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Review Article

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"MODERN DOSAGE FORMS FROM CLASSICAL *KALPANAS* (GRANULES, TABLETS, SYRUPS AND DRIED EXTRACTS): DOES CONVERSION PRESERVE QUALITY AND EFFICACY?"

Dr. Abhay Gandhi[1]

AFFILIATIONS:
1. Director, IRA Consultancy and Research Organisation, Bhosari MIDC, Pune, Maharashtra, India

CORRESPONDENCE:
Dr. Abhay Gandhi
EMAILID:
director@icro.co.in

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ABSTRACT

Background: Many classical Ayurvedic preparations, particularly *kwatha* (decoction) and *avaleha* (confection), are inconvenient, short-lived or unpalatable. Manufacturers increasingly convert them into granules, tablets (*ghana vati*), syrups, capsules and spray-dried powders. Whether these modern forms are equivalent to the classical preparation is rarely tested. **Objective:** To review the pharmaceutical rationale for converting classical *kalpanas* into modern dosage forms and the evidence on how conversion affects composition, stability and efficacy. **Methods:** A structured narrative review following scoping principles, covering standard manufacturing procedure studies, comparative pharmaceutico-analytical studies, stability studies and reviews of dosage-form modification. **Results:** Studies have developed granules, tablets, syrups and spray-dried powders from *kwatha*, *avaleha* and dried extracts, with acceptable pharmacopoeial parameters such as moisture, hardness and disintegration. Converting *avaleha* into granules has been studied as a way to improve shelf life, and industrial extraction with spray drying can give stable powders without preservatives. However, a comparison of freshly prepared and commercial *Cirivilvadi kashaya* found differences in specific phytochemical indicators, and only a minority of comparative studies measured marker compounds, dissolution or biological activity. No randomised clinical trial comparing a converted form with its classical counterpart was identified. **Conclusion:** Conversion can improve convenience and stability, but equivalence is assumed rather than demonstrated. A tiered equivalence framework, from marker profiles to dissolution and, where needed, clinical bridging, is proposed.

KEYWORDS: *Kwatha*; *Avaleha*; Granules; *Ghana vati*; Syrup; Spray drying; Dosage form modification; Equivalence

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INTRODUCTION

Classical Ayurvedic dosage forms were designed for preparation close to the point of use. A *kwatha* has a classical potency period of about three hours, must be prepared fresh, is bulky and often bitter[1]. An *avaleha* is a sticky confection with a high sugar content. These features make classical forms difficult to manufacture at scale, to distribute and to take regularly.

The solution adopted widely by industry is dosage-form modification: decoctions are concentrated and converted into granules, tablets (*ghana vati*), syrups or spray-dried powders, and confections into granules. Classical texts themselves describe derived forms such as *ghana* (solid extract), *avaleha* and *khanda* from decoctions[2], and reviews have proposed granulation as a logical modern extension[3,4]. The key question is whether the modified product delivers the same constituents and effects as the classical one.

METHODS OF THE REVIEW

This is a structured narrative review following scoping principles. Studies were identified through PubMed, PubMed Central, DOAJ, Crossref-indexed records, journal archives and the reference lists of recent reviews on *kwatha* and on stability of Ayurvedic formulations, using the terms granules, *ghana vati*, tablet, syrup, spray drying, modified dosage form, *kwatha*, *avaleha* and comparative study. Studies comparing a modern form with its classical counterpart, or developing a modern form with stated quality parameters, were charted.

RATIONALE FOR CONVERSION

Table 1. Classical dosage forms, their limitations and common modern alternatives

Classical form	Main limitations	Common modern forms	Main advantages claimed
Kwatha (decoction)	Short life (about 3 h), bulk, taste, preparation time	Liquid *kashaya* with preservative, granules, *ghana vati*, spray-dried powder, syrup	Convenience, dose accuracy, longer shelf life
Avaleha (confection)	Sticky, high sugar, microbial and moisture sensitivity	Granules	Easier handling, improved stability
Churna (powder)	Bulk, taste, moisture uptake	Tablets, capsules	Dose accuracy, palatability
Swarasa (fresh juice)	Seasonal availability, very short life	Dried juice powders, extracts	Year-round availability

Granules are attractive because they have good flowability, can be dosed accurately and can be further processed into tablets or capsules; wet granulation is considered the most suitable technique for *kwatha*-based products[3]. Industrial extraction has been reported to cut the boiling time of decoctions from 16–21 hours to about six hours, and spray drying of concentrated decoction can give a stable powder without preservatives[1,5].

