Perfume and Flavour Technology Letters

Perfume and Flavour Industry in India: A Narrative Review

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ABSTRACT

India's perfume and flavour sector is two industries sharing one raw-material base. The first is a centuries-old, artisanal, oil-based perfumery centred on Kannauj, with a codified Sanskrit antecedent in Varahamihira's Brhatsamhita. The second is a modern, export-oriented business built on mint, spice oleoresins, pine-derived aroma chemicals and the Indian operations of global flavour and fragrance houses. Published market-size estimates for the sector differ by a factor of more than five depending on definition (about USD 0.56 billion to USD 3.1 billion for 2025), which is itself a finding: the sector is poorly measured. This review covers history, raw materials, traditional and industrial technology, regulation, government schemes, formulations and the chemistry schemes behind them, and the main threats (water stress in mint, sandalwood scarcity and adulteration, a shrinking Kannauj distillery base). Where the evidence is thin or comes only from trade press, this is said explicitly.

1. Scope, method and how to read the references

I searched for market reports, government and regulator documents, peer-reviewed papers, standards bodies and institutional pages, then opened and read the sources that carry the load-bearing claims. Every reference is graded:

- **A**: peer-reviewed paper, official registry, regulator, standards body or standard reference book.
- **B**: government or institutional page, or reputable institutional publication, not peer-reviewed.
- **C**: market-research vendor, trade or popular press, aggregator, or encyclopaedia. Used only for context, and flagged in the text.

Two limits apply. Several pay walled papers were verified by their bibliographic record and abstract, not full text (marked "record verified"). And the formulations in Sections 5 to 10 are of three kinds, always labelled: **published** (taken from a cited study), **traditional** (from a cited historical or technical account) and **template** (my own illustrative design for bench work, not a literature value).

2. Historical and cultural foundations

Indian perfumery has a documented textual tradition. Varahamihira (480 to 587 CE) devoted a chapter, *gandhayukti*, of his *Brhatsamhita* to blending fragrant substances, and the commentator Bhattotpala analysed it around 950 CE [6]. The National Council of Science Museums describes about thirty-seven verses on blending and lists six processes (*bhavana, paka, bodha, vedha, dhupana, vasana*) [9]. The Persian-Arabic word *attar* entered later, and a syncretic Indo-Muslim perfumery culture developed from the meeting of the Indian and Islamic traditions [8].

Kannauj, on the Ganga in Uttar Pradesh, became the hub. Popular accounts say its copper still design is Indus-era, and that Kannauj's distilling is around 5,000 years old; I could not trace these claims to a primary archaeological source, so treat them as folklore (C) [46b]. A nineteenth-century record of a native method for jasmine and *bela* (Arabian jasmine) scented oils, published in the *Journal of the*

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Asiatic Society of Bengal, in its 1832 to 1936 series (the article's own year is not stated in the record I retrieved), shows that the scented-oil tradition was documented in colonial scholarship [44].

The sector's modern institutional history starts in 1991 with the Fragrance and Flavour Development Centre (FFDC), Kannauj, set up under a tripartite arrangement: The State supplied land, the Centre capital and running costs, and UNDP/UNIDO technical know-how [40]. A UNIDO document prepared for the Government of India on the Kannauj essential-oil industry belongs to this origin story [47].

3. Industry structure and market size

3.1 Competing estimates

The table shows why no single number should be quoted without its definition.

Source (grade)	Scope	Value	Growth
IMARC [1] (C)	Flavors and fragrances, India	USD 3.08 bn (2025)	2.7% CAGR to USD 3.91 bn (2034)
Ken Research [2] (C)	Flavors and fragrances, India	USD 2.72 bn (2025)	7.7% CAGR to USD 4.57 bn (2032)
Ken Research [3] (C)	Fragrance and flavour *compounds*	USD 561 m (2025)	11.5% CAGR to USD 1.2 bn (2032)
IMARC [4] (C)	Flavours only	INR 4,591.5 crore (2024)	6.75% CAGR (2025 to 2033)

The same vendor (Ken Research) gives USD 2.72 billion and USD 561 million for neighbouring definitions, so the difference is partly definitional (finished products and ingredients versus compounds). The growth forecasts range from 2.7% to 11.5%; I would not rely on any of them for investment decisions. Another trade writer quotes the global industry at about USD 24.1 billion with India at roughly USD 500 million, attributing it to an MSME source I could not locate; this is unverified [40b].

3.2 Who is in the industry

- **Enterprises.** The Secretary of the Ministry of MSME told a 2022 FICCI summit that 26,000 industries are registered under MSME in the fragrance and flavour sector, and that a second technology centre was being set up in Imphal, Manipur [5].
- **Multinational houses.** Market vendors name Givaudan India, IFF India, dsm-firmenich India, Symrise India and S H Kelkar among the major players [2][3].
- **Ingredient manufacturers.** Privi Speciality Chemicals describes itself as India's largest manufacturer and exporter of aroma chemicals, with more than 20% global share in ten products, plants in Mahad (Maharashtra) and Jhagadia (Gujarat), and capacity above 48,000 tonnes a year (company-derived statements carried by investor sites, so grade C) [24]. Its Q2 FY25 call put pinene-derived products at about 55% of revenue, musks and specialities at about 23%, citral-based chemicals at about 11% and phenol-based at about 7% [57].
- **Kannauj distillers.** Counts conflict badly: more than 200 distilleries [38], 350 to 400 with turnover of INR 660 crore and 10% exports [40], over 500 units [48], and a claim that over 700 distilleries a couple of decades ago had fallen below one hundred [46]. All are grade B or C; the honest summary is that no audited census is available to me.

3.3 Trade

Trade data for essential oils sit inside broad customs chapters. An aggregator of DGCI&S data reports HSN Chapter 33 (essential oils, resinoids, perfumery and cosmetics) exports of INR 22,863 crore in FY 2024-25 and a trade surplus of INR 10,928 crore; this chapter includes cosmetics, so it overstates the perfume and flavour share [22]. An export-guide site gives essential oils under heading 3301 as USD 929 million in 2024-25 and mint oils (two sub-headings) as USD 297 million [23]. Both are grade C and should be rechecked against DGCI&S before citation.

The Spices Board, an official source, is better. Spice oils and oleoresins exports were 20,940 tonnes worth INR 4,533.24 crore (USD 535.92 million) in 2024-25 and an estimated 20,730 tonnes worth INR 4,670.81 crore (USD 528.73 million) in 2025-26 [21]. A Spices Board table also carries a "mint products" line separately from oils and oleoresins [21].

