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Abstract

Intangible Cultural Heritage (ICH) is intrinsically tied to human sensory perception. Yet, open-air smellscapes remain undocumented and vulnerable to climate change and urban gentrification. This study captures the atmospheric evolution of the *Lavagem do Bonfim* in Salvador, Brazil, where Roman Catholic devotion and Afro-Brazilian Candomblé cosmology converge. Using active Tenax® TA sorbent sampling, thermal desorption gas chromatography–mass spectrometry–olfactometry (GC–MS/O), and Principal Odor Map (POM) neural predictions, volatile organic compounds were characterized alongside qualitative sensory ethnography (n = 52). Reconstructing 48-hour storylines across three archetypes (Baiana, Priest, Reveller) shows how micro-level sensory acts scale into a collective atmosphere. Intersection analyses isolate a universal 23-compound chemical core (α-pinene, β-pinene, linalool, eucalyptol, eugenol, camphor, benzyl acetate, phenylethyl alcohol, acetic acid, and key terpenic/ester species) defining the festival's multisensory fingerprint. This framework shows that volatile heritage is preserved as a living, community-validated archive, offering a transferable blueprint for safeguarding endangered sensory heritage worldwide.

1. Introduction

Human sensory perception serves as the primary vehicle for transmitting community identity, historical memory, and living traditions across generations [1, 2]. In recent years, the emerging paradigm of sensory urbanism has increasingly challenged ocularcentric frameworks in spatial design, emphasizing that built environments are experienced through complex, multidimensional sensory registers rather than visual elements alone [3, 4, 5, 6, 7, 8]. While visual artifacts and auditory expressions are regularly archived in heritage studies, olfactory and gustatory dimensions remain under-documented and highly vulnerable to rapid erosion driven by industrialization, social shifts, and climate change [1, 2, 9]. Scents and flavors possess a distinct neurological intimacy, engaging the human limbic system directly and bypassing the thalamus to evoke vivid, affectively charged autobiographical recollections, a phenomenon widely recognized as the Proustian effect [1, 2]. When a traditional aroma or flavor profile disappears, the loss extends beyond aesthetic enjoyment to compromise the cognitive and emotional registers that sustain collective identity and community well-being [2, 4].

This systemic degradation of sensory heritage presents a profound challenge in living heritage contexts, particularly within Afro-diasporic expressions, where scents function as active vectors of spiritual and historical continuity [1]. Safeguarding these ephemeral landscapes is complicated by existing preservation paradigms, which frequently suffer from methodological invisibility [1, 5]. Conventional conservation remains heavily focused on static physical objects inside controlled museum environments, failing to safeguard dynamic, open-air sensory landscapes constructed in unbounded public spaces [1, 2, 5]. Notable pioneering exceptions demonstrate the value of formal recognition, such as the inclusion of the perfumery savoir-faire of Grasse, France, on the UNESCO Representative List of Intangible Cultural Heritage of Humanity [10], or Japan's national "100 Fragrant Landscapes" initiative [11, 12]. However, systematic frameworks for open-air living smellscapes remain rare. Compounding this issue, urban environmental regulations historically approach olfactory management through a negative, industrial abatement lens centered on nuisance control, neglecting the positive cultural and restorative value of heritage smellscapes [4, 5, 9].

Beyond the limitations of physical preservation and environmental regulation, classical documentation models also fail because they treat heritage at a broad, static institutional scale, ignoring the reciprocal feedback loop between the individual and society [2, 3, 13]. Culture is not a bounded or passive artifact, but a dynamic, porous, and ongoing process of self-constitution continuously learned, transmitted, and re-interpreted through lifelong socialization [14, 15]. While individuals are continually shaped by their cultural surroundings and socialized through routine daily habits, local norms, and institutional structures, they also possess practice-based agency [15, 16, 17]. Rather than being passive recipients of tradition, individuals within communities of practice act as social agents who actively

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deploy, negotiate, and reshape cultural symbols to establish belonging, construct identity boundaries, and navigate power relations [2, 17, 18]. Through a multilevel lens of micro-macro interactions, localized collective activities, such as communal preparation, shared rituals, or traditional culinary practices, foster shared macro-level cultural norms that permeate the entire social fabric [13].