EVIDENCE FROM COMPARATIVE AND DEVELOPMENT STUDIES

Table 2. Selected studies on modern dosage forms derived from classical *kalpanas*

Classical form	Modern form	Focus
Jwarahara dashemani (decoction group)	Syrup and tablet	Standard manufacturing procedure
Dashanga decoction	*Ghana* tablet	Standardisation and quality control parameters
Dashamoola kwatha	Instant granules	Standardisation and quality control
Gojihvadi kwatha	Granules	Comparative pharmaceutico-chemical study with stability profile
Lodhradi kashaya	Spray-dried powder	Pharmaceutical processing and standardisation
Cirivilvadi kashaya	Commercial-scale liquid	Phytochemical indicators, fresh vs commercial
Kamsaharitaki avaleha	Granules	Comparative shelf life
Agastyaharitaki avaleha	Granules	Comparative shelf life

Kantakari avaleha	Granules	Accelerated stability
Centella asiatica	Dried extracts	Accelerated stability

1. Pharmaceutical feasibility

Standard manufacturing procedures have been established for syrups and tablets from a decoction group, for *ghana* tablets from *Dashanga* decoction, for instant *Dashamoola* granules and for a spray-dried *Lodhradi kashaya*[5-8]. These studies show that modern forms meeting conventional quality parameters, such as moisture, hardness, friability and disintegration, can be produced from classical formulations.

2. Stability

Stability is the most frequently studied advantage. Granules have been compared with the parent *avaleha* for *Kamsaharitaki*, *Agastyaharitaki* and *Kantakari* preparations, and with the parent *kwatha* for *Gojihvadi*[9,11-13]. A broader appraisal of stability studies found that processing steps such as granulation are among the factors that influence shelf life, but also that most studies were accelerated and single-batch[15].

3. Composition

Few studies have compared the chemical composition of modern and classical forms using markers. In one study, *Cirivilvadi kashaya* prepared at commercial scale differed from freshly prepared decoction in specific phytochemical indicators[10]. Concentration and drying steps, such as evaporation to *ghana* and spray drying, involve additional heat exposure that may degrade thermolabile or volatile constituents, and excipients added during granulation or tableting may affect release.

4. Efficacy

No randomised clinical trial comparing a modern form directly with its classical counterpart was identified in this review. Efficacy of modern forms is generally inferred from the classical formulation, sometimes supported by pharmacological studies of the new form alone.

RISKS OF CONVERSION

- **Loss or transformation of constituents** during extended heating, concentration or drying.
- **Excipient effects** on disintegration and release, especially with binders and lubricants not used classically.
- **Dose translation errors** when converting a decoction volume or confection weight into a dry dose.
- **Added sugar or preservatives** in syrups and liquid *kashayas*, with implications for diabetic patients and children.
- **Loss of the vehicle effect** when *anupana* or the classical base, such as honey or ghee, is omitted.

A TIERED EQUIVALENCE FRAMEWORK

Table 3. Proposed tiers for demonstrating equivalence of a modern form to its classical *kalpana*

Tier	Evidence	Purpose
1. Composition	Marker compound profiles (HPTLC or HPLC fingerprints) of classical and modern forms prepared from the same raw materials	Show that key constituents are present in comparable amounts
2. Release	Dissolution or disintegration of the modern form in relevant media compared with the marker content of the classical form	Show that constituents are released
3. Stability	Real-time and accelerated stability of the modern form with marker assays	Justify shelf life
4. Pharmacology	Comparative activity in a relevant model	Support functional equivalence where markers are uncertain
5. Clinical bridging	Small comparative clinical or pharmacokinetic study	Required where composition or release differs materially

RESEARCH GAPS

The main gaps are: marker-based comparisons of modern and classical forms for widely used formulations; dissolution methods suitable for polyherbal products; studies of excipient interactions; dose translation guidelines; and comparative clinical studies.

CONCLUSION

Classical *kalpanas* can be converted into granules, tablets, syrups and dried powders that meet pharmaceutical quality parameters and often have

longer shelf lives. Equivalence to the classical preparation is, however, usually assumed rather than shown, and the limited evidence suggests that composition can change. Adopting a tiered equivalence framework would allow the advantages of modern dosage forms to be realised without losing the therapeutic identity of classical formulations.

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