4. The raw-material base

4.1 Mint (Mentha arvensis)

India dominates menthol-mint. A World Resources Institute (WRI) feature says India supplies around 80% of global mentha oil demand, with about 70% of Indian output from Uttar Pradesh [17]. NIFTEM material gives menthol content of 75 to 85% in the oil and says about 95% of the crop is grown in Uttar Pradesh [18]. A 2008 *Business Today* report credits CIMAP's cultivars (Himalaya, Kosi, Saksham, Kushal) and reports 125 to 200 kg of oil per hectare from 20 to 40 tonnes of herbage [49]; these are old figures, useful for orders of magnitude only.

The present risk is water. WRI reports farmers in Sambhal, Chandausi and Amroha, and parts of Punjab and Bihar, giving up mentha as groundwater tightens, and quotes a manufacturer describing a steep drop in output (60 to 65% relative to 2023-24; the article's wording on the base year is ambiguous) [17]. I treat that figure as an anecdote, not a statistic.

4.2 Sandalwood (Santalum album)

Indian sandalwood oil is the aspirational natural base for attars and fine fragrance. ISO 3518 specifies the oil: α-santalol of about 41 to 54% and β-santalol of about 16 to 24% [15]. ISO 3518:2022 is now shown as withdrawn, with a 2025 edition listed [16], so current specification limits should be read from the 2025 edition.

Adulteration is documented. Kucharska and co-workers bought six "sandalwood" oils; none met ISO 3518:2002; only one contained both santalols; three were dominated by compounds typical of *Amyris balsamifera* ("West Indian sandalwood"); and two were synthetic mixtures, one rich in benzyl benzoate and one in synthetic sandalwood alcohols (javanol, polysantol, ebanol) [15]. Only three labels were accurate [15]. For an industry whose heritage product is "attar distilled into sandalwood", authenticity testing by GC-MS is therefore a commercial necessity.

4.3 Kewda (Pandanus fascicularis)

Kewda is a distinct Odisha story. A bibliometric review's authors state that Ganjam district accounts for nearly 90% of India's kewda production and about INR 120 crore a year to the regional economy (grade B, from the authors' summary of their *Discover Sustainability* paper, whose full text I did not open) [13]. Ganjam Kewda Rooh holds a Geographical Indication [14]. The primary technical papers are Mohapatra and Sahoo (2007) on the traditional system of kewda oil and attar, and Sahu and Misra (2007) on screw-pine ecology and technology, both in the *Indian Journal of Traditional Knowledge* (record verified) [11][12]. The 3 to 5% kewda essence in sandalwood oil for a typical attar comes from an encyclopaedia entry [14] and is grade C.

4.4 Spice oleoresins and flavour raw materials

India's flavour raw materials are dominated by spice extracts: oleoresins of chilli, turmeric and ginger and spice essential oils, which earn the USD 0.5 billion a year noted above [21]. Public-sector support for value addition runs through the Spices Board (technology upgrading, market promotion) as described in a Lok Sabha reply [56].

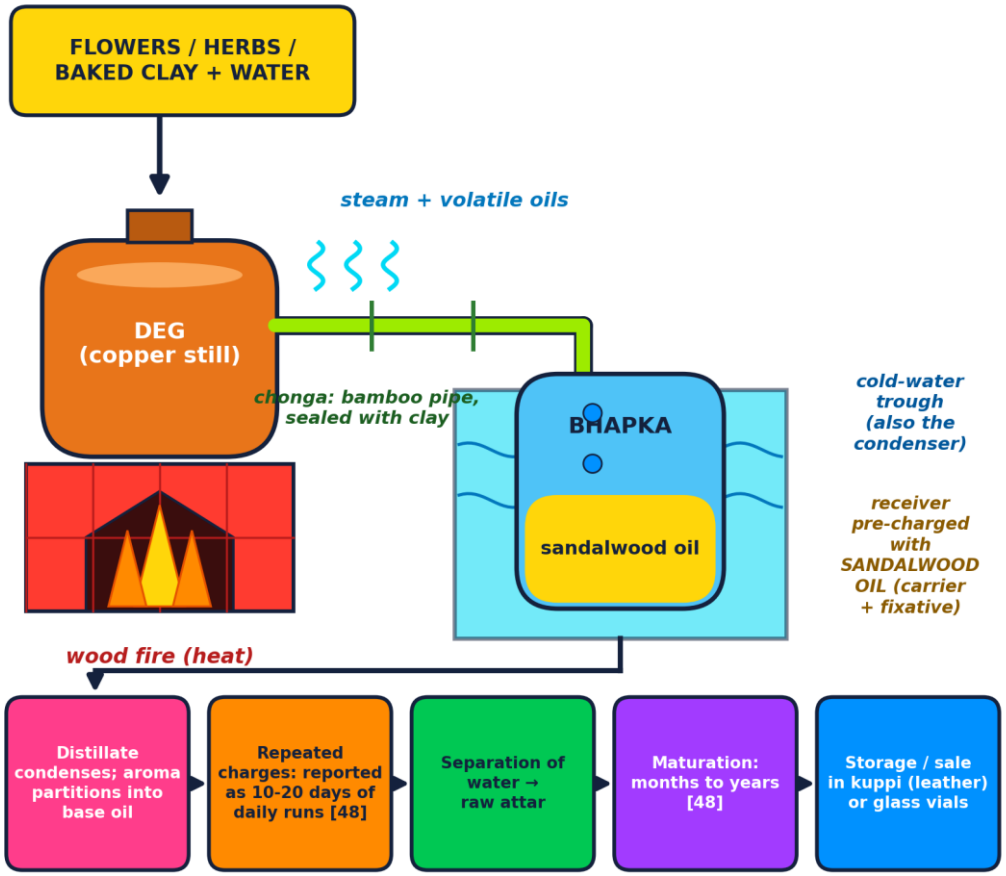
4.5 CSIR Aroma Mission

The CSIR Aroma Mission aims to move farmers into high-value aromatic crops (lavender, marigold, lemongrass, mint, rosemary, rose, rosagrass and others) with CSIR-CIMAP, Lucknow as nodal laboratory and IHBT Palampur, IIIM Jammu, NBRI Lucknow and NEIST Jorhat participating [20]. CSIR-IIIM reports Phase I from 1 April 2016 to 31 March 2019 and Phase II from April 2020 to March 2023, with 10,938 ha brought under captive cultivation across both phases [19]. These are the implementing laboratory's own figures (grade B) and are not independently audited.

