ORIGINAL ARTICLE

Standardization of Modified Dosage Form of Lodhradi Kashaya Prepared by Two Different Techniques

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Abstract

Introduction: Time-dependent advancement in dosage form has been required to stay in competitive market and to provide ease of administration to the patients. Standardization, a tool to ensure quality and safety among consumer is primary concern during the preparation of any drug. *Lodhradi Kashaya* (formulation mentioned in Basavarajiyam and Vaidya Chintamani for diabetes mellitus) is decoction dosage form, so the demand versus supply has been questioned against its stability period. Hence, modification in the dosage form was attempted to ensure stability period, and thus, powder dosage form has been prepared. **Aim:** Standardization of modified dosage form of *Lodhradi Kashaya* has been done to ensure quality of finished drug. **Materials and Methods:** Two sample were prepared, one is by following the traditional method of Ayurveda followed by drying and grinding to get fine powder (LKLB). In second sample decoction was prepared by following continuous aqueous extraction and dried with spray drier technology to get fine powder (LKSD). Both the samples were standardized over several physicochemical testing, organoleptic properties along with microbial load and heavy metal content. **Results:** The comparative result was interpreted in this paper, major highlight are color and fineness of both powder was found different. No much variation in the physicochemical parameter. Microbial load of LKLB was much higher than LKSD but found within limit. Heavy metal content was found within the limit prescribed in The Ayurvedic Pharmacopoeia of India. **Conclusion:** Both the samples were standardized and quality of the modified dosage form of *Lodhradi Kashaya* has been assured.

Key words: Ayurveda, *Lodhradi kashaya*, spray drier, standardization

INTRODUCTION

India has a rich heritage of using ayurvedic system of medicine, having various references for the treatments of *Madhumeha* (diabetes), there are many formulations and lifestyle procedures were mentioned for its regulation and treatment. *Lodhradi Kashaya* was described as *Ayurvedic kwath* dosage form (decoction) in *Basavarajiyam Meharoga Nidan Lakshanam Chikitsadhyaya* (*Kaphaj Prameha*), and here, it was called as *Madhumehajeet* (win over diabetes) when administered with honey.[1] The same formulation was also mentioned in *Vaidya Chintamani* under "*Prameha Prakaranam*" and indicated to take in Kashaya form.[2]

To meet the increasing global demand for Ayurvedic, herbal and herbomineral medicines, it is essential to ensure the quality and consistency of drugs to achieve their safety and maximal efficacy. In Ayurveda, whole medicinal action is due to synergistic effect of each agent in spite of single constituents.[3] Physicochemical standardization is a prerequisite in quality control of drugs both single as well as compound formulation as the efficacy of the drugs mainly depends on their chemical and physical properties. Standardization of a compound ayurvedic formulation is a critical and essential issue to ensure therapeutic efficacy and safety in rational use in the health care system. Ayurveda, the traditional Indian medicine, is the "great tradition of caring and curing" with sound philosophical, experiential, and experimental basis. Ayurvedic pharmaceutical sciences advocate the use of quality control tests to make sure that

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the formulation must adhere to the standards mentioned in ayurvedic text/protocol prescribed by regulatory authority. Quality is the critical determinant of safety and efficacy of herbal medicines; however, herbal formulations rarely meet the standards of quality. Hence, there is a need for standardization, and development of reliable quality protocols for ayurvedic formulations using modern techniques of analysis is extremely important to validate and ensure quality in medicine even in commercial scale production.[4,5]

MATERIALS AND METHODS

Lodhradi Kashaya is decoction of *Kwath* churna having equal amount of *Lodhra* stem bark, *Katphala* stem bark, *Haritaki* fruit pulp and *Musta* rhizome [Table 1][6] of raw drug ingredients were collected from "raw drug supplier" Sikandrabad, Noida India through supplier of Sanath Product Ltd. and authenticated by the quality control unit at Sanath Product Ltd. and best precaution were taken to purchase the drugs. Raw materials (*Lodhra, Musta, Katphala,* and *Haritaki*) were made decoction separately by following traditional method mentioned in Ayurveda and converted into powder form after drying in oven followed by grinding.

First, equal amount of all the ingredients are made to *Kwathchurna* (coarse powder). This *Kwathchurna* was subject for *Kashaya* (decoction) preparation by following the traditional method of Ayurveda.[7] Filtered decoction was dried in oven and powdered to get fine powder (LKLB). In another batch aqueous decoction was prepared by successive complete aqueous extraction of same *Kwathchurna* and dried using spray drier technology to get modified dosage form of *Kashaya* as spray dried powder (LKSD).[8] Physicochemical standardization of *Lodhradi Kashaya* powder (LKLB and LKSD) and raw material extract powder were done immediately after preparation, with analytical grade chemical following the standard procedure mention in The Ayurvedic Pharmacopoeia of India (API) and testing protocol for Ayurveda, Siddha and Unani drugs. The samples were evaluated for different organoleptic characteristics, as well as for standardization parameters like determination of ash value[9] (total ash and acid insoluble ash), determination of extractive values[10] (in water, methanol, ethyl acetate), solubility in water at a different temperature and its fineness.[11]