Understood through this historical-processual lens, individual sensory memories and practices function as micro-level actuators within a complex cultural ecosystem [17]. Small-scale individual actions, such as a Baiana selecting specific botanicals at a local market or a Catholic priest preparing a ceremonial incense blend, act as micro-level inputs that scale upward to dictate macro-level cultural continuity, social cohesion, and community resilience [13, 17]. In multicultural and post-colonial settings, these micro-level practices operate as dynamic regulators of interpersonal relations, helping communities continuously reconstitute themselves in response to institutional pressures and historical contingencies [14, 19]. Consequently, historical processes of religious and cultural syncretism should not be viewed as passive assimilation or the loss of an idealized cultural "purity", but as an active, politically charged, and creative condition of cultural survival, adaptation, and resistance [1, 14, 17].

This historical dynamic of sensory resistance is acutely exemplified in Salvador, Bahia, where the roots of regional cultural identity are deeply intertwined with the transatlantic slave trade and the disembarkation of an estimated 1.6 million enslaved Africans [1, 20]. Between 1750 and 1850, a heavy demographic concentration of Yoruba (Nagô) peoples arrived in the region due to political upheavals in the Oyo Empire, accounting for nearly 40% of all enslaved Africans arriving in Bahia during that era [1, 20]. Facing forced conversion and violent structural oppression, these communities developed strategic mechanisms of cultural preservation [1, 14, 17, 20]. Rather than representing a passive surrender, religious syncretism operated as a creative process of cultural self-constitution, enabling practitioners to negotiate power relations, maintain social cohesion, and safeguard sacred cosmologies under coercive conditions [14, 17, 20]. Within this syncretic matrix, *Nosso Senhor do Bonfim* was associated with *Oxalá*, the supreme Yoruba *orixá* of creation, peace, and spiritual purity, whose sacred color is white [1, 20].

Parallel to Afro-Brazilian devotional survival, the institutional origin of Catholic devotion to *Nosso Senhor do Bonfim* in Salvador dates to 1745, when Captain Theodózio Rodrigues de Faria brought a wooden replica of the crucified Christ from Setúbal, Portugal [21, 22, 23, 24]. Construction on the Church of *Nosso Senhor do Bonfim* began in 1745 on the *Colina Sagrada* in the Itapagipe Peninsula, with the sanctuary officially inaugurated in 1754 [21, 22, 23]. The *Devoção do Senhor Bom Jesus do Bonfim*, a brotherhood founded by Faria, managed the site and organized the annual feast [23, 24]. Over time, Catholic devotional customs such as *fitinhas do Bonfim* (colorful wish ribbons tied around wrists or church gates) and the *Sala dos Milagres* (Room of Miracles, filled with ex-votos) became central fixtures of the shrine's pilgrimage culture [21, 22].

The *Lavagem do Bonfim* itself originated as an institutionalized labor requirement wherein enslaved devotees were tasked with washing the interior of the church sanctuary in preparation for the Catholic feast day on the second Sunday after Epiphany [1, 20, 23, 24, 25]. Through practice-based agency, marginalized practitioners transformed this routine chore into a self-defining public ritual, infusing the space with Candomblé aesthetics, percussive rhythms, and the symbolic application of *água de cheiro* (perfumed herbal water) [1, 17, 18, 20, 26]. Active participation in these shared rites provided practitioners with moments of social recognition and collective legitimacy, establishing an enduring *habitus* centered on spiritual purification and communal identity [17, 18, 20, 26].

In 1889, Catholic authorities officially prohibited the interior washing of the sanctuary, a ban reinforced by pastoral decrees between 1890 and 1894 to enforce institutional orthodoxy and distance the church from Afro-Brazilian expressions [1, 20, 24, 26, 27]. However, this institutional exclusion failed to suppress the ritual; instead, it relegated the cleansing practices to the exterior forecourt and public steps [1, 20, 24, 26]. Paradoxically, this spatial exile birthed an unwritten social code regulating shared public space, giving rise to a unique syncretic threshold [1, 19, 20, 24]. The resulting public staircase became the physical location for an iconic smellscape, where resinous Catholic incense drifting from the altar meets the volatile herbal and floral vapors of Afro-Brazilian purification water, demonstrating how micro-level ritual acts scale into a macro-level expression of cultural resilience [1, 13, 20, 28].