5. Traditional technology: attar

5.1 Scheme 1: The deg-bhapka process

The traditional still is a copper vessel (*deg*) on a wood-fired hearth, joined by a bamboo pipe (*chonga*) to a receiving vessel (*bhapka*) standing in a water trough that doubles as a condenser. The bhapka is pre-charged with the base oil, traditionally sandalwood oil [50][48].



Scheme 1. *The deg–bhapka process of attar distillation, redrawn from the text diagram [50][48].*

Variations: *mitti attar* distils sun-baked clay discs in place of botanicals [50]; *shamama* and *marigold* attars are herb- and flower-based variants named by Kannauj distillers [46][48]. Some accounts note modern substitution of the sandalwood carrier with liquid paraffin or similar [52]; this is grade C and the practice should be verified in the field.

5.2 Geographical Indication

"Kannauj Perfume" is registered in the GI Registry as application 157 (Class 3), filed 9 February 2009 by the Export Commissioner, Uttar Pradesh Government Export Promotion Bureau, with certificate number 203 dated 31 March 2014 and registration valid to 8 February 2029 [10]. A companion application (158) was merged into 157 [10]. The GI protects origin and traditional method; it does not by itself set chemical specifications.

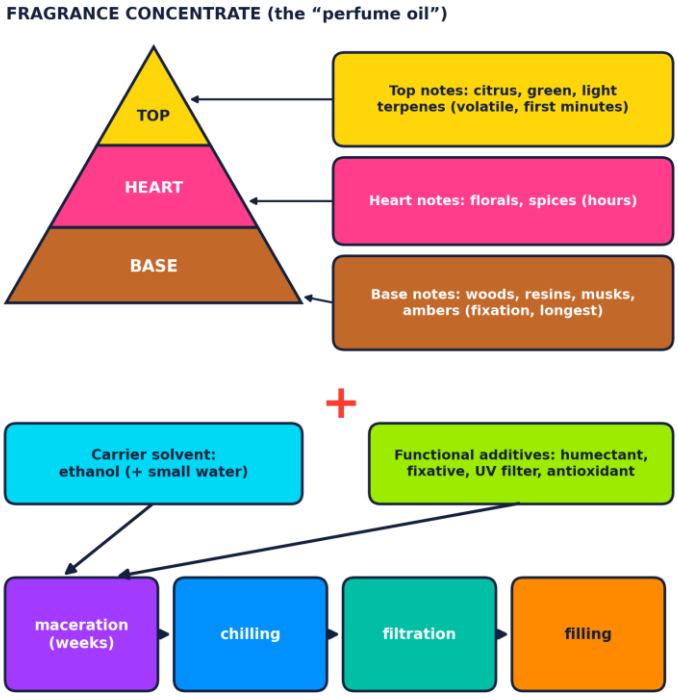
5.3 Traditional formulations (summary)

Product	Composition	Basis
Mitti attar	Clay discs distilled into sandalwood oil	traditional [50]
Kewda attar	About 3 to 5% kewda essence, remainder sandalwood oil	traditional, grade C [14]
Rooh kewda	Neat kewda distillate oil, priced far above attar	traditional, grade C [14]

Popular literature has not published standard recipes, and exact ratios vary by house and batch. Any manufacturing recipe should be set by GC-MS fingerprint and sensory panel against a reference sample, with FFDC testing as a neutral option [40].

6. Modern perfumery

6.1 Scheme 2: Structure of an alcohol-based fine fragrance



Scheme 2. *Structure of an alcohol-based fine fragrance: concentrate with top, heart and base notes, carrier solvent, additives and processing steps.*

6.2 Concentration classes

Class boundaries vary by source. A 2023 *BIOFARM* paper gives parfum 15 to 30% fragrance, eau de parfum 8 to 15%, eau de toilette 4 to 15% and eau de cologne 3 to 5% [26]. Other texts and vendors quote slightly different ranges, so always state the source of a class definition.

6.3 Formulation F1 (published): A natural-oil-based eau de parfum

Moraes Júnior and co-authors screened 21 combinations of aroma materials and selected a fragrance of *Pogostemon cablin* (patchouli), *Amyris balsamifera*, *Citrus limon* and *Baccharis dracunculifolia* essential oils with a synthetic passion-fruit essence [26]. The final product used **7% of that fragrance** in ethanol as vehicle, **propylene glycol** as humectant, **triclosan** as preservative and **galaxolide** as fixative; GC-MS identified valerianol (12.5%), limonene (6.7%) and β-caryophyllene (6.7%) as the main volatiles [26]. Two cautions: the work is Brazilian, and the preservative and fixative choices should be re-checked against India's current restricted-substance lists before any Indian use (Section 8).

6.4 Formulation F1b (published concept): Water-based nano-perfume

Miastkowska and co-authors prepared water-based nano-perfume nanoemulsions (transparent or semi-transparent, small droplets, low viscosity, high kinetic stability) as an alternative to ethanol vehicles, noting that nanoemulsions can address fragrance oxidation, and that pilot-scale practicality was the next research need [27]. They show the direction of travel for alcohol-free and sustainability-led products; Indian adoption is not documented in my sources.

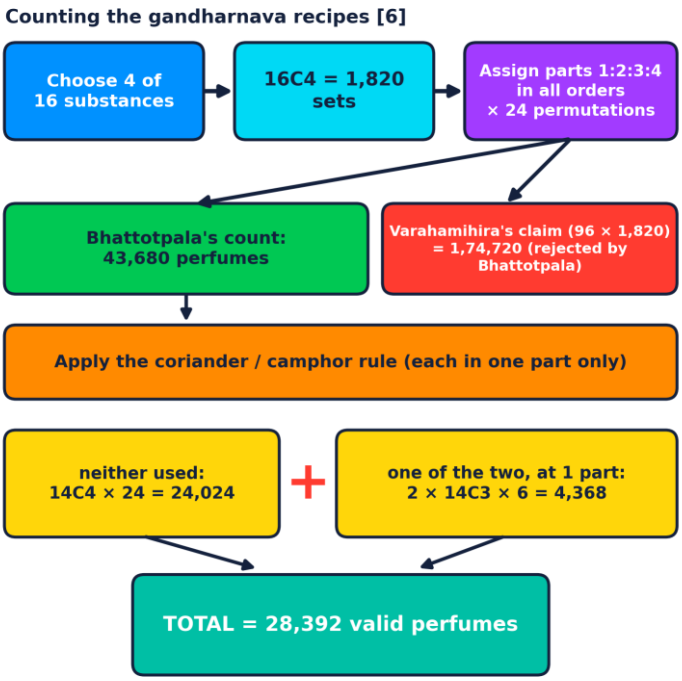
7. The Sanskrit formulation tradition: Gandhayukti

This is the best-documented historical formulation system and the one most useful to teaching, because it is written as an explicit recipe scheme. The source verses, their commentary and a modern combinatorial check are in Chauthaiwale, Deopujari and Chauthaiwale (2021) [6] (grade A; read in full).