Table 1: Ingredients of *Lodhradi Kashaya*

Plant	Botanical name	Family	Part used
Lodhra	*S. racemosa* Roxb.	Symplocaceae	Stem bark
Haritaki	*T. chebula* Retz.	Combretaceae	Fruit pulp
Musta	*C. rotundus* Linn	Cyperaceae	Rhizome
Katphala	*M. esculenta*	Myricaceae	Stem bark

S. racemosa: Symplocos racemosa, T. chebula: Terminalia chebula, C. rotundus: Cyperus rotundus, M. esculenta: Myrica esculenta

Moisture content[10]

Moisture analysis has been done by using Shimadzu moisture analyzer MOC-120H at room temperature.

Determination of pH[12]

The sample was dissolve in water to prepare 1% and 5% strength solution, and then pH was measured by digital pH meter using glass membrane electrode at room temperature.

Heavy metal analysis[13]

Heavy metal is analyzed by atomic absorption spectroscopy. Sample was dissolved in 50% HNO_3 for the digestion that was further diluted with distilled water.

Microbial load[14]

Both samples were subjected for the microbial contamination. LKSD was taken after 48 h of its preparation, whereas LKLB was evaluated after 30 days of its preparation.

RESULTS AND DISCUSSION

The World is standing over diabetic bomb as in 2014 the global prevalence of diabetes was estimated to be 9% among adults. In 2012, an estimated 1.5 million deaths were directly caused by diabetes and among them Cardiovascular disease is responsible for between 50% and 80% of deaths in people. About 347 million people worldwide have diabetes, among them 90% have diabetes mellitus (DM).[15]

Since *kwath* is the liquid dosage form which is always questioned for stability because decoction was indicated to take fresh in ayurvedic classics. To answer the stability issue, the modification was done and dosage form was modified from decoction (liquid) to *Kashaya* powder. After medicine preparation, standardization of finished drug was done to ensure the quality and to assure reproducibility and flourish a data that can be utilized to limit batch to batch variation in future.

Organoleptic characteristic of the *Lodhradi Kashaya* shows that formulation is dark brown, smooth, astringent, bitter and possesses specific aromatic odor. Aromatic odor may be due to the mixed constituents the ingredients (Tables 2). Bitter and astringent test is due to the *tikta*, *katu,* and *Kashaya Rasa* present in ingredients. In terms of phytochemicals, it may be tannins and polyphenols that are responsible for its taste.[16] Analytical evaluation of the *Lodhradi Kashaya* powder shows that moisture content of the LKLB and LKSD are 6.35% and 5.86% respectively while extract powder of *Lodhra*, *Musta*, *Katphala*, *Haritaki* are 7.39%, 4.35%, 4.90% and 8.65%,

respectively. Moisture content denotes the presence of water content in the sample which was responsible for stability period and intactness of the products. It also reflects hygroscopicity nature of samples.[17] The presence of excess moisture is conducive to the promotion of mold and bacterial growth, and subsequently to deterioration and spoilage of the drug.[18] Ash value is the common method to know the adulteration of the inorganic materials, and it has greater importance in the quality control and standardization. Higher the inorganic material higher will be the ash value.[19] Total ash value of the LKSD and LKLB were 10.68% and 12.24% respectively (Table 3) while extract powder of *Lodhra, Musta, Katphala, Haritaki* are 10.25%, 9.35%, 9.90%, 11.26%, respectively, which denotes that there are some inorganic material present in the product that may be due to plant constituent and physical impurities. Acid insoluble ash value of the LKSD and LKLB were 0.47% and 0.52% which represent the siliceous content in the sample.[18] Extractive value represents the quantity of the phytoconstituents and materials that are soluble in the respective solvent. It is also related to the availability of drugs in a different medium in body through different solvent carriers. Water soluble extractive value of the LKSD and LKLB were 84.95% and 78.60% respectively. Extract powder of *Lodhra, Musta, Katphala, Haritaki* has 10.25%, 9.35%, 9.90%, 11.26%, respectively, water soluble extractive value. Methanol soluble extractive was found 51.21%, 46.30%, 42.6%, 38.25%, 24.75% and 52.60%, respectively (Table-3), for LKSD, LKLB, *Lodhra*, *Musta Katphala* and *Haritaki*. Ethyl acetate extractive value was found 0.86% for LKSD while nil in LKLB. Any change in the extractive value refers the change in the constituents thus it helps in the standardization and reproducibility of the drugs. On the basis of methanol soluble, water soluble extractive value, it is obvious that *Lodhradi Kashaya* have greater solubility in water when compared to alcohol and ether, which depicts indicates more bioavailability of *Lodhradi Kashaya* in water medium.[19] Water soluble extractive value is due to the presence of sugars, acids, polar constituents, glycosides of steroid, alkaloids, and coumarins.[20] Alcohol soluble extractive value shows the presence of fewer amounts of polar substances like phenols, tannins, glycosides and flavonoids.[20] pH of 1% solution of the LKSD and LKLB were found to be 3.55 and 3.50, respectively, while extract powder of *Lodhra*, *Musta*, *Katphala*, *Haritaki* have 4.10, 5.20, 4.80, 2.80 pH. pH of 1% solution of the LKSD and LKLB were found to be 3.42 and 3.26, respectively (Table 3), which denotes that solution of the formulation is acidic in nature. All the powder drug of LKSD was passed through 80# mesh size while approximately 95% of LKLB