To address these safeguarding gaps, overcome the documented bibliometric neglect surrounding Afro-diasporic olfactory heritage, and establish a framework for multidimensional landscape equity, this study develops a multisensory documentation methodology applied to the *Lavagem do Bonfim* in Salvador, Bahia [1, 4]. The goal of this article is to construct a comprehensive smellscape map of the festivities by examining the sensory experiences of three distinct participants: a Baiana do acarajé, a Catholic Father, and an event participant (Reveller). By integrating chemical analyses of volatile organic compounds, including gas chromatography–mass spectrometry coupled with olfactory detection (GC–MS/O) and dynamic headspace active sampling on Tenax® TA sorbent tubes, with qualitative sensory ethnography, narrative elicitation, and photographic archiving, the sensory environment across a 48-hour timeline is documented [1, 2]. The primary innovation lies in positioning multisensory storytelling as the main analytical result, demonstrating how individual sensory practices synthesize at the steps of the Bonfim Church to form a unified, syncretic cultural manifestation.

2. Methods

2.1. Methodological Workflow and Operational Architecture

The multisensory documentation pipeline follows a sequential, six-stage operational workflow structured to bridge qualitative ethnographic inquiry with quantitative analytical chemistry,

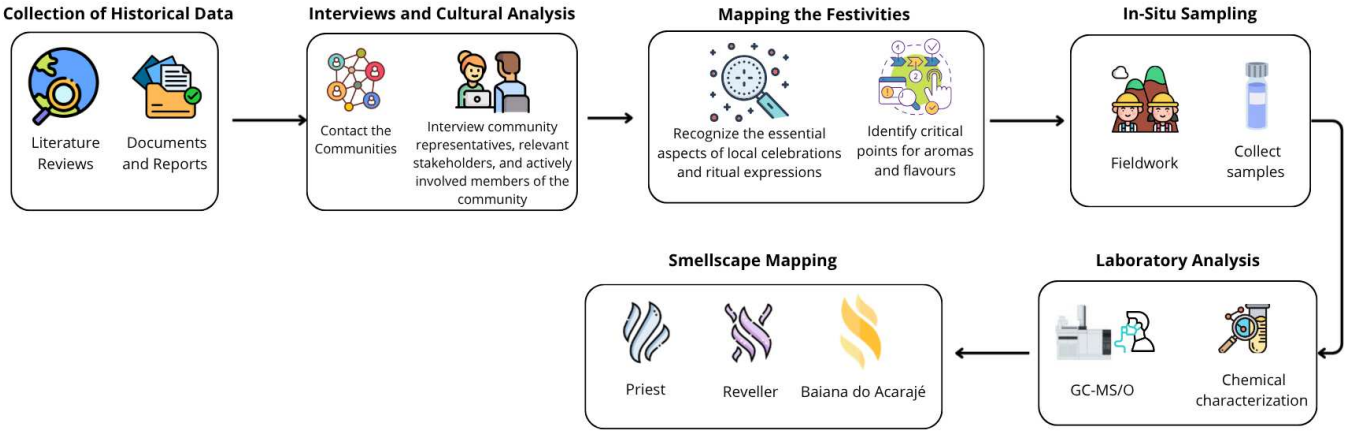


Fig. 1. **Operational architecture of the multisensory documentation pipeline.** The six-stage workflow integrates historical data, participatory community interviews, process mapping, in-situ active headspace sampling, GC–MS/O laboratory characterization, and smellscape mapping.

as visually summarized in Fig. 1. The pipeline advances from: (i) collection of historical data and contextual literature audits; (ii) participatory community interviews and cultural analysis; (iii) mapping production processes and critical aroma/flavor touchpoints; (iv) in-situ active headspace sampling; (v) laboratory characterization via GC–MS/O, NIST library matching, and Principal Odor Map (POM) predictive neural modeling; to (vi) smellscape mapping and storyline reconstruction across character archetypes.

