



Review Article

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A CONCEPTUAL OVERVIEW OF GRANULES (KHANDA KALPANA) AND ITS UTILITY FOR CLINICIANS

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Abstract

Granules, rooted in the classical Ayurvedic practice of Khanda Kalpana, represent a pivotal innovation in herbal drug delivery, offering enhanced stability, palatability, and ease of administration compared to traditional forms like churna or kwatha. This review explores the historical context, preparation methods, key formulations including Haridra Khanda, Kushmanda Khanda, Shalaparni granules, and other Khanda Kalpana examples and their pharmacognostical evaluations. It elaborates on the advantages, limitations, and clinical utility of granules in managing conditions such as obesity, infertility, cognitive disorders, inflammatory diseases, allergies, and digestive disorders. Standardized through physicochemical and HPTLC analyses, granules align traditional Ayurveda with modern pharmaceutical standards, facilitating evidence-based practice and global acceptance.

Key Words: Granules, Khanda Kalpana, Ayurveda, Palatability

Introduction

Ayurveda, a 5,000-year-old Indian holistic healing system, employs diverse herbal dosage forms tailored to individual constitutions (Prakriti) and Dosha imbalances (Vata, Pitta, Kapha). Traditional forms like churna (powders), kwatha (decoctions), avaleha (confections), and vati (tablets) often face challenges such as short shelf life, bitter taste, and dosing inconsistencies [1]. Granules, multi-particulate systems (0.2–4 mm), have emerged as a modern adaptation rooted in Khanda Kalpana, a classical method of preparing granular herbal mixtures. These granules enhance preservation, patient compliance, and scalability, meeting global standards like those of the World Health Organization (WHO) and Ayurvedic Pharmacopoeia of India (API) [1]. Particularly effective in polyherbal therapies, granules maintain synergistic effects and serve as intermediates for tablets or capsules. This review provides a comprehensive exploration of granules' historical evolution, preparation techniques, key examples, advantages, limitations, and clinical applications, emphasizing their role in modern Ayurvedic practice.

Historical Context

Granules in Ayurveda originate from ancient texts like Charaka Samhita, Sushruta Samhita, and Bhaishajya Ratnavali, which describe Khanda Paka cooking herbal decoctions or juices with sugar (khanda sharkara) to form granules [1]. Examples include Haridra Khanda (Bhaishajya Ratnavali) for allergies and Vasa Khanda (Chakradatta) for respiratory issues, blending herbs like turmeric or Adhatoda vasica with sweeteners to improve palatability and stability [1]. Guda Kalpana, using jaggery, further enhanced shelf life for digestive and tonic formulations [3]. These methods addressed the instability of kwathas and inhalation risks of powders. Modern advancements, driven by global demand for herbal medicines, have adapted forms like avaleha into granules, such as Vasa Avaleha, to meet contemporary needs while preserving Ayurvedic principles [2]. This evolution ensures granules balance Doshas effectively, supporting their integration into global pharmacopeias.

Methods of Preparation

Ayurvedic granules are prepared through classical and modern techniques, ensuring therapeutic potency and industrial scalability.

Classical Method (Khanda Paka)

Authenticated herbs per API standards are used to prepare a liquid base (kwatha or swarasa), boiled with sugar or jaggery until specific consistency markers (paaka siddhi lakshanas) like threading or soft ball formation are achieved. Herbal powders and additives (prakshepa dravyas) are added, cooled, sieved (10–20 mesh), and dried. For Vayahsthapana Khanda, ten Rasayana herbs (e.g., Amrita) are decocted with milk, mixed with sugar and ghee, heated to 90–100°C, and granulated for rejuvenation [4,5]. Adraka Khanda follows a similar process for urticaria, yielding low-moisture granules [6]. This preserves volatile oils and enhances bioavailability.

Modern Methods

- **Wet Granulation:** Herbal powders or extracts are mixed with binders (e.g., water, ethanol), extruded, dried at 40–60°C, and resized. Antiobesity granules use ethanolic extracts of *Achyranthes aspera*, achieving excellent flow (Carr's index 10–15%) [7].
- **Dry Granulation:** Powders are compacted into slugs and milled, ideal for moisture-sensitive herbs [1].
- **Advanced Techniques:** Steam, melt, moisture-activated dry granulation (MADG), thermal adhesion (TAGP), and foam granulation ensure uniformity and controlled release. Prajasthapana granules involve reducing kwatha, mixing with sugar, sieving, and drying at 50°C, with HPTLC confirming markers like gallic acid [8]. Quality tests include bulk density (0.4–0.6 g/ml), angle of repose (<30°), and microbial limits.

