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Review Article

A CRITICAL REVIEW OF *ANUPANA* AS A BIOAVAILABILITY ENHANCER IN *VATI* FORMULATIONS

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ABSTRACT

Anupana is a distinctive Ayurvedic therapeutic principle in which a specific adjuvant is administered with or after medicine to enhance and direct its therapeutic action. Its selection is traditionally based on *Dosha*, disease condition, *Agni, Bala,* age, season, and the properties of the medicine. Thus, *Anupana* is considered an integral component of therapy rather than merely a vehicle for drug administration. This review aimed to explore its therapeutic significance in *Vati* formulations and its potential role as a bioavailability-enhancing factor from a contemporary perspective. **Methods:** A classical literary review was conducted using major Ayurvedic texts, and 50 *Vati* formulations representing diverse therapeutic indications were systematically evaluated with respect to their prescribed *Anupana* and therapeutic applications. **Results:** Considerable diversity was observed in *Anupana* selection, reflecting the individualized principles of Ayurvedic therapeutics. *Madhu* was the most frequently prescribed *Anupana*, followed by *Ushna Jala*, *Adraka Swarasa*, *Dugdha*, *Triphala Kwatha, Pippali, Takra, Ghrita, and Gomutra.* These associations suggested that *Anupana* selection was closely related to the intended therapeutic action and disease-specific requirements. From a contemporary perspective, these adjuvants may influence drug dissolution, gastrointestinal transit, absorption, membrane permeability, distribution, and bioavailability. **Conclusion:** *Anupana* represents a sophisticated therapeutic and drug-delivery principle within Ayurvedic pharmaceutics, with potential to optimize therapeutic efficacy and provide a valuable framework for investigating traditional drug–vehicle combinations through modern pharmaceutical and pharmacokinetic approaches.

INTRODUCTION

Ayurveda, the traditional system of medicine known as the "science of life," encompasses comprehensive principles for the prevention and management of diseases. Among its distinctive therapeutic concepts is the judicious use of *Anupana*, a substance administered before, along with, or after food or medicine to optimize therapeutic outcomes. In Ayurvedic practice, the selection of *Anupana* is individualized according to factors such as *Dosha* predominance, disease condition, *Prakriti, Agni, Bala,* age, season, and the nature of the administered medicine. Classical Ayurvedic texts emphasize that *Anupana* is not merely intended to improve palatability or facilitate administration but plays an active role in enhancing the therapeutic efficacy of both *Ahara* (diet) and *Aushadha* (medicine). By facilitating the proper dissemination of medicines throughout the body, *Anupana* is believed to promote better absorption, assimilation, tissue distribution, and overall therapeutic effectiveness. These characteristics closely resemble the modern concepts of pharmaceutical vehicles, drug carriers, bioenhancers, and therapeutic adjuvants that influence drug disposition and efficacy.

Acharya Sharangadhara elegantly explains the significance of *Anupana* through the analogy,

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"Yatha tailam jale kshiptam kshanenaiva prasarpati, Anupana-balad eva tatha sarpati bheshajam[1]", meaning that just as a drop of oil rapidly spreads over the surface of water, an appropriate *Anupana* enables medicine to disseminate efficiently throughout the body, thereby enhancing its therapeutic action. This classical description suggests that *Anupana* may influence both the pharmacokinetic and pharmacodynamic behaviour of medicines by facilitating their transport, distribution, and action at the desired site. Despite its considerable therapeutic importance and widespread mention in classical Ayurvedic literature, the scientific basis and clinical application of *Anupana* remain insufficiently explored in contemporary research.

According to its derivation, *Anupana* is broadly classified into *Sahapana* and *Paschatpana*. Based on its purpose, it is further categorized as *Aharopayogi Anupana*, administered along with food, and *Aushadopayogi Anupana*, administered with medicines. Although the term *Sahapana* does not appear in the earlier *Brihatrayi* texts, it is clearly defined in *Rasa Tarangini*[2] as the administration of medicines with an appropriate accompanying substance that facilitates their proper disintegration, absorption, and uniform distribution throughout the body, thereby enhancing therapeutic efficacy. This definition reflects a remarkably advanced understanding of factors that influence the effectiveness of orally administered medicines.