7.1 Formulation T1 (traditional): Gandharnava, "The ocean of perfumes"

Varahamihira lists **sixteen substances**: *ghana, valaka, shaileyaka, karpura, ushira, nagapushpa, vyaghranakha, spruk, aguru, damanaka, nakha, tagara, dhanya, karchura, cola, malaya* [6]. The paper's retrieved text does not map each Sanskrit name to a botanical species, so I do not do so here; consult the cited commentaries before use.

The rule: Choose **any four** of the sixteen and use them in **parts 1, 2, 3** and **4**, permuting which substance takes which part [6]. One constraint applies: coriander (*dhanya*) and camphor (*karpura*) must be used in **one part only**, because their strong odours overpower the rest [6].



Scheme 3. *Counting the gandharnava recipes [6].*

The 28,392 figure agrees with the nineteenth-century translator Iyer, as cited by the authors [6]. I re-derived the arithmetic: 1,001 × 24 = 24,024 and 2 × 364 × 6 = 4,368, which sum to 28,392. The paper's own text says "13 other substances" beside the figure 14C3, but 364 equals 14C3, so I have written 14.

7.2 Formulation T2 (traditional): Kacchaputa, the magic-square blend

Sixteen substances sit in a 4 × 4 grid, each with a fixed proportion. Any four whose proportions sum to **18** (along a row, column, diagonal or other symmetric pattern) are "fit for perfumes" [6].

aguru 2	patra 3	turushka 5	shaileyaka 8
priyangu 5	musta 8	rasa 2	kesha 3
sprkka 4	tvak 1	tagara 7	mamsi 6
malaya 7	nakha 6	shrika 4	kunduruka 1

Example (top row): aguru 2; patra 3; turushka 5; shaileyaka 8 parts (sum 18). Bhattotpala listed 18 such quadruples; the modern authors' program finds **172** of the 1,820 possible quadruples that sum to 18 [6]. The grid is a pan-diagonal magic square and the authors place it in the Nagarjuna tradition of 4 × 4 squares [6]. Spellings follow the paper's transliteration with minor simplification.

7.3 Modern bench test

Deopujari and colleagues prepared 24 perfume samples from eight raw materials under the constraints and tested them on human skin and clothes; all had a satisfactory response with a six-month shelf life (as summarised by [6] from the original paper, Deopujari, Mandavgane and Holey, *Indian Journal of Traditional Knowledge* 2009, 8(2):275; the original was not opened) [7]. It is a small, non-blinded demonstration, but it is rare evidence that the classical scheme is physically workable.

8. Regulation and quality

8.1 Perfumes and cosmetics

Cosmetics, including fine fragrance, are regulated in India under the Drugs and Cosmetics Act, 1940, the Cosmetics Rules, 2020 and BIS standards, administered by CDSCO; imported cosmetics require an Import Registration Certificate, and a CDSCO circular of 22 July 2026 asked licensing authorities and port officers to step up vigilance on unregistered imports [36]. Composition rules (permitted, restricted and prohibited ingredients) lean mainly on IS 4707 Parts 1 and 2 [36]. One compliance database lists the current series as IS 4707 Part 1:2020, Part 2:2025, Part 3:2025 and Part 4:2022, notes that animal-tested cosmetics may not be imported or made in India, and records fragrance materials (for example *Saussurea lappa* costus) in the Part 2:2025 Annex A list of ingredients that must not be used [37] (grade C; confirm in the standard itself). Alignment with the International Fragrance Association (IFRA) standards was a stated theme of the FICCI fragrance business summits [45a], and FFDC reports presenting studies on IFRA standards and helping frame Indian incense-stick standards [60].

8.2 Flavours

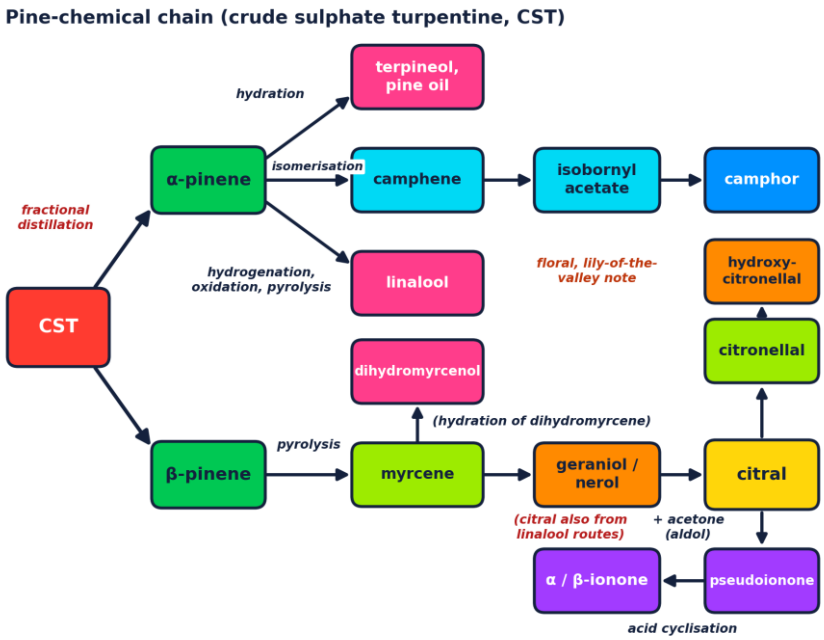
Flavours are food additives under the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011, issued by FSSAI [32]. The regulation recognises natural, nature-identical and artificial flavouring substances [33]. Labelling rules require a declaration such as "contains added flavour" with the flavour type specified, and where only natural or nature-identical flavours are used, the class name suffices [34]. The regulation holds a list of prohibited flavouring agents: a 2018 draft noted eleven already listed and proposed adding 4,5-epoxydec-2(trans)-enal [35] (a draft; confirm the final text). A 2026 law-firm note records that FSSAI is scrutinising "product identity": a product that meets additive and label rules can still be challenged if flavours are used to mimic the characteristic taste or aroma of a food it does not contain [45b].