Examples of Formulations

- **Antiobesity Polyherbal Granules:** Combining *Achyranthes aspera*, *Camellia sinensis*, and others, these reduce weight and lipids in preclinical models via appetite suppression [9].
- **Prajasthapana Granules:** With Brahmi and Shatavari, these support fetal health, showing high water-soluble extracts (40–50%) and safety [8].
- **Withania Somnifera Granules:** Optimized for immunomodulation, with rapid dissolution (>80% in 30 minutes) [10].
- **Vayahsthapana Khanda:** Rejuvenative with low moisture (<5%) and high sugar content [4,5].

- Adraka Khanda: Sweet-spicy granules for urticaria, pH 6–7 [16].
- Smrutisudha Granules: Memory-enhancing with Brahmi, standardized via HPTLC [11].
- Jyotishmati and Yastimadhu Granules: Boost IQ in children (Kapha-Pitta Prakriti) by 10–15 points [12].
- Polyherbal Granules (Curcuma, Tinospora, Withania): Antioxidant, anti-inflammatory, with fast disintegration [13].
- Shalaparni Granules: From *Desmodium gangeticum* roots, these address male infertility (oligozoospermia), cardiac pain, fever, respiratory issues, and Vata disorders. Prepared via wet granulation, they show loss on drying (5.066%), total sugar (54.1%), pH (7), and HPTLC (10 spots at 254 nm). Microscopic analysis reveals starch grains and lignified vessels, ensuring quality for Vajikarana therapy [14].
- Haridra Khanda: Classical polyherbal granules from Bhaishajya Ratnavali, primarily containing turmeric (Haridra), prepared by boiling with sugar and additives; often converted to tablets for better palatability. Pharmaceutical evaluation confirms quality parameters like homogeneity and stability. Clinically useful for Udarda, Shitapitta, and Kotha (urticarial rashes) due to anti-allergic and anti-inflammatory properties [1,15].
- Kushmanda Khanda: Prepared from Kushmanda (*Benincasa hispida*) juice, Amlaki powder, milk, ghee, and sugar granules via boiling and reduction to granular form. Clinical trials demonstrate significant relief in Urdhwaga Amlapitta (acid peptic disorders like GERD) symptoms such as regurgitation, heartburn, and nausea, with $p < 0.0001$ reductions and no adverse effects [16].
- Narikela Khanda: From Bhaishajya Ratnavali, incorporating coconut (Narikela); classical for Shularoga (pain disorders). Granular form enhances digestibility and efficacy in gastroprotective and cooling therapies [1].
- Vasa Khanda: From Chakradatta, with *Adhatoda vasica*; indicated for Raktapitta (bleeding disorders) and respiratory issues. Granules provide sustained release for anti-inflammatory effects [1].
- Vasa Khanda Kushmanda: Variant from Chakradatta, combining Vasa with Kushmanda; used for similar indications with added nourishing properties [1].

Advantages and Disadvantages

Advantages

Aspect	Benefits	Evidence
Stability	Low moisture (<5–10%) ensures 1–2 year shelf life.	Prajasthapana granules [8].
Palatability	Sweeteners mask bitterness; dissolvable forms aid compliance.	Shalaparni granules for infertility [14]. Haridra Khanda tablets [15].
Bioavailability	Rapid dissolution (>70% in 1 hour); sustained release reduces dosing.	Antiobesity granules [9].
Handling	Excellent flow (Carr's index <20%) supports scalability.	Withania granules [10].
Efficacy	Synergistic polyherbal action preserved.	Cognitive granules [12]. Kushmanda Khanda for Amlapitta [16].

Disadvantages

Excipient interactions may reduce potency; heat-sensitive herbs risk degradation; equipment costs limit small-scale production. Long-term stability and efficacy need further validation [1,14].

Utility for Clinicians

Granules enhance compliance through palatability and fixed dosing, ideal for pediatrics and geriatrics. Antiobesity granules support holistic weight management [9]. Shalaparni granules address male infertility, improving sperm parameters in 30–40% of cases, with HPTLC ensuring quality [14]. Cognitive granules enhance IQ in children [12]. Respiratory and inflammatory conditions benefit from sustained-release granules. Haridra Khanda is valuable for allergic skin disorders like urticaria, offering a patient-friendly alternative to powders [15]. Kushmanda Khanda aids in managing acid-related digestive issues, integrating well with dietary regimens for long-term relief [16]. Clinicians can integrate these with Panchakarma and diet, leveraging standardization for evidence-based practice in integrative settings.

Conclusion

Granules (Khanda Kalpana) bridge traditional Ayurveda with modern pharmaceuticals, offering clinicians stable, effective, and patient-friendly options. Examples like Haridra

Khanda, Kushmanda Khanda, and Shalaparni exemplify their potential in specialized therapies. Future research should focus on clinical trials and nanotechnology to enhance global adoption.

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