The concept of *Anupana* has been described in all the *Brihatrayi* texts following the chapters on *Bhakshya Varga* or *Kritanna Varga*, highlighting its close relationship with food and digestion[3]. Classical *Acharyas* state that an ideal *Anupana* should possess qualities different from those of the consumed food while remaining compatible with the body's *Dhatus*, thereby promoting proper digestion and metabolism without producing incompatibility. Furthermore, *Acharya Sushruta* emphasized that the physiological effects of *Anupana* vary according to the timing of its administration[4]. *Anupana* consumed before meals produces *Karshana* (reducing effect), along with meals promotes *Sthirata* (maintenance and stability), whereas after meals it produces *Brimhana* (nourishment and tissue building). These observations indicate that the timing of *Anupana* administration itself contributes significantly to therapeutic outcomes. Subsequent Ayurvedic treatises, including *Yogaratnakara*, further expanded the concept by emphasizing the use of *Anupana* with medicines in addition to food. These texts consistently recommend that *Anupana* should be selected according to the nature of the disease, the medicine, and the strength of the patient, indicating that its administration forms an integral component of individualized Ayurvedic therapeutics. Classical descriptions by *Acharyas Charaka, Sushruta*, and *Vagbhata* attribute numerous therapeutic properties to *Anupana*, including *Prinana* (refreshing), *Urjakara* (providing energy), *Mardavakara* (imparting smoothness), *Brimhana* (nourishment), *Deepana* (improving digestive capacity), *Pachana* (facilitating digestion), *Dosha Shamana, Trishna Nigrahana* (relieving thirst), *Klama Hara* (relieving fatigue), *Ruchikara* (improving palatability), and *Vyavayi* or rapid dissemination of food and medicines throughout the body. Collectively, these attributes indicate that *Anupana* is regarded as an active therapeutic adjunct capable of enhancing digestion, assimilation, tissue nourishment, systemic distribution, and overall treatment efficacy.

Among the various Ayurvedic dosage forms, *Vati Kalpana* represents one of the most widely prescribed and clinically convenient formulations because of its stability, ease of administration, portability, accurate dosing, and prolonged shelf life. Classical Ayurvedic literature consistently prescribes specific *Anupanas* for numerous *Vati* formulations according to disease conditions and therapeutic objectives. However, these recommendations remain scattered across different classical texts, and a comprehensive synthesis of their therapeutic rationale has not been undertaken. Moreover, recent advances in pharmaceutical sciences have demonstrated that pharmaceutical excipients, lipid-based carriers, bioenhancers, and drug-delivery systems substantially influence drug absorption, distribution, metabolism, excretion, efficacy, and safety. These developments provide an opportunity to reinterpret the classical concept of *Anupana* using contemporary pharmacokinetic and pharmacodynamic principles.

The present review aims to comprehensively compile and critically analyze the *Anupanas* prescribed for various *Vati* formulations described in authoritative classical Ayurvedic texts and to explore their therapeutic significance. Specifically, the review examines the relationship between *Anupana* selection and disease-specific therapeutic indications, evaluates the probable Ayurvedic pharmacological actions of commonly prescribed *Anupanas,* correlates these concepts with modern pharmacokinetic and pharmacodynamic principles, including absorption, distribution, metabolism, and excretion, and discusses the potential role of *Anupana* in enhancing drug bioavailability, therapeutic efficacy, tolerance, and safety, particularly in the administration of *Rasaushadhi* formulations.

METHODOLOGY

The present study is a classical literary review based on references collected from major Ayurvedic texts. The *Vati* formulations included in this review were selected based on their repeated mention in classical Ayurvedic literature and their therapeutic relevance in clinical practice. Data regarding various *Vati* formulations, their indicated disease conditions, and corresponding *Anupanas* were systematically compiled and reviewed from authoritative classical sources, including *Charaka Samhita, Sharangadhara Samhita, Bhaishajya Ratnavali, Yogaratnakara, Rasendra Sara Samgraha*. A total of 50 *Vati* formulations were included in the present review to provide representative coverage of diverse clinical conditions and the wide range of *Anupanas* described in classical Ayurvedic literature**.**

Result

A total of 50 *Vati* formulations associated with specific *Anupanas* were documented from classical Ayurvedic literature. The compiled formulations were distributed across a broad spectrum of clinical conditions, with the highest representation observed in *Jwara* (10 formulations), followed by *Vatavyadhi* (8), *Vatrakta* (1), *Kasa–Shwasa* (5), *Rajayakshma* (4), *Agnimandya* (4), and *Amavata* (3). Additional formulations were identified for conditions such as *Yakrit–Pliha Roga* (2), *Kamla* (1), *Prameha* (3), *Arsha* (2), *Grahani* (1), *Gulma* (1), *Amlapitta* (1), *Kshaya*, *Balaroga* (1), *Unmada* (2), and *Rasayana–Vajikarana* (1).