8.3 Quality and authenticity

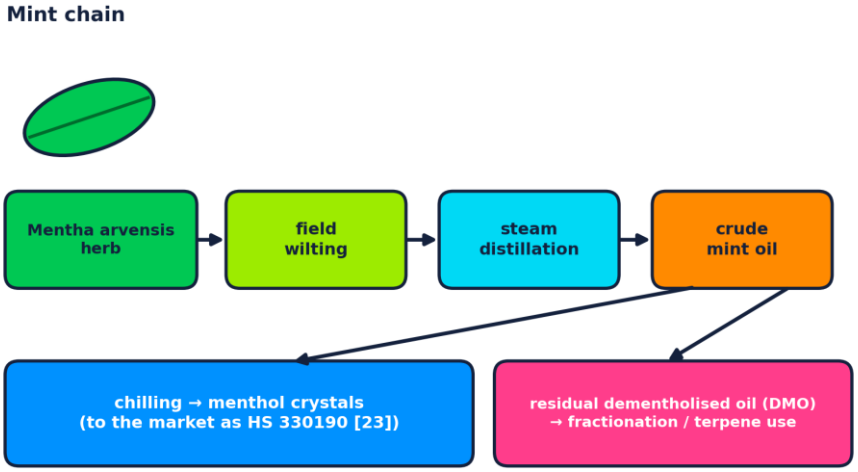
Issue	Instrument	Evidence
Sandalwood authenticity	ISO 3518 (α-/β-santalol limits), GC-MS	0 of 6 commercial oils compliant [15][16]
Origin and method	GI registration	Kannauj Perfume GI 157 [10]
Independent testing	FFDC lab, reported 3,500 samples a year	trade profile, grade C [40]
Safety lists	IS 4707; FSSAI prohibited list	[36][37][35]

9. Aroma-chemical schemes behind the industrial side

The reaction routes below are standard industrial chemistry summarised from general knowledge. The product lists are tied to Privi's published portfolio (dihydromyrcenol, citral, camphor, ionones, terpineol and pine oil, musks) [24]. For process detail and safety data use the reference text by Surburg and Panten [25] (grade A), which I did not re-open page by page in this session.



Scheme 4. *Pine-chemical chain from crude sulphate turpentine (CST).*



Scheme 5. *Mint chain from Mentha arvensis herb to menthol crystals and dementholised oil.*

The Privi call figures (pinene about 55% of revenue) show why the CST-to-pinene chain is the backbone of India's aroma-chemical exports [57]. For mint, India's competitive edge is agronomic: varieties and distillation know-how from CIMAP, not synthetic chemistry [49].

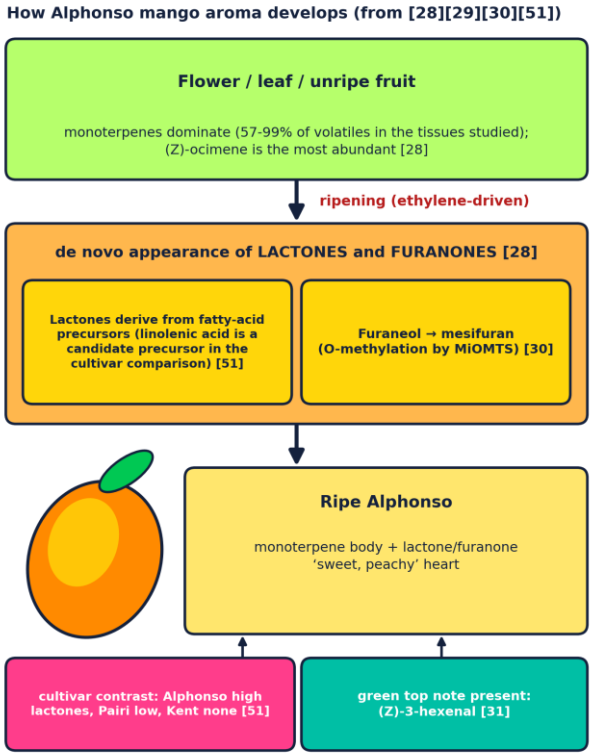
10. Flavours

10.1 Raw-material logic

Indian flavour houses draw on three streams: spice and herb extracts (oleoresins and spice oils, Section 3.3), natural isolates such as menthol, and nature-identical or artificial aroma chemicals from the fragrance-chemical industry (Section 9). Under FSSAI rules the label class depends on the stream (Section 8.2) [33][34]. IMARC estimates that natural products hold about 45% and liquid forms about 60% of the Indian flavour-and-fragrance market in 2025 [1] (vendor estimate, grade C).

10.2 A worked case: Alphonso mango aroma

Alphonso is India's best-studied flavour fruit, and its volatile chemistry gives a concrete flavour-design target.



Scheme 6. *How Alphonso mango aroma develops (from [28][29][30][51]).*

Pandit and colleagues identified 55 volatiles in Alphonso (aldehydes, alcohols, mono- and sesquiterpene hydrocarbons, lactones, furanones) across developmental and ripening stages [28]. A transcriptome study of seven stages found transcripts for the synthesis of monoterpenes, sesquiterpenes, diterpenes, lactones and furanones [29]. These support a flavour architecture built from a terpene body plus lactone and furanone character.

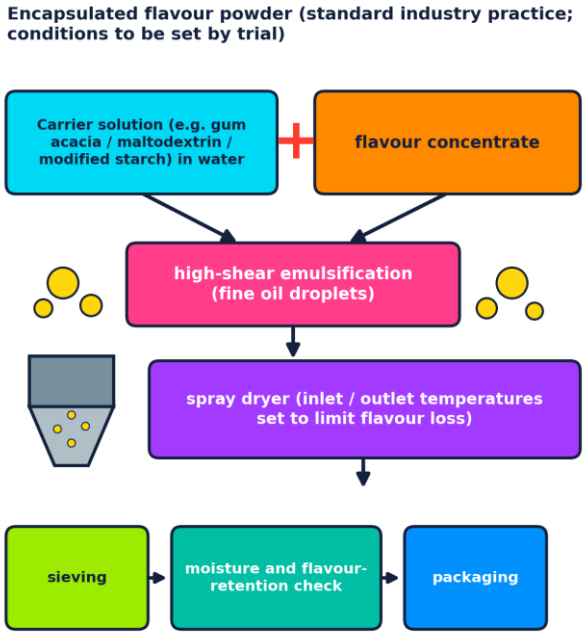
10.3 Formulation F3 (template, not from a source): Alphonso-type mango flavour

This is my design template, built from the compound classes reported above. It gives rank order and function only. I have deliberately not invented percentages, because dosages depend on supplier grade, solvent and the target product. Every component must be checked against the FSSAI list of permitted flavouring substances and the labelling class chosen.

