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Physico Chemical and Phyto Chemical Analysis of Herbomineral Formulation - Ksharagada

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KEYWORDS
Ksharagada, Physico chemical analysis, Anticancer, Herbo-mineral formulation, Drug induced toxicity.

ABSTRACT:
A comprehensive evaluation of the quality of herbo-mineral formulations is essential to support their acceptance in the contemporary medical system. Given their accessibility, affordability, safety, and perceived efficacy, herbo-mineral preparations are playing a significant role in today's health care systems. Keeping the foregoing factors in mind, it is intended to standardise Ksharagada (KA) by utilising a standard testing technique for AYUSH medications. Physicochemical investigations such as loss on drying at 105^0C, total ash, acid insoluble ash, water soluble ash, alcohol soluble extractive, water soluble extractive HPTLC, and GCMS were performed in accordance with WHO recommendations, the Ayurvedic Pharmacopoeia, and the Indian Pharmacopoeia. Physical and chemical tests to determine quality were carried out, and Ksharagada (KA) standard values were reported. Standardisation tests on Ksharagada were used to authenticate and ensure the purity of the herbomineral formulation.

INTRODUCTION:

Drug-induced toxicity in humans refers to the adverse effects or harmful reactions caused by the administration of drugs or pharmaceutical substances. These toxic effects can range from mild discomfort to severe complications, including organ damage or failure, and even death. Some drugs may exert toxic effects due to their intended pharmacological actions. For example, chemotherapeutic agents used to treat cancer often cause toxicity to rapidly dividing cells, including normal tissues. Exceeding the recommended dosage of a drug can lead to toxicity. This can occur due to accidental overdose, misuse, or improper administration. People may vary in their response to drugs due to factors such as genetic makeup, age, gender, underlying health conditions, or concurrent use of other medications. What may be a safe dose for one individual could be toxic for another. Preventing drug-induced toxicity requires careful prescribing practices, patient education, monitoring for adverse effects, and prompt recognition and management of toxicity when it occurs. Ayurveda relies heavily on natural remedies, including herbs, minerals, and dietary supplements, which are believed to support the body's innate healing mechanisms. These natural remedies are often used to address underlying health conditions and promote overall well-being, potentially reducing the need for pharmaceutical drugs and their associated risks. Agadas or Anti-toxic formulation plays an important role in treating drug induced toxicity. The present study is aimed to lay down pharmacopeial standards of Ksharagada (KA).

MATERIALS AND METHODS:

Pharmaceutical study[1]: All the ingredients[2,3] (Table 1) for Ksharagada were collected from the Parul Institute of Ayurved Pharmacy and surrounding locations in Vadodara, Gujarat. The pharmaceutical experiment was carried out at the Rasashastra and Bhaishajya Kalpana Practical Halls, Parul Institute of Ayurved Pharmacy, Vadodara. Taruna Palasha Kshara (Ash of Butea monosperma) was collected in, added six times to water in a 1:6 ratio, and stirred well. This mixture is kept for 2 hours and allowed to settle at the bottom of the glass jar. Filtration of the mixture is done with a double-folded cloth and transferred to a measuring jar. This filtering process was performed 21 times, and finally, Ksharodka (after the 21st filtration) was collected and measured. Ksharodaka was boiled in a steel vessel. After boiling for 30 minutes, Sookshma churna (fine powder) of all drugs was added and stirred well. Stirring continued until the mixture reached a thick consistency. After self-cooling, the Ksharagada was collected and stored in an airtight container (Fig 2) and organoleptic features was observed (Table 2).

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www.jchr.org
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Analytical study

KA was subjected to organoleptic parameters like loss on drying, total ash, acid insoluble ash, extractive values, and pH (Table 4). Physico chemical analysis, HPTLC and GCMS were carried out as per the WHO guidelines[4] and Ayurvedic pharmacopeia[5] and Indian pharmacopeia[6]. Physicochemical analysis and HPTLC were performed at the VASU laboratory in Vadodara, while GCMS was analysed at the Sophisticated Instrumentation Centre for Applied Research and Testing - SICART in Anand, Gujarat.