Analysis of the collected data revealed that the selection of *Anupana* varied according to the disease condition and the therapeutic objective of the formulation. Madhu emerged as the most frequently prescribed *Anupana*, followed by *Ushna Jala*, *Adraka Swarasa*, *Dugdha*, *Triphala Kwatha*, *Pippali*, *Takra*, *Ghrita*, and *Gomutra*. The findings indicate that *Anupana* is an integral component of Vati administration and is consistently employed to support the intended therapeutic action across diverse clinical conditions.

S.No.	***Vati* Formulation**	**Disease Condition**	***Anupana/ Prakshep Dravya***
1.	*Laghumalinibasant Rasa* (*Yogaratnakara*)[5]	*Jwara*	*Dugdha* (milk), *Madhu*
2.	*Swacchanda Bhairava Rasa* (*Bhaishajya Ratnavali*)[6]	*Jwara*	*Adraka swarasa* (ginger juice), *Sita jala* (sugar water) and *Saindhava lavana*
3.	*Saubhagya vati* (*Bhaishajya Ratnavali*)[7]	*Jwara.*	*Adraka swarasa*, *Ushna jala* (warm water)
4.	*Trailokya Chintamani Rasa* (*Bhaishajya Ratnavali*)[8]	*Jwara*	*Narikelodalka* (coconut water), *Tambula*
5.	*Anandabhairava Rasa* (*Rasendra Sara Sangraha*)[9]	*Jwara*	*Adraka swarasa*, *Madhu* (honey)
6.	*Hinguleshwara Rasa* (*Bhaishajya Ratnavali*)[10]	*Jwara*	*Madhu*
7.	*Ratnagiri Rasa* (*Bhaishajya Ratnavali*)[11]	*Jwara*	*Pippali Churn*, *Dhanyaka Churn*, *Madhu*
8.	*Mratunjaya Rasa* (*Bhaishajya Ratnavali*)[12]	*Jwara*	*Mastu*, *Adraka Swarasa*, *Madhu*
9.	*Sannipata Bhairava Rasa* (*Bhaishajya Ratnavali*)[13]	*Jwara*	*Madhu*, *Tulsi Swarasa*, *Adraka swarasa*
10.	*Vasantmalti Rasa* (*Siddh Bheshaj Manimala*)[14]	*Jwara*	*Pippali churn*, *Madhu*
11.	*Punarnava Mandoora* (*Charak Samhita*)[15]	*Kamla*	*Takra*
12.	*Lokanatha Rasa* (*Rasendra Sara Sangraha*)[16]	*Yakrutpleeha Rogadhikar*	*Pippali* with *Madhu, Haritaki* with *Guda, Gomutra*
13.	*Plihari Vatika* (*Bhaishajya Ratnavali*)[17]	*Yakrutpleeha Rogadhikar*	*Ushna Jala*
14.	*Chitrakadi vati (Charak*	*Agnimandhya*	*Ushna Jala, Takra* (butter milk*)*