2.2. *Chemical Analysis and In-Situ Sampling*

In-situ volatile organic compound (VOC) sampling was conducted across key spatio-temporal nodes along the 48-hour timeline during the active festival in January 2025. Sampling was executed using pre-conditioned stainless steel sorbent tubes packed with 200 mg Tenax® TA (35/60 mesh, Markes International Ltd., Llantrisant, UK), connected via PTFE tubing to calibrated active-sampling pumps (GilAir 5, Sensidyne®, St. Petersburg, FL, USA; and Pocket Pump TOUCH, SKC Ltd., Dorset, UK). Tenax® TA (2,6-diphenyl-p-phenylene oxide) was selected as the primary sorbent due to its high hydrophobic character and thermal stability, making it the ideal medium for capturing C6–C30 volatile organic compounds (including monoterpenes, sesquiterpenes, aromatic esters, and fatty aldehydes) in high-humidity tropical coastal environments (63%–69% RH) without water co-adsorption. Because single-bed Tenax® TA has minimal retention capacity (breakthrough volumes < 100 mL) for highly volatile, low-boiling C2–C5 gases (e.g., formaldehyde, acetaldehyde, ethanol, and ambient CO2), permanent atmospheric gases pass through the bed un-retained. While multi-bed sorbent tubes containing carbon molecular sieves (e.g., Carboxen 1003) could capture lighter C2–C5 species, their strong hydrophilic nature risks severe water clogging under tropical field conditions. Sampling was performed at constant flow rates ranging from 250 mL/min for mobile processional runs to 1.0 L/min for stationary micro-environments. Total sampled air volumes ranged from 2.5 L to 20.0 L per tube depending on spatial scale and air movement. Duplicate active sampling tubes were deployed simultaneously at the central church stairs (*Colina Sagrada*), while single active samples were collected at all other spatio-temporal stations.

To mitigate high relative humidity (63%–69% RH) in tropical coastal air during active sampling, sorbent tubes were positioned at a greater distance from the sample matrix to prevent condensation on the Tenax® TA bed. While increasing sampling distance presents a minor risk of analyte dilution, it was the necessary operational precaution to prevent bed saturation and sample degradation. Environmental parameters, ambient temperature (°C), relative humidity (%), wind speed (m/s), and precise GPS coordinates were recorded at each station using a handheld Kestrel 5500 Weather Meter. Following field collection, sorbent tubes were immediately sealed with brass long-term storage caps equipped with PTFE ferrules and placed inside air-tight, heavy-duty metal transport boxes closed with screw clamps for international transport. To cushion the tubes during air transit, sorbent tubes were supported inside factory cardboard fitting inserts. Subsequent laboratory analysis revealed that extended contact with this cardboard packaging introduced exogenous plasticizers and paper markers (including phthalates, diisopropylnaphthalene, and 2-ethyl-1-hexanol), which necessitated rigorous analytical background filtering prior to final dataset synthesis. The total storage duration between field sampling in Brazil and chemical desorption at the laboratory was 9 months, during which sealed tube containers were stored under refrigerated conditions (4 °C).

Sampling sites were strategically selected to represent the primary micro-environments defining the three participant trajectories: (i) preliminary culinary frying at street food stalls (*tabuleiros*), market sourcing at Feira de São Joaquim, leaf maceration, terracotta filtration, and ancestral dress laundering at the Memorial das Baianas; (ii) indoor Catholic liturgy, floral offerings, and sanctuary thurible incensation inside the Basilica of Bonfim; (iii) mobile processional emissions along the nautical bay route and 8-kilometer street march; and (iv) the public climax during crowd concentration and stair washing at the *Colina Sagrada*. A complete breakdown of operational parameters,

Table 1: Spatio-temporal, climatic, and operational parameters for in-situ active headspace sampling along the *Lavagem do Bonfim* 48-hour timeline.