OBSERVATIONS AND RESULTS:

High Performance Thin Layer Chromatography

5 gm of Ksharagada was extracted with 10 ml of alcohol by cold percolation method. 8 µl of the extract were applied on a pre-coated silica gel F254 on aluminum plates to a band width of 8 mm using Linomat 5 TLC applicator. The plate was developed in toluene: ethyl acetate: acetic acid. The developed plates were visualized in UV 254, 366 nm and after derivatisation with vanillin-sulphuric acid and scanned under UV 254, 366 nm, and 566 nm. Rf, colour of the spots and densitometric scan were recorded[7] (Table 5).

Gas chromatography and Mass spectrometry

KA extract using an ethanol solvent revealed more than 100 compounds, of which eight major ones were identified (Table 6). These compounds included Thunbergol, Alpha Amyrin, Beta Amyrone Neo intermedeol (Piper Nigrum), Bete-ocimene, Elemene (Curcuma Longa), 9 elcocyne, and N-Hexadecenoic acid.

Table 1: Ingredients of KA[3]

Drug Name	Botanical Name
Haridra	Curcuma Longa
Surasamanjari	Ocimum sanctum
Daru haridra	Berberis aristate
Jatamamsi	Nardostachys jatamansi
Hingu	Ferula foetida
Sariva	Hemidesmus indicus
Sweta sariva	Hemidesmus indicus
Maduka	Glycyrrhiza glabra
Kushta	Saussurea lappa
Shunti	Zingiber officinale
Pippali	Piper longum
Maricha	Piper nigrum)
Bahlika	Ferula foetida
Palasha	Butea monosperma
Lavana	Rock salt
Laksha	Laccifer lacca
Gairika	Red Ocre

Table No: 2 Observations of KA

Observations	Results
Taste	Taste of all ingredients and Salty
Colour	Maroon
Smell	Characteristic
Consistency	Thick and Soft
Appearance	Powder

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Table: 3 showing PH of KA in different stages of preparation.

Stages of Preparation of Ksharagada	PH
Taruna Paasha kshara	10
Ksharagada after 1st filtration	9.7
Ksharagada after 7th Filtration	9
Ksharagada after 15th filtration	8.7
Ksharagada after 21st filtration	8.6
Before adding sookshma Churna	8.5
Ksharagada	7.8

Table: 4 Showing Physio chemical analysis of KA

Parameters	Result
pH Analysis (1%)	7.82
Loss on drying (LOD)	3.99 %
Water Soluble Extractive	69.62%
Alcohol Soluble Extractive	24.32%
Total Ash Content	39.64%
Acid Soluble Ash Content	5.88 %

Table 5: Showing Rf values of KA.

RF Values of KA at 254 nm	RF Values of KA at 366 nm	RF Values of KA at 566 nm After derivatization
0.36	0.24	0.07
0.40	0.31	0.19
0.45	0.40	0.36
0.50	0.73	0.40
0.55		0.64
0.64		0.73
0.73		0.83

Table 6: Showing Phytochemical compounds of KA extracted with ethanol solvent.

Compound Name	Efficacy
Thunbergol	Anti Allergic, Antimicrobial
Alpha Amyrin	Antileukemic agents
Beta Amyrone	Anti Inflammatory & Antifungal
Neo intermedeol	Antioxidant, Antibacterial, Anticytotoxic, synergetic
Bete-ocimene	Volatile compound present in leaves, flower of many plant species
Elemene	Antioxidant and anti-cancerous antibacterial etc.
9 elcocyne	Antioxidant, anticancer

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N-Hexadecenoic acid	Anti-Inflammatory Property