	Chikitsa)[18]	*Rogadhikar (Grahni)*	
15.	*Agnitundi vati* (*Bhaishajya Ratnavali*)- *Marichakar vati*[19]	*Agnimandhya Rogadhikar*	*Ushna Jala*
16.	*Gandhaka Vati* (*Bhaishajya Ratnavali*)[20]	*Agnimandhya Rogadhikar*	*Nimbu Swarasa* (lemon juice), *Ushna Jala*
17.	*Mahashankha vati (Bhaishajya Ratnavali)*[21]	*Agnimandhya Rogadhikar*	*Ushna Jala, Takra*
18.	*Soorana vataka (Sharangdhara Samhita)*[22]	*Arsha*	*Ushna Jala*
19.	*Pranada Gutika (Bhaisaja Ratnavali)*[23]	*Arsha*	*Madhu, Ushna Jala, Madhya, Mamsarasa, Yush*
20.	*Grahanikapata rasa (Yogaratnakara)*[24]	*Grahni*	*Maricha Choorn, Madhu*
21.	*Kankayana Gudika (Bhaishajya Ratnavali)*[25]	*Gulmadi*	*Gomutra- Kaphaja Gulma, Ksheer-Pittaj gulma, Madhya-Vataj gulma, Triphala Kashaya, Gomutra-Sannipataj, Raktaj gulma*- Camel milk.
22.	*Amlapittantaka rasa (Rasendra Sara Sangraha)*[26]	*Amlapitta*	*Madhu*
23.	*Chandraprabha vati (Sharangdhara Samhita)*[27]	*Prameha*	*Ushna Jala, Dugdha*
24.	*Sukramatraka vati (Bhaishajya Ratnavali)*[28]	*Prameha*	*Dadima Swarasa,Ushna Jala, Ajadugdha* (goat milk*)*
25.	*Hemanatha rasa (Bhaishajya Ratnavali)*[29]	*Prameha (Bahumutradhikara)*	*Yathavyadhyanupana*
26.	*Lakshamivilasa Rasa (Rasendra Sara Sangraha)*[30]	*Kasa, Shwasa*	*Sheetal Jala* (cold water)
27.	*Shwaskuthara rasa (yogratnakara)*[31]	*Kasa, Shwasa*	*Tambula patra.*
28.	*Shringarabhra Rasa (Bhaishajya Ratnavali)*[32]	*Kasa Shwasa*	*Madhu*
29.	*Panchamrita Rasa (Bhaishajya Ratnavali)*[33]	*Kasa*	*Madhu and Vibhitaki Phaltvaka*
30.	*Chandramrit rasa (Bhaishajya Ratnavali)*[34]	*Kasa, Shwasa*	*Raktotpala Swarasa* (heamoptysis), *Pippali Churna* added with *Madhu, Adraka Swarasa*
31.	*Asvakanchuki rasa (Rasayogsagar)*[35]	*Kasa, Shwasa*	*Adraka Swarasa* *Yathavyadhyanupana*
32.	*Shilajatvadi Loha (Rasendra Sara Sangraha)*[36]	*Rajyakshma*	*Dugdha*
33.	*Rajmriganka rasa (Rasendra Sara Sangraha)*[37]	*Rajyakshma*	*Pippali Churna* and *Madhu, Maricha Churna* and *Ghrita*
34.	*Shiva gutika (Yogaratnakara)*[38]	*Rajyakshma*	*Mudga Yusha, Jangala Mansrasa,Sura, Godugdha*
35.	*Navratnarajmriganka rasa (Yogaratnakara)*[39]	*Rajyakshma*	*Pippali Churna, Madhu, Guduchi Sattva*
36.	*Kaishor Guggul (Sharangadhara*	*Vatrakta*	*Ushna jala, Manjistha kwatha, Vasadi*

	Samhita)[40]		*Kwatha,Khadira kwatha-Sharangdhara Samhita, Mudga yush, Yusha, Sugandhi Jala- Bhaishajya Ratnavali.*
37.	*Lakshminarayan rasa (yogaratnakara)* [41]	*Vatvyadhi*	*Adraka Swarasa*
38.	*Vatari Guggul (Bhaishajya Ratnavali)*[42]	*Vatvyadhi*	*Ushna Jala*
39.	*Chaturmukha rasa (Bhaishajya Ratnavali)*[43]	*Vatvyadhi*	*Triphala Kwatha, Madhu*
40.	*Chintamanichaturmukha rasa (Bhaishajya Ratnavali)*[44]	*Vatvyadhi*	*Triphala Kwatha, Madhu, Brahmi Swarasa*
41.	*Rasaraj Rasa (Bhaisajya Ratnavali)*[45]	*Vatvyadhi*	*Madhu, Dugdha, Sita Jala*
42.	*Yogendra rasa (Bhaisajya Ratnavali.)*[46]	*Vatvyadhi*	*Triphala Kwatha, Vanshlochana, Sharkara*
43.	*Brihat Vata Chintamani (Bhaishajya Ratnavali)*[47]	*Vatvyadhi*	*Yathavyadhyanupana*
44.	*MahaYograj Guggul (Sharangdhara Samhita)*[48]	*Amvata*	*Rasnadi Kwatha-Vatashamak* *Kakolyadi Kashaya-Pittahara* *Argvadhadi Kwatha-Kaphahara* *Darvi Kwath-Meha* *Gomutra-Pandu* *Madhu-Medovriddhi* *Nimba Kwatha-Kustha* *Guduchi Kwatha-Vataj Shotha* *Pippali Kwatha-Shoola* *Patala Kwatha-Mooshaka Visha* *Triphala Kwatha-Netra arti* *Punarnawa Kwatha-Sarva udara Rogahara*
45.	*Amvatari Rasa (Bhaishajya Ratnavali)*[49]	*Amvata*	*Ushna Jala*
46.	*Simhanada Guggulu (Bhaishajya Ratnavali)*[50]	*Amvata*	*Ushna Jala*
47.	*Kumarkalyana rasa (Bhaishajya Ratnavali)*[51]	*Balrogadhikar*	*Dugdha, Madhu, Sita*
48.	*Chaturbhuja rasa (Rasendra Sara Sangraha)*[52]	*Unmand chikitsa*	*Triphala kwatha, Madhu*
49.	*Unmad Gajakesari Rasa (Bhaisajya Ratnavali)*[53]	*Unmand chikitsa*	*Ghrita*
50.	*Vasantkusumakara rasa (Rasendra Sara Sangraha)*[54]	*Rasayanvajikaranadhikara*	*Madhu, Goghrita, Dugdha, Sita*