Micro-Environment / Node	GPS Coordinates	Flow Rate	Volume (L)	Climatic Conditions
Commercial Lavender (*Alfazema*)	−12.9877, −38.5174	1.0 L/min	10.31	29.5 °C, 69% H, 0 m/s W
Nautical Procession	−12.9120, −38.4910	1.0 L/min	20.00	Maritime coastal air
Center Church Stairs Washed	−12.9239, −38.5083	1.0 L/min	12.00	32.5 °C, 63% H, 0.4 m/s W
Novena Service (Beginning Mass)	−12.9236, −38.5081	1.0 L/min	10.31	Nave indoor
Sanctuary Incensation	−12.9236, −38.5081	0.5 L/min	10.25	Nave indoor
Stairs of Bonfim Church (Ambient)	−12.9240, −38.5080	1.0 L/min	15.00	Outdoor forecourt air
Feijoada Feast	−13.0079, −38.4894	1.0 L/min	20.00	Ambient indoor
Tabuleiro Baiana Val	−12.9710, −38.5080	1.0 L/min	15.00	Ambient outdoor
Botanical Flower Maceration	−12.9735, −38.5120	1.0 L/min	15.00	Ambient indoor
Filtered *Água de Cheiro*	−12.9735, −38.5120	1.0 L/min	13.00	Ambient indoor
Recently Washed Baiana White Clothes	−12.9735, −38.5120	1.0 L/min	12.00	Ambient indoor
Procession *Lavagem* (Start–End)	−12.9731, −38.5135 to −12.9572, −38.5030	250 mL/min	6.25	Mobile outdoor
Ladeira da Colina Sagrada March	−12.9261, −38.5079	250 mL/min	11.00	Mobile outdoor
Left Side of Church Stairs	−12.9239, −38.5083	1.0 L/min	10.00	Outdoor forecourt air
End of Procession & Church Conc.	−12.9240, −38.5082	1.0 L/min	10.00	Outdoor crowd conc.

flow rates, total sampled volumes, climatic conditions, and GPS coordinates is summarized in Table 1.

Chemical analysis was performed at the Heritage Science Laboratory, University of Ljubljana, utilizing an Agilent 7890B Gas Chromatograph coupled with an Agilent 7000E Triple Quadrupole Mass Spectrometer operating in single quadrupole full-scan MS mode (m/z 35–350). Sorbent tubes were desorbed using a Gerstel Thermal Desorption Unit (TDU 2, Gerstel GmbH, Mülheim an der Ruhr, Germany) operated in splitless mode at 250 °C for 10 min under a helium desorb flow of 50 mL/min. Desorbed volatiles were trapped on a Gerstel Cooled Injection System (CIS 4) PTV inlet packed with tenax liners maintained at −10 °C using liquid CO_2 cooling, before rapid ballistic heating at 12 °C/sec to 280 °C (held for 3 min) for chromatographic injection.

Chromatographic separation was achieved on a VOCOL capillary column (60 m × 250 μm × 1.5 μm film thickness, Supelco / Sigma-Aldrich, St. Louis, MO, USA) in constant flow mode at 1.5 mL/min helium carrier gas (99.999% purity). The GC oven temperature program was initiated at 40 °C (held for 2 min), ramped at 15 °C/min to 200 °C (held for 0 min), and then ramped at 5 °C/min to 230 °C (held for 15 min), yielding a total chromatographic run time of 33.67 min. Column effluent was split 1 : 1 at the column exit using a microfluidic splitter into the mass spectrometer (transfer line at 250 °C, electron ionization at 70 eV, source at 230 °C) and an Agilent Olfactory Detection Port (ODP 3) sniffing port maintained at 230 °C with humidified makeup air (15 mL/min) to prevent nasal mucosa desiccation.

Olfactometry evaluations (GC–O) were conducted by a two-panelist team comprising one formally trained sensory assessor and one research investigator who participated directly in the field sampling in Salvador and was familiar with the cultural odor vocabulary. Due to the limited volume of single active sample tubes, the olfactometer setup utilized an automated tube-recollecting split function: during the first run, 50% of the column effluent was evaluated by Panelist 1 at the sniffing port while the remaining 50% was re-trapped onto a secondary Tenax® TA tube. The secondary tube was subsequently desorbed in a second run for Panelist 2. This two-run crossover protocol ensured that both panelists independently evaluated the complete 33.67-minute chromatographic run for every olfactometry sample. Panelists recorded real-time odor descriptors and perceived intensity on a 3-point scale (1 = weak, 2 = moderate, 3 = strong) using Gerstel Olfactory Information System software.