Table 2: Organoleptic characteristic of LKSD and LKLB

Organoleptic properties	LKSD	LKLB
Appearance	Soft and smooth fine powder	Granular and fine
Odor	Aromatic	Aromatic
Taste	Astringent and bitter	Astringent and bitter
Color	Dark brown	Blackish brown
Touch	Smooth	Rough and hard

Table 3: Physico-chemical properties of different samples of raw material and *Lodhradi Kashaya*

Parameter	LKSD* (%)	LKLB*	Lodhra*	Musta*	Katphala*	Haritaki*
Moisture content	5.86	6.35	7.39	4.35	4.90	8.65
Water soluble extractive value	84.95	78.60	72.90	79.00	65.25	83.75
Methanol soluble extractive value	51.21	46.30	42.6	38.25	24.75	52.60
Ethyl acetate soluble extractive value	0.86	Nil	Not done	Not done	Not done	Not done
Total ash value	10.68	12.24	10.25	9.35	9.90	11.26
Acid insoluble ash value	0.47	0.52	Not done	Not done	Not done	Not done
pH (1% solution)	3.55	3.50	4.10	5.20	4.80	2.80
pH (5% solution)	3.42	3.26	Not done	Not done	Not done	Not done
Sieve analysis (80# size)	100 pass	Approximately 95% pass	Not done	Not done	Not done	Not done

*Mean of three readings (*n*=3)

Table 4: Heavy metal content of LKSD and LKLB

Element	Wavelength (nm)	LKSD* (ppm)	LKLB* (ppm)	Limit (ppm)
Cadmium	228.802	0.020	0.011	0.3
Lead	220.353	0.416	0.57	10
Zinc	213.9	1.26	1.09	-
Mercury	253.652	Not detected	Not detected	1
Arsenic	193.696	Not detected	Not detected	3

*Mean of three readings (*n*=3)

Table 5: Microbial load of LKSD and LKLB

Testing parameter	LKSD	LKLB	Limit
Total bacterial count (CFU/g)	60	942	1×10^5
Total fungal count (CFU/g)	27	430	1×10^3
E. coli	Absent	Absent	Absent
Salmonella sp.	Absent	Absent	Absent
P. aeruginosa	Absent	Absent	Absent
P. aureus	Absent	Absent	Absent

E. coli: Escherichia coli, P. aeruginosa: Pseudomonas aeruginosa, P. aureus: Pseudomonas aureus

was passed through, that refers that powder is fine in nature and having good flow property.[11] Heavy metal estimation was done for cadmium, lead, zinc, mercury and arsenic, and the result shows that lead, cadmium and zinc were found to be 0.416, 0.020 and 1.26 ppm, respectively, in LKSD while 0.57, 0.011 and 1.09 ppm in LKLB (Table 4). Other heavy metals (mercury and arsenic) were not detected. Heavy metal contents were found here complies within limit.[21] The microbial load was calculated based on agar media. Total bacterial count was found 60 and 942 CFU/g for LKSD and LKLB respectively (Table 5) Total fungal count was found 24 CFU/g and 430 CFU/g for LKSD and LKLB respectively. The microbial load was found within limit[21] and it reflect that proper hygiene norms followed during the preparation of formulation and packing. It shows that finished product is safe for use, and all the data are complies within the prescribed limit while physicochemical data support that product is safe and stable.

CONCLUSION

Lodhradi Kashaya is ayurvedic formulation, mention for *Madhumeha* (DM) has been indicated to take in liquid form. But in present study *Kashaya* (liquid) dosage form was converted to powder. Standardization of *Lodhradi Kashaya* powder made by two different techniques (LKSD and LKLB) were done on various parameters. Organoleptic characteristic was found nearly similar except touch and appearance. The physicochemical profile of both the sample was slightly different but no big difference was observed. Microbial load of LKLB was found little higher but within limit prescribed in API. Similarly, the heavy metal was found within limit ensuring safety of the formulation. This standardization data will help to maintain reproducibility in future as well as to ensure quality and safety in both samples and also aid some standard for the *Lodhradi Kashaya* formulation.

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