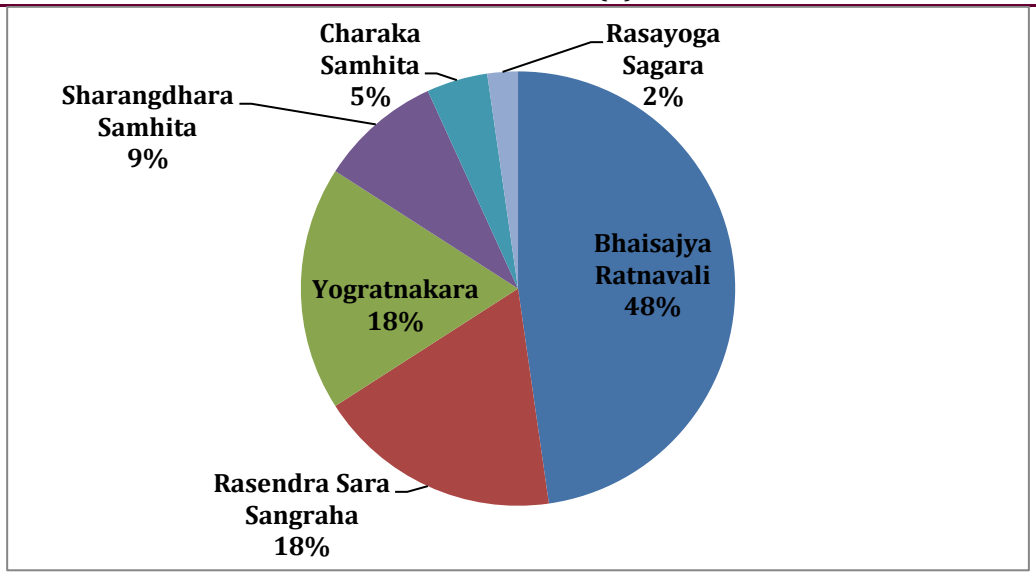

Figure 1: Distribution of formulation on the basis of mentioned in different text