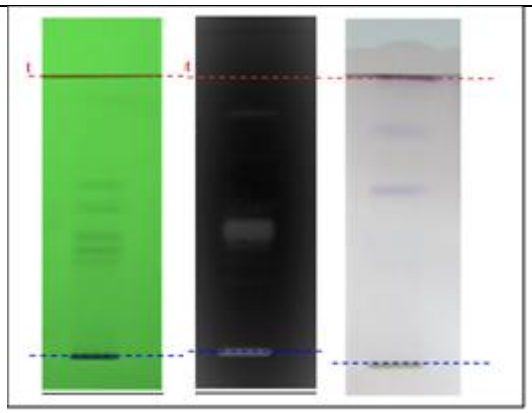


Fig 1: TLC photo documentation of Ksharagada

Fig 2: Showing Prepared Ksharagada

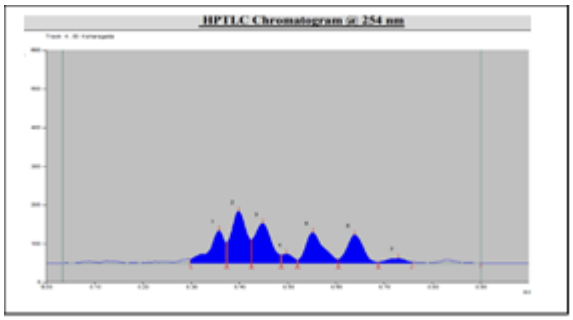
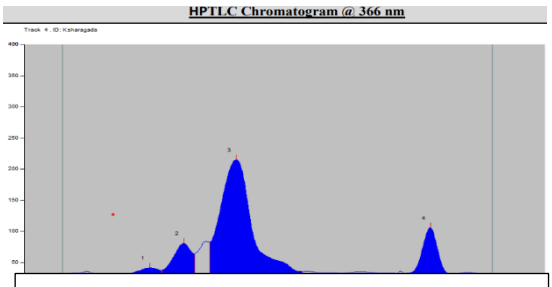


Fig 3: Showing Densitometric scan of Ksharagada at 254 nm and 366 nm

HPTLC Densitometric scan at 254 nm



HPTLC Densitometric scan at 366 nm

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RESULTS AND DISCUSSION:

Throughout the Ksharagada preparation process, the pH was checked multiple times to guarantee the precision and quality of the final product (Table 3). Ksharagada has a flavour of every component and is velvety, maroon in colour, and salty (Table 2). Sample stability is indicated by loss upon drying. Ksharagada exhibits a lower value in drying loss, which indicates the sample's less moisture content. The amount of inorganic material in the sample can be ascertained with the use of the ash value. Ksharagada's elevated ash values could be attributed to additional ingredients and preparation techniques. Ksharagada's water solubility is shown by a high water-soluble extractive rating. The maximum pH of Taruna Palasha Kshara is 10(Table 3), while Ksharagada has a pH of 7.8. HPTLC is an important method for standardising and controlling the quality of polyherbal compositions. As there are multiple ingredients, qualitative HPTLC fingerprinting can be utilised to set quality criteria for polyherbal compositions. Rf values for Ksharagada in 254 densitometric scans were 0.36, 0.40, 0.45, 0.50, 0.55, 0.64, and 0.73. The RF values of Ksharagada (Table No 5) at 366 nm were 0.24, 0.31, 0.40, and 0.73. The RF values of Ksharagada at 566 nm after derivatization were 0.07, 0.19, 0.36, 0.40, 0.64, 0.73, and 0.83. When Ksharagada was exposed to GCMS analysis (Table 6), antiallergic[8], antimicrobial[8], antileukemic[9], anti-inflammatory[8,11], antifungal[9], antioxidant[12], antibacterial,[8] and anticytotoxic[10,12] agents were found, demonstrating the drug's therapeutic efficacy.

CONCLUSION: Ksharagada (KA) is an Ayurvedic herbal-mineral formulation that is mainly used to treat toxicity in different forms, including drug-induced toxicity and animal poisoning. In this study, K A was prepared in accordance with the guidelines and subjected to HPTLC and GCMS analysis, which revealed the presence of numerous phytochemical constants, including anticancer agents and antioxidants. Pre-clinical and clinical research on this formulation will be clarified, which is crucial to ascertain its pharmacological activity in a range of disease conditions.

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