

# Effect of Heat on Snehapaka: Scientific Rationale of Mandagni in Ayurvedic Sneha Kalpana

Dr Vinay. R. Kadibagil

Professor, Department of Rasashastra and Bhaishajya Kalpana  
Shri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, B.M Road, Thanniruhalla, Hassan-573201, Karnataka, India  
[Email-drvinaykadibagil@gmail.com](mailto:Email-drvinaykadibagil@gmail.com)

## ABSTRACT

**Introduction:** Ayurvedic pharmaceutical science (Bhaishajya Kalpana) employs a distinct low-temperature processing method known as Mandagni (mild fire) for the preparation of medicated oils (Taila) and ghee (Ghrita). This methodology contrasts significantly with modern high-temperature cooking practices associated with the formation of carcinogenic compounds.

**Methods:** This review analyzes the thermodynamic and biochemical rationale behind Sneha Kalpana, specifically the role of aqueous media (Drava Dravya) in temperature clamping.

**Discussion:** Contemporary research validates that by maintaining processing temperatures below 100°C, Sneha Kalpana effectively extracts therapeutic phytoconstituents while avoiding the generation of harmful aldehydes, polycyclic aromatic hydrocarbons (PAHs), and trans fatty acids—compounds typically formed at temperatures exceeding 180°C.

**Conclusion:** The traditional Mandagni process acts as a protective mechanism, preserving lipid integrity and vascular health while ensuring bioavailability.

**KEYWORDS:** The Thermodynamics of Mandagni Mild Heat, Temperature Regulation via Aqueous Media

**How to Cite:** Dr Vinay. R. Kadibagil., (2025) Effect of Heat on Snehapaka: Scientific Rationale of Mandagni in Ayurvedic Sneha Kalpana, Vascular and Endovascular Review, Vol.8, No.18s, 16-18

## INTRODUCTION

*Sneha Kalpana* is a specialized Ayurvedic pharmaceutical process designed to prepare oleaginous medicaments using a specific ratio of three components: *Kalka* (herbal paste), *Sneha* (lipid medium: oil or ghee), and *Drava Dravya* (liquid media such as decoction, milk, or cow urine). The classical formulation ratio is 1 part *Kalka*, 4 parts *Sneha*, and 16 parts *Drava Dravya* [1]. This 1:4:16 ratio ensures the comprehensive extraction of both hydrophilic and lipophilic therapeutic compounds. Crucially, the process relies on *Mandagni* (mild heat), a temperature control mechanism that has recently garnered scientific interest for its ability to prevent the formation of lipid oxidation products (LOPs) linked to vascular endothelial damage [2].

### The Thermodynamics of Mandagni (Mild Heat)

Ayurvedic texts, including *Charaka Samhita* and *Sushruta Samhita*, specifically prescribe *Mridu Agni* (gentle fire) or *Mandagni* (50°C–90°C) for *Sneha* preparation [3].

### Temperature Regulation via Aqueous Media

A pivotal scientific observation confirms the efficacy of this method: during traditional *Sneha Paka*, the temperature of the oil mixture remains consistently below 100°C throughout the majority of the processing duration [4]. This temperature regulation is achieved through the presence of the *Drava Dravya*.

- **Boiling Point Clamping:** As long as water is present in the mixture, the temperature is thermodynamically clamped at approximately 100°C (at sea level).
- **Evaporative Cooling:** The continuous evaporation of the aqueous phase absorbs thermal energy, preventing localized overheating of the lipid phase [4].
- **Brief Peak:** Research indicates that the temperature only rises to 105-110°C briefly at the final stage (*Siddhi*) once all moisture has evaporated [4].

### Comparative Analysis: Ayurvedic Processing vs. High-Temperature Cooking

Modern research has established clear thermal thresholds for the formation of cytotoxic and genotoxic compounds in edible oils. The safety of *Sneha Kalpana* becomes evident when contrasted with modern frying techniques.

### Aldehyde Formation

Heating vegetable oils to temperatures typical of deep-frying (180°C+) generates  $\alpha,\beta$ -unsaturated aldehydes (such as 4-hydroxy-trans-2-nonenal or HNE).

- Research demonstrates that at temperatures below 100°C—the operating range of *Sneha Paka*—the formation of toxic aldehydes is negligible [5].
- Conversely, significant increases in mutagenic aldehydes occur at temperatures exceeding 145°C [6].
- Toxicologically significant concentrations of aldehydes found in high-heat frying products are linked to cellular damage and neurotoxicity [5].

#### **Polycyclic Aromatic Hydrocarbons (PAHs)**

PAHs are carcinogenic compounds formed during the incomplete combustion of organic matter.

- The formation of PAHs is strongly temperature-dependent, with major formation occurring above 240°C and significant risks beginning at 165°C [7].
- Ayurvedic processing (50–110°C) operates well below the threshold for PAH generation.
- Repeated reheating of cooking oils, a common modern practice, has been explicitly warned against by the Indian Council of Medical Research (ICMR) due to increased cancer risk and cardiovascular toxicity [8, 9].