***Anupana* with probable action**

S.No	***Anupana Dravya***	***Karma***
1.	*Madhu* (Honey)[55]	*Kapha-shamaka*, *Vata-vardhaka, Lekhana* (scraping action), *Yogavahi* (excellent bio-enhancer), most commonly used *Anupana*
2.	*Ghrita* (Ghee)[56]	Pacifies *Vata* and *Pitta*, *Rasayana, Agnideepana* (digestive stimulant), *Medhya-ayushya* (beneficial for heart and brain), relieves burning sensation
3.	*Sharkara* (Sugar)[57]	Pacifies *Vata* and *Pitta*, *Ruchya* (appetite promoter), *Murchachardijwarana hanti* (subside fainting, vomiting, fever), nourishing, *Shukrakarini* (semen enhancer), anti-dotal action
4.	*Mutra* (Urine)[58]	Pacifies *Kapha* and *Vata*, purifies *Pitta*, *Lekhana* (scraping action), *Agnideepana* (digestive), *Shothavarchograhapahama* (anti-inflammatory and used in retention of stool)
5.	*Trikatu*[59] *Shunthi* (dry ginger) *Maricha* (black pepper) *Pippali* (long pepper)	Pacifies *Kapha* and *Vata*, excellent *Ama-pachana, Jwarhara* (antipyretic) and *Shothahara* (anti-inflammatory) Pacifies *Kapha* and *Vata*, *Agnideepana* (improves digestion and metabolism) Pacifies *Kapha* and *Vata, Deepani* (digestive*), Rasayani* (nourishing), *Shoolamarutana* (carminative), *Pleeharogahara* (spleen supportive), *Krimiroganuta* (anthelmintic).
6.	*Ardraka*[60]	*Mala-bhedana* (facilitates evacuation of stool), *Tikshna* (sharp and penetrating in action*), Ushna Virya* (hot in potency*), Agnideepaka* (enhances digestive fire), *Katu Rasa* (pungent taste*), Madhura Vipaka* (sweet post-digestive effect).
7.	*Tulsi*[61]	*Katu, Tikta, Hridya, ushna, Dahapittakrit, Deepani, Kaphavatajita, Pashvarukanashaka.*
8.	*Triphala*[62]	Pacifies *Kapha* and *Pitta*, in *Meda roga* (obesity/metabolic disorders), *Kushtha* (skin diseases), mild laxative.
9.	*Amlaki*[63]	*Tridoshashamaka, Raktapittahara, Vrishya, Rasayana*
10.	*Rasna*[64]	*Ama-pachana, Tikta, Guru ushna,* pacifies *Kapha* and *Vata, Jwarhara* (antipyretic) and *Sothahara* (anti- inflammatory),
11.	*Godughdha* (milk)[65]	Pacifies *Vata* and *Pitta*, *Dosha dhatu mala srotah kinchit kledakara guru* (it is slightly moistening, and acts on the *Doṣas, Dhatus, Malas*, and body channels), *Jara samasta roganam shantikrit sevinam sada* (produce *Rasayan* effect)
12.	*Tambula*[66]	*Teekshana, Ushna, Vishada, Tikta, Katu Kshaar,* Pacifies *Vata* and *Shrama*

13.	*Brahmi*[67]	*Tidoshashamaka, Medhya, Rasayana* effect
15.	*Guduchi*[68]	*Tidoshaghna, Rasayana, Balya, Deepana, Pittasaraka, Jwaraghna*