Layer	Function	Candidate materials (from the cited studies)	Relative level
Green top	Freshness, cut-fruit lift	(Z)-3-hexenal [31]	Trace (very powerful)
Terpene body	Fresh, resinous mango character	(Z)-ocimene and other monoterpenes [28]	Dominant
Furanone heart	Caramel-sweet fruit	furaneol, mesifuran [30]	Low
Lactone heart	Creamy peach-like ripeness	mango lactones [28][51]	Low to moderate
Carrier	Solubility, dosing	propylene glycol, triacetin or ethanol (common practice, not from a cited source)	Balance

Validation plan: (1). GC-MS and GC-olfactometry against a ripe-fruit headspace reference; (2). triangle test and descriptive panel against a commercial benchmark; (3). stability trial in the target matrix; (4). regulatory screen. Terpenes and green aldehydes oxidise readily, so antioxidant and storage conditions need testing.

10.4 Process scheme F4 (template): spray-dried powder flavour



Scheme 7. *Encapsulated flavour powder (standard industry practice; conditions to be set by trial).*

The general approach is established in the flavour-technology literature, but I did not retrieve a specific paper for it in this session, so no loading or temperature numbers are given.

11. Government schemes, institutions and support

The table lists only items I could tie to a source. Eligibility, budgets and current operating status were not verified unless stated.

Scheme or institution	Agency	What it does	Source
CSIR Aroma Mission (Phase I 2016-19, Phase II 2020-23)	CSIR (CIMAP nodal; IHBT, IIIM, NBRI, NEIST)	Aromatic-crop cultivation, distillation units, value addition, marketing	[19][20]
FFDC Kannauj (est. 1991)	Ministry of MSME, UNDP/UNIDO origin	Testing, training, fragrance creation lab, standards work	[5][40][60]
FFDC extension centres	MSME	Kanpur centre (est. 1998), Godda (foundation stone 2017), Imphal centre announced 2022	[55][54][5]
ICAR-DFR / FFDC MoU (15 Oct 2024)	ICAR, MSME	Training and fragrance development from flower crops	[41]
ICFRE-FRI / FFDC training (June 2022)	MoEFCC, MSME	Workshop on essential oil, perfumery and aromatherapy	[42]
One District One Product (ODOP), Uttar Pradesh	State Government	Attar, later incense, under ODOP; portal lists common facility centre, market development, finance and skill/toolkit schemes	[38][60]
Perfume park, Kannauj	Uttar Pradesh	57-acre park with common facilities, reported 2022	[39]
GI registration	GI Registry	Kannauj Perfume (No. 157), valid to Feb 2029	[10]
Spices Board value-addition support	Ministry of Commerce	Technology upgrade and market promotion for oils and oleoresins	[56]
FICCI Fragrance Business Summit	Industry body	Policy dialogue, IFRA harmonisation roadmap	[45a]
CHEMEXCIL, MoDoNER and FFDC agarwood summit	Export council, ministry	Agarwood oil export prospects (year not stated in retrieved text)	[43]

The ODOP portal also lists general artisan schemes for Kannauj (for example handicraft-ministry assistance and MUDRA margin money) [38]; whether attar distillers actually qualify is not verified. A reported national "Sugandh Mission" with an outlay of INR 1 lakh crore appears in a single institute newsletter [40] and I could not corroborate it; treat it as unverified.

12. Challenges and outlook

1. **Measurement.** Market estimates differ several-fold (Section 3.1), distillery counts differ by a factor of five (Section 3.2), and trade statistics are mixed with cosmetics. A single audited census and a clean HS-code definition of the sector would improve policy.
2. **Raw-material security.** Water stress is shrinking mint areas in parts of Uttar Pradesh [17]; sandalwood is scarce and widely adulterated [15]; Aroma Mission diversifies crops but its figures are self-reported [19].
3. **Authenticity and trust.** The Kannauj GI protects method and origin [10] but no public chemical reference library of authentic attars exists in my sources. A GC-MS fingerprint library, built with FFDC and CSIR laboratories, would let buyers verify product.
4. **Carrier change.** If sandalwood is no longer the carrier [52], the "attar" category blurs into oil-based perfumery, and GI language and labelling need to say what the base is.
5. **Regulatory alignment.** Cosmetics rules are tightening on imports [36]; harmonising fragrance safety with IFRA is an industry priority [45a]; flavour makers face product-identity scrutiny [45b].
6. **Innovation openings.** Water-based nano-perfumes [27], biotechnology-informed flavour work on Alphonso [29][30], and the Sanskrit combinatorial formulation scheme [6] (as a heritage-branded range) are three concrete directions.

13. Limitations and items I could not verify

- Market-research figures (Section 3.1) are vendor estimates and are not reconciled with one another.
- Trade figures from aggregators [22][23] should be rechecked against DGCI&S before citation.
- **Multi-source numbers:** references 40, 45 and 46 each hold two separate sources, marked a and b, and the text points to the one used; the article in reference 44 has no year in the record I retrieved, only the journal's 1832 to 1936 series.
- **Not opened in full text:** Mohapatra and Sahoo 2007 [11], Sahu and Misra 2007 [12], Deopujari et al. 2009 [7], the *Discover Sustainability* kewda review [13], ISO 3518 [16], IS 4707 [37], the final FSSAI text of the prohibited-flavour list [35], and the individual chapters of Surburg and Panten [25]. For [15] the volume and article number (Molecules 26(8), 2249) are inferred from the citation markers in the retrieved text and should be confirmed.
- Authors were not captured for [30] and [31]; both are cited by DOI or URL.
- Formulations F1 and T1 to T2 are published or traditional as labelled; F3 and F4 are my templates. The Brazilian F1 uses triclosan; check current Indian restricted lists before use.
- A claim, found only on a hobbyist forum, that sandalwood-oil exports have been restricted since 2017 was not verified and is not used.
- The reference numbering is not contiguous (53, 58 and 59 are not used); every number cited in the text appears below.

