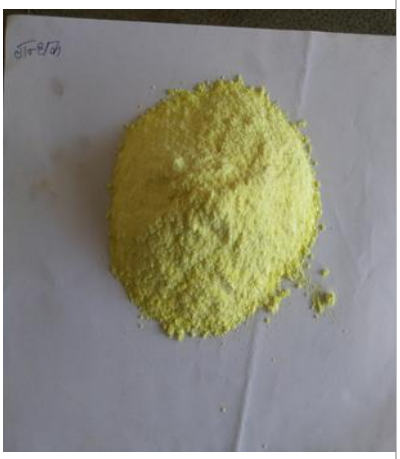
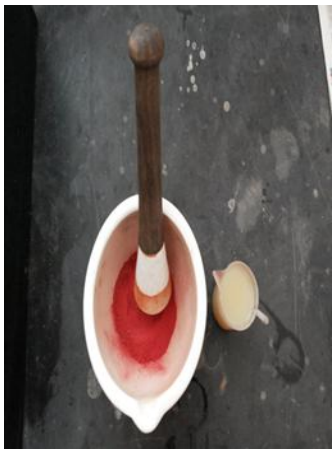
SHODHITA PARADA 	**SHODHITA GANDHAKA** 	**SHODHITA HINGULA** 
SHODHITA SAMUDRAPHENA 	**PREPRATION OF KAJJALI** 	**SHODHITA HINGU-LA,SAMUDRAPHENA & KAJJALI** 
AARDRAKA SWARASA ADDING TO THE MIXTURE OF DHUMAKETURASA 	**After Completion Of 3days Bhavana** 	**Preapred dhumaketu rasa** 

SHODHITA GANDHAKA