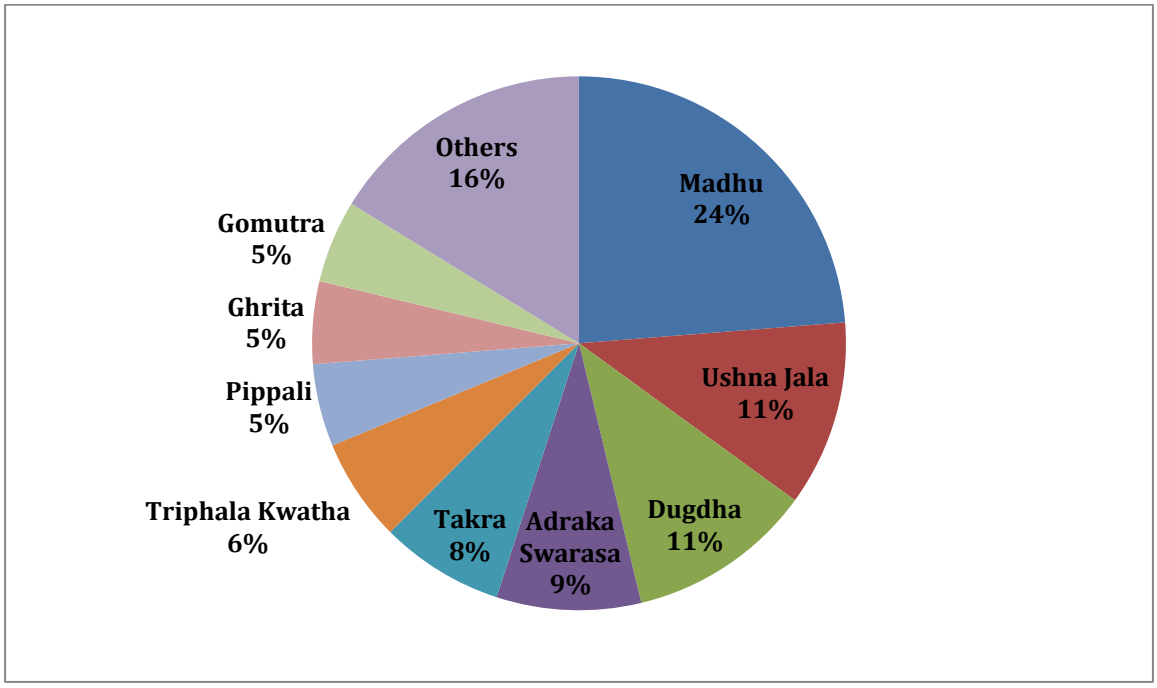

Figure 2: Percentage distribution of commonly used *Anupanas* in various *Vati* formulation

DISCUSSION

The present analysis of fifty *Vati* formulations drawn from *Charaka Samhita, Ashtanga Hridaya, Sharangadhara Samhita, Bhaishajya Ratnavali, Yogaratnakara* and *Rasendra Sara Sangraha* that *Anupana* selection was never incidental. The same formulation is frequently paired with different *Anupanas* depending on the disease, *Dosha* predominance, patient constitution, digestive strength, and season, pointing to a deliberate, individualised system of prescribing rather than a fixed convention. This pattern mirrors the modern principle of personalised pharmacotherapy, where the vehicle and adjuvant accompanying a drug are chosen according to patient-specific factors that determine its pharmacokinetic and pharmacodynamic behaviour.

Classical physiology explains this individualisation through the framework of *Agni, Dosha, Dhatu, Mala* and *Srotasa*. Impaired *Agni* is said to generate *Ama*, an undigested residue that obstructs the channels (*Srotorodha*) through which medicines must travel to reach their target tissues; *Anupanas* such as *Trikatu* and *Adraka Swarasa* are therefore prescribed to kindle digestion, while *Madhu, Triphala, Takra* and *Gomutra* are favoured for their channel-clearing (*Srotoshodhana*) action. *Ghrita* and *Dugdha*, by contrast, are reserved for formulations that are *Tikshna* or *Ushna* in nature, nourishing depleted tissue and preserving *Ojas*. Read together, these principles position *Anupana* as an active physiological modulator rather than a passive carrier.

This classical reasoning translates readily into pharmacokinetic language. The rate at which a drug crosses a biological membrane is governed by concentration gradient, surface area, and membrane permeability, as formalised in Fick's law of diffusion[69], while overall systemic exposure can be described within the standard LADME framework of liberation, absorption, distribution, metabolism, and excretion. Any substance capable of altering gastric pH, luminal fluid composition, mucosal permeability, or intestinal transit time will inevitably shift the resulting plasma concentration-time profile- parameters such as Cmax, Tmax and AUC that pharmaceutical scientists use to quantify bioavailability. Several classical *Anupanas* appear to act precisely along these axes, suggesting their traditional use reflects an empirical, if unformalised, grasp of absorption physiology that predates modern pharmacokinetic theory by centuries.

The clearest illustration is *Trikatu*, whose piperine content is now recognised as one of the best-studied natural bioenhancers, inhibiting intestinal and hepatic CYP3A4 and P-glycoprotein-mediated efflux to raise the systemic exposure of co-administered compounds[70]. The magnitude of this effect can be substantial: piperine co-administration has been shown to increase the relative bioavailability of curcumin by roughly 2000% in human subjects[71], and

produces comparable, if smaller, increases for several other structurally unrelated phytoconstituents and drugs- a plausible quantitative basis for the classical terms *Yogavahi* and *Agni-deepana*. *Ghrita* behaves as a lipid-based delivery vehicle, aiding dissolution of fat-soluble constituents[72] through bile stimulation, micelle formation, and lymphatic transport that bypasses first-pass hepatic clearance[73]; its lipophilicity may further explain why it is favoured in *Medhya Rasayana* formulations intended to cross the blood-brain barrier, a route whose selectivity for lipophilic molecules is well established in neuropharmacology. *Madhu* contributes mucoadhesive, antioxidant, and antimicrobial properties that prolong gastrointestinal contact time and reduce enzymatic degradation of labile constituents[74], while *Dugdha* supports micelle formation and reversibly binds phytochemicals via casein, protecting them from premature degradation and moderating their release[75]. *Adraka Swarasa* stimulates gastric motility and enzyme secretion, and fermented *Anupanas* such as *Takra* may act indirectly through modulation of the gut microbiome and its metabolic transformation of ingested phytochemicals, a mechanism only beginning to be characterised experimentally.