Declarations

1. Use of AI-Assisted Tools

AI-assisted tools were used for language refinement, organisation of the manuscript, development of the review structure, and improvement of the presentation of scientific and technical information. The authors critically reviewed, verified, and edited the AI-assisted content and take full responsibility for the accuracy, originality, scientific integrity, and final content of the manuscript.

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3. Conflict of Interest

The authors declare that they have no known financial, commercial, personal or professional conflicts of interest that could have influenced the preparation or presentation of this manuscript.

4. Ethical Approval

Ethical approval was not required for this narrative review, as it is based exclusively on previously published literature and publicly available information and does not involve human participants, animals, or experimental investigations.

5. Informed Consent

Not applicable. This manuscript does not involve human participants or the collection of personal or identifiable information.

6. Data Availability Statement

No new experimental datasets were generated or analysed during this review. The information discussed is derived from previously published scientific literature, reports and other publicly available sources, which are cited in the manuscript.

7. Author Contributions

The author contributed to the conceptualisation, visualization, literature review, collection and interpretation of relevant information, manuscript preparation, critical revision and approval of the final version of the manuscript.

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References

Grades: **A** = peer-reviewed, official, regulator, standards body or standard reference; **B** = institutional or government page; **C** = vendor, trade, popular or aggregator.

[1] IMARC Group. India Flavors and Fragrances Market, 2026-2034. https://www.imarcgroup.com/india-flavors-fragrances-market (C)

[2] Ken Research. India Flavors and Fragrances Market, 2025-2032. https://www.kenresearch.com/industry-reports/india-flavors-and-fragrances-market (C)

[3] Ken Research. India Fragrance and Flavor Compounds Market, 2025-2032. https://www.kenresearch.com/industry-reports/india-fragrance-and-flavor-compounds-market (C)

[4] IMARC Group. India Flavors Market, 2025-2033. https://www.imarcgroup.com/india-flavors-market (C)

[5] FICCI press release, 21 Sep 2022: second technology centre for fragrance in Imphal; 26,000 MSME units. https://ficcitest2.ficci.in/press_release_details/4537 (B)

[6] Chauthaiwale S, Deopujari J, Chauthaiwale A. Computing the number of perfumes that constitute the gandharnava and kacchaputa of Varahamihira. Indian Journal of History of Science 2021;56:85-92. https://doi.org/10.1007/s43539-021-00012-2 (A; read in full; PDF at https://cahc.jainuniversity.ac.in/assets/ijhs/2__Chauthaiwale.pdf)

[7] Deopujari JY, Mandavgane SA, Holey PP. Preparation and testing of perfumes as described in Brhatsamhita. Indian Journal of Traditional Knowledge 2009;8(2):275-277. (A; cited *via* reference 6; not opened)

[8] Sahapedia. Technologies of Perfumery in India: Overview and the Case of Kannauj. https://www.sahapedia.org/technologies-of-perfumery-india-overview-and-the-case-of-kannauj (B)

[9] National Council of Science Museums. Ittar (perfume) story, Google Arts & Culture. https://artsandculture.google.com/story/pgVxuEAUIIOfJw (B)

[10] Geographical Indications Registry. Kannauj Perfume, application 157, certificate 203. https://search.ipindia.gov.in/GIRPublicSearch/Application/Details/157 (A)

[11] Mohapatra DK, Sahoo S. Traditional system for the production of kewda essential oil and attar. Indian Journal of Traditional Knowledge 2007;6(3):399-402. Record: https://indianmedicine.eldoc.ub.rug.nl/49526/ (A; record verified)

[12] Sahu D, Misra MK. Ecology and traditional technology of screw pine perfume industry in coastal Orissa. Indian Journal of Traditional Knowledge 2007;6(2):253-261. Record: https://indianmedicine.eldoc.ub.rug.nl/57624/ (A; record verified)

[13] Springer Nature Communities. The Untold Story of Kewda (authors' note on a bibliometric review in Discover Sustainability). https://communities.springernature.com/posts/the-untold-story-of-kewda-what-the-literature-reveals-and-what-it-ignores (B)