#### **Trans Fatty Acids (TFA)**

A systematic review indicates that heating edible oils to temperatures 200°C has a minimal effect on trans fatty acid generation [10]. However, prolonged heating between 200–240°C significantly increases TFA levels, which are established contributors to atherosclerosis and cardiovascular disease. The *Mandagni* process avoids these thermal ranges entirely [10].

#### **Physicochemical Stability and Antioxidant Preservation**

Despite the prolonged duration of heating involved in *Sneha Kalpana*, the lipid profile remains stable. A landmark study by Lahorkar et al. validated that sesame oil processed with herbal decoctions showed minimal increases in peroxide value, indicating resistance to oxidative degradation [4].

#### **Natural Antioxidants in Base Media**

- **Sesame Oil (*Tila Taila*):** Contains sesamol, sesamin, and sesamol. Sesamol exhibits antioxidant capacity superior to synthetic antioxidants (like BHA) and maintains stability at elevated temperatures [11].
- **Ghee (*Ghrita*):** Possesses a high smoke point (approximately 250°C) and natural resistance to oxidation due to its saturated fatty acid content and presence of conjugated linoleic acid (CLA) [12, 13].

#### **Synergistic Herbal Protection**

The incorporation of herbal pastes (*Kalka*) introduces polyphenolic compounds into the lipid medium. These bioactive constituents act as radical scavengers, providing synergistic protection against lipid peroxidation during the heating process [13]. Studies confirm that medicated ghee exhibits superior thermal stability and extended shelf life compared to plain ghee [14].

#### **Classical Quality Control: Paka Siddhi Lakshana**

Ayurveda mandates specific endpoints (*Paka Siddhi Lakshana*) to ensure the process is halted before thermal degradation occurs [15].

- **Phenashanti (in Ghrita):** The disappearance of foam indicates the complete evaporation of water.
- **Phenotpatti (in Taila):** The appearance of froth in oil marks the endpoint.
- **Varti Pariksha:** The herbal paste acts as a moisture indicator; it must be rolled into a wick without crackling when exposed to fire, confirming the absence of residual water.

These organoleptic tests serve as a primitive yet highly effective method of controlling water activity and preventing the oil from entering the temperature zone where polymerization and thermal decomposition occur.

## **CONCLUSION**

The Ayurvedic science of *Sneha Kalpana* represents a sophisticated application of pharmaceutical thermodynamics. The prescription of *Mandagni* is not merely ritualistic but a scientifically sound methodology that maintains processing temperatures in a safe range (50–110°C). By utilizing aqueous media as temperature regulators, this method prevents the formation of carcinogenic aldehydes, PAHs, and trans fats associated with modern high-temperature cooking. Furthermore, the process effectively facilitates the transfer of both lipophilic and hydrophilic active principles into a stable lipid carrier, validated by modern physicochemical analysis.

## **REFERENCES**

1. Gadave S, Shah N. Sneha Kalpana: A Comprehensive Review. *Rasamruta*. 2017;9(9):1-12.
2. Chavan RR, Mandhare A. Lipid-based Ayurvedic formulations of a single herb: A review. *J Ayurveda Integr Med*. 2023;14(2):100713.
3. Murthy K.R.S. *Sushruta Samhita* (English Translation). Vol 2. Varanasi: Chaukhamba Orientalia; 2008. Chikitsa Sthana, 31/8.
4. Lahorkar KL, Sudharshan CY, Deshpande SS. A Comparative Evaluation of Medicated Oils Prepared by Ayurvedic Method. *Asian J Pharm Sci*. 2009. PMC2846471.
5. Moutaz S, et al. Toxic aldehyde generation in and food uptake from deep-frying oils. *Sci Rep*. 2019;9:3129.
6. Chen H, et al. The effect of temperature and heating time on the formation of aldehydes. *Food Chem*. 2019.

7. Ganesan K, Sukalingam K, Xu B. Impact of consumption of repeatedly heated cooking oils on health. *Food Chem Toxicol.* 2017;107(Pt A):450-460.
8. Indian Council of Medical Research (ICMR). Dietary Guidelines for Indians. Repeated heating of vegetable oils may increase cancer risk. *Hindustan Times.* 2024.
9. Vijayan VK, Ashraf MA. Exposure to Cooking Oil Fumes and Oxidative Damages. *Environ Toxicol.* 2012. PMC3215405.
10. Song J, et al. Influence of Heating during Cooking on Trans Fatty Acid Content of Edible Oils: A Systematic Review. *Nutrients.* 2015.
11. Hemalatha S, Ghafoorunissa. Free Radical Reactions and Antioxidant Activities of Sesamol. *J Agric Food Chem.* 2004.
12. Sharma H, Zhang X, Dwivedi C. The effect of ghee (clarified butter) on serum lipid levels and microsomal lipid peroxidation. *Ayu.* 2010;31(2):134-40.
13. Patel K, Gajjar AK. Oxidative Stability of Ghee Incorporated with Clove Extracts. *Food Sci Nutr.* 2024.
14. Pawar K, et al. Standardization of herbal ayurvedic Ghrita formulation. *J Ayurveda Holist Med.* 2018.
15. Sharma M. Scientific relevance and significance of sneha siddhi lakshanas. *World J Pharm Sci Res.* 2016.