The influence of *Anupana* is unlikely to end at absorption. Lipid-based carriers such as *Ghrita* plausibly favour deeper tissue penetration through enhanced membrane partitioning, whereas aqueous or carbohydrate-based *Anupanas* may promote faster systemic distribution- an empirical parallel to the classical notion of *Dhatu*-specific targeting. The consistent pairing of specific *Anupanas* with potent *Rasaushadhi* formulations further resembles the modern concept of drug synergism, in which the medicine and its accompanying substance act as a single therapeutic unit, potentially allowing dose reduction without loss of efficacy- a pharmacoeconomic and safety consideration of particular relevance for formulations containing purified metals or minerals. The same substances also appear protective at the tissue level: *Ghrita*, for instance, is rich in butyrate, a short-chain fatty acid known to strengthen epithelial tight-junction integrity and suppress pro-inflammatory cytokine production, while *Dugdha* and *Madhu* may buffer irritant compounds and shield the gastrointestinal mucosa, offering a rationale for their repeated use alongside *Tikshna* or corrosive formulations.

More broadly, the deliberate matching of *Anupana* to *Prakriti, Vikriti, Agni, Bala, Kala* and *Desha* anticipates the contemporary shift toward precision medicine and pharmacogenomics, in which identical drugs are expected to behave differently depending on the metabolic, genetic, and physiological context of administration.

These parallels remain, however, largely interpretative rather than confirmatory. Most supporting evidence comes from studies of isolated *Anupana* constituents examined in vitro or in animal models, rather than from controlled human pharmacokinetic trials of complete *Vati–Anupana* combinations, and classical sources themselves disagree on dose, timing, and preparation across regional traditions. The fifty formulations reviewed here, while representative, cannot capture the full range of *Anupana* usage recorded in less-studied texts. Closing this evidence gap will require dedicated pharmacokinetic work- including Caco-2 or PAMPA permeability assays, transporter- and enzyme-inhibition studies, LC–MS/MS-based plasma profiling, physiologically based pharmacokinetic (PBPK) modelling, gut-microbiome metagenomics, and randomised controlled clinical trials- before these classical practices can be translated into standardised, evidence-based protocols with defined pharmacokinetic endpoints.

CONCLUSION

The present review highlights that *Anupana* is not merely an adjuvant or vehicle used with medicine, but a therapeutically significant and scientifically relevant component of Ayurvedic pharmaceutics. The critical analysis of classical references demonstrates that the selection of *Anupana* in *vati* formulations is highly rational, individualized, and based on the principles of *Dosha, Vyadhi, Agni, Rogi Bala*, and the pharmacodynamic nature of the formulation**.**

The study reveals that *Anupana* plays a multidimensional role by enhancing absorption, bioavailability, tissue targeting, palatability, therapeutic potency, and overall clinical efficacy of medicines. Equally important is its contribution in improving drug tolerance and safety**,** particularly in potent herbo-mineral and *Rasaushadhi* preparations, where suitable *Anupana* may help reduce irritation, buffer *Tikshna* effects, minimize adverse reactions, and support safer administration.

When interpreted through a modern scientific lens, *Anupana* can be understood as functioning similarly to a pharmaceutical vehicle, bioavailability enhancer, synergistic adjuvant, metabolic regulator, and safety modulator. This demonstrates the remarkable sophistication of Ayurvedic drug administration principles and their relevance to contemporary pharmacology.

Thus, the concept of *Anupana* represents an advanced therapeutic strategy in Ayurveda that optimizes both efficacy and safety of treatment.

Further pharmacological, clinical, and translational research is warranted to scientifically validate these traditional concepts and explore their application in modern personalized medicine and drug delivery systems.

Therefore, *Anupana* may be considered as a dynamic therapeutic bridge between *Aushadha* and *Sharira*, ensuring that the administered medicine is not only absorbed but also appropriately transformed, distributed, and utilized in accordance with the Ayurvedic principles of *Agni, Dosha, Dhatu,* and *Ojas.*

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