[14] Wikipedia. Ganjam Kewda Rooh. https://en.wikipedia.org/wiki/Ganjam_Kewda_Rooh (C)
[15] Kucharska M, Frydrych B, Wesolowski W, Szymanska JA, Kilanowicz A. A comparison of the composition of selected commercial sandalwood oils with the international standard. Molecules 2021 (published 13 Apr 2021). https://pmc.ncbi.nlm.nih.gov/articles/PMC8070282 (A)
[16] ISO 3518:2022 (shown as withdrawn; ISO 3518:2025 listed). https://store.sfs.fi/en/iso-3518-2022-3 (A)
[17] World Resources Institute. India mint supply chain climate resilience. https://www.wri.org/insights/india-mint-supply-chain-climate-resilience (B)
[18] NIFTEM. Mint processing (PMFME material). https://niftem.ac.in/newsite/pmfme/wp-content/uploads/2022/08/mintprocessing.pdf (B)
[19] CSIR-IIIM. Aroma Mission Phase I and II success stories. https://aroma.iiim.res.in/aroma-phase-i-success-story/ (B)
[20] CSIR-IIIM. Catalyzing rural empowerment through cultivation, value addition and marketing of aromatic plants. https://iiim.res.in/?p=3223 (B)
[21] Spices Board of India. Estimated export of spices for March 2026 (Apr-Mar 2025-26 vs 2024-25). https://indianspices.com/sites/default/files/estimated%20export%20of%20spices%20for%20march%202026.pdf (A)
[22] Busy.in. HSN Chapter 33 trade statistics, FY 2024-25. https://busy.in/hsn/chapter-33/ (C)
[23] Ximpex. How to export essential oils from India. https://ximpex.in/guides/how-to-export-essential-oils-from-india (C)
[24] Privi Speciality Chemicals profiles: https://www.screener.in/company/PRIVISCL and https://www.roic.ai/quote/PRIVISCL.BO (C)
[25] Surburg H, Panten J. Common Fragrance and Flavor Materials: Preparation, Properties and Uses, 6th ed. Wiley-VCH, 2016. ISBN 978-3-527-33160-4. (A; bibliographic record verified)
[26] Moraes Junior RC, Ruela ALM, Gomes AF, Amaral JG, Leite MF. Desenvolvimento e caracterizacao quimica de fragrancias a partir de oleos essenciais e flavorizante sintetico. BIOFARM 2023;17(1):206-222. https://doi.org/10.18391/biofarm.v17i1.2230 (A)
[27] Miastkowska M, Lason E, Sikora E, Wolinska-Kennard K. Preparation and characterization of water-based nano-perfumes. Nanomaterials 2018;8(12):981. https://doi.org/10.3390/nano8120981 (A)
[28] Pandit SS, Kulkarni RS, Chidley HG, Giri AP, Pujari KH, Koellner TG, Degenhardt J, Gershenzon J, Gupta VS. Changes in volatile composition during fruit development and ripening of 'Alphonso' mango. Journal of the Science of Food and Agriculture 2009;89(12):2071-2081. Record: https://library.ncl.res.in/node/39537 (A)
[29] Deshpande AB et al. Transcriptional transitions in Alphonso mango during fruit development and ripening explain its distinct aroma and shelf life characteristics. Scientific Reports 2017;7. https://doi.org/10.1038/s41598-017-08499-5 (A)
[30] Study on MiOMTS (furaneol to mesifuran) in Alphonso mango. Molecular Biotechnology 2016. https://doi.org/10.1007/s12033-016-9933-2 (A; authors not captured)
[31] Potent volatiles of three mango cultivars by AEDA and AROMATCH. Food Science and Technology Research 2021;27(1):103-109. https://www.jstage.jst.go.jp/article/fstr/27/1/27_103/_html/-char/en (A; authors not captured)
[32] FSSAI. Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011 (record copy). https://indiaenvironmentportal.org.in/reports-and-documents/food-safety-and-standards-food-product-standards-and-food-additives-regulation-2011 (B)
[33] Food Safety Helpline. What are flavouring agents; what do FSSAI regulations say. https://foodsafetyhelpline.com/what-are-flavouring-agents-what-do-fssai-regulations-say/ (C)
[34] Food Safety Helpline. Food labelling requirements for declaring food additives, module 6. https://foodsafetyhelpline.com/food-labelling-requirements-for-declaring-food-additives-module-6/ (C)
[35] Food Safety Helpline. FSSAI proposes amendments to other substances used in food products (2018 draft). https://foodsafetyhelpline.com/fssai-proposes-amendments-to-other-substances-used-in-food-products/ (C)
[36] Freyr Solutions. Cosmetic product registration in India: a step-by-step CDSCO guide. https://www.freyrsolutions.com/blog/cosmetic-product-registration-in-india-a-step-by-step-cdsco-guide (C)
[37] CosIng Checker. India cosmetic ingredient regulations. https://cosingchecker.com/regulations/in/ (C)
[38] One District One Product Uttar Pradesh. Kannauj. https://odopup.in/districts/kannauj (B)
[39] Drishti IAS. Kannauj's perfume (7 Sep 2022). https://www.drishtiias.com/statepcs/07-09-2022 (C)
[40] (a). Dadoo JK. Perfume Capital of India. IIM Ahmedabad alumni magazine. https://wimwian.iima.ac.in/perfume-capital-of-india/ (C); (b) Goyal A. Fragrant opportunities in the air for Indian MSMEs. https://anuradhagoyal.com/?p=1489 (C)
[41] Cosmetech. ICAR and FFDC sign MoU to facilitate training. https://cosmetech.co.in/icar-ffdc-sign-mou-to-facilitate-training (C)
[42] ICFRE. Training cum workshop on essential oil, perfumery and aromatherapy, 7-11 June 2022. https://www.icfre.org/forthcomming_event/forthcommevent70.pdf (B)
[43] Tribune India. CHEMEXCIL, MoDoNER and FFDC unite to drive the future of India's agarwood industry. https://www.tribuneindia.com/news/business/chemexcil-modoner-ffdc-unite-to-drive-the-future-of-indias-agarwood-industry/ (C)
[44] Jackson (Ghazeepore). Note on the native mode of preparing the perfumed oils of jasmine and bela. Journal of the Asiatic Society of Bengal (series 1832-1936). https://www.biodiversitylibrary.org/part/367078 (A; record verified)
[45] (a) FICCI's 4th Fragrance Business Summit report. https://cosmetech.co.in/?p=234912 (C). (b) ELP. Product identity and organoleptic characteristics: understanding FSSAI's recent regulatory focus (2026). https://elplaw.in/wp-content/uploads/2026/07/Product-Identity-and-Organoleptic-Characteristics-Understanding-FSSAIs-recent-regulatory-focus.pdf (C)
[46] (a.) Live History India. Kannauj: Perfume Capital of India. https://livehistoryindia.com/story/living-culture/kannauj-attar (C). (b). Homegrown. The Indian city that makes perfume from the smell of rain. https://homegrown.co.in/article/55364/the-indian-city-that-makes-perfume-from-the-smell-of-rain-this-is-the-story-of-mitti-attar (C)
[47] UNIDO. Kannauj district essential-oil industry report prepared for the Government of India. https://downloads.unido.org/ot/48/13/4813119/15001-20000_16030.pdf (B)

[48] Scento. Guide to Indian attars: history and modern use. https://www.scento.com/pl/blog/guide-indian-attars-history-modern-use (C)
[49] Business Today. UP farmers mint it big (9 Jun 2008). https://www.businesstoday.in/magazine/reporters-diary/story/up-farmers-mint-it-big-128980-2008-06-09 (C)
[50] The Better India. Mitti attar of Kannauj. https://www.thebetterindia.com/59606/scent-rain-mitti-attar-kannauj (C)
[51] Fatty acid and lactone data for Alphonso, Pairi and Kent mango (Data in Brief). https://pmc.ncbi.nlm.nih.gov/articles/PMC5050263 (A; authors not captured)
[52] Wikipedia. Attar. https://en.wikipedia.org/wiki/Attar (C)
[54] KNN India. MSME Minister lays foundation stone for FFDC extension in Godda (7 Nov 2017). https://knnindia.co.in/news/newsdetails/state/msme-minister-giriraj-singh-lays-foundation-stone-for-extension-project-in-godda (C)
[55] India Retailing. FFDC Kanpur extension unit (from Times of India). https://www.indiaretailing.com/?p=37124 (C)
[56] Lok Sabha reply on export of spices (Spices Board measures). https://eparlib.sansad.in/bitstream/123456789/450207/1/63227.pdf (B)
[57] AlphaStreet. Privi Speciality Chemicals Q2 FY25 earnings call transcript. https://alphastreet.com/india/?p=176264 (C)
[60] Sugandh India. FFDC: shaping the future of the fragrance industry (interview with FFDC Principal Director). https://sugandhindia.in/ffdc-shaping-the-future-of-the-fragrance-industry/ (C)