Peak identification was performed by matching mass spectra against the NIST 14 and NIST 20 Mass Spectral Libraries. To achieve computational scale across all sample sheets, custom Python scripts executed in a Google Colab virtual environment automated the extraction of CAS Registry Numbers. Where CAS numbers were missing or represented internal NIST codes, an automated fallback bridge queried the NIST Chemistry WebBook REST API [29] to resolve unique CAS numbers. The resolved CAS numbers were automatically cross-referenced against sensory descriptor databases, including Flavornet [30], PubChem (via PUG-View REST API) [31], and The Good Scents Company (TGSC) [32]. To ensure computational reproducibility and scale high-throughput molecular processing, data cleaning, automated web scraping, structural featurization, and deep learning predictions were executed within a cloud-based Google Colab Python 3.10 virtual envi-

ronment equipped with GPU acceleration [33]. Custom Python workflows automated the extraction of experimental organoleptic descriptors across PubChem [31], Flavornet [30], and The Good Scents Company [32] while performing fallback CAS resolution against NIST Chemistry WebBook REST endpoints [29, 33].

To complement empirical literature descriptors and resolve uncharacterized or rare volatile species, descriptor predictions were augmented using the Principal Odor Map (POM) message-passing neural network framework [34]. The POM model treats molecular structures as graph representations with defined atomic and bond properties, projecting canonical SMILES into a 134-dimensional feature space to predict binary classification probabilities across 138 semantic odor descriptors with human-panel accuracy [34].

System artifacts and exogenous contaminants were systematically identified and classified into three distinct categories prior to statistical and sensomic analysis:

1. System/Instrumental Contaminants: Volatiles originating from analytical equipment or column bleed (siloxanes including cyclotrisiloxane, cyclopentasiloxane, and tetrahydrofuran) were classified as system contaminants and completely disregarded.
2. Packaging Contaminants: Compounds associated with cardboard fittings and plastic packaging, including diisopropylnaphthalene (DIPN), phthalate plasticizers (diethyl, dibutyl, and bis(2-ethylhexyl) phthalates), photoinitiators (benzophenone), MOSH/MOAH markers, 2-ethyl-1-hexanol, furfural, and resin acids (abietic or dehydroabietic acid), were flagged and purged due to exogenous contamination during 9-month transport and storage.
3. Blank/Ambient Air Filtering: Peak areas of identified compounds in sample sheets were compared against corresponding ambient blank runs. A strict area-threshold filter was applied: a compound was retained as an authentic sample peak only if its integrated peak area in the sample was at least three times (3×) greater than its maximum peak area observed in the blank. Compounded peaks failing the 3× threshold were flagged and purged.

For GC–O matching, alignment between chromatographic chemical peaks and human sensory detections was performed using a retention time window of ±1.0 min. Olfactory matches were categorized into four confidence levels:

- **Level 1:** Confirmed compound identified in both independent GC–O sniffing runs with matching retention times and semantic descriptor agreement.
- **Level 2:** Confirmed compound in a single GC–O run aligned with a chemical peak in the GC–MS chromatogram.
- **Level 3:** Chemical compound identified by GC–MS without an associated sensory detection at the sniffing port (odorless or below human detection threshold).
- **Level 4:** Unassigned active odor peaks detected during olfactometry without a corresponding GC–MS chemical peak within ±1.0 min. Level 4 peaks were retained only if detected across both independent GC–O runs and aligned with the cultural vocabulary of the festival (e.g., lavender, incense, *dendê*).

2.3. Ethnographic and Participatory Inquiry

Parallel to chemical analysis, the pipeline incorporates participatory inquiry and sensory ethnography to center local custodians as primary interpretive authorities [2]. In-depth qualitative long interviews (60–120 min) were conducted with key heritage custodians, including leadership of the National Association of Baianas de Acarajé (ABAM), managers of the *Irmandade de Nosso Senhor do Bonfim*, and Candomblé practitioners [2]. These sessions adapted sensory panel logic into qualitative elicitation, encouraging practitioners to connect olfactory impressions with ancestral memory, ritual function, and vernacular descriptors [2, 35].

During the public festival, long-form interviews were complemented by focused short intercept interviews ($n = 52$ at Bonfim) [2]. Intercepted community members evaluated the immediate sensory environment on a 10-point scale for intensity and hedonicity, confirming public resonance of specific olfactory markers [2, 35]. High-resolution photographic mapping was collected to preserve spatial and temporal context [2].

3. Results

The primary output of this multisensory methodology is the narrative reconstruction of three distinct participant trajectories over a 48-hour spatio-temporal timeline, culminating in their convergence at the *Colina Sagrada*. The empirical chemical, olfactometric, and ethnographic results presented herein correspond to field documentation and sampling conducted during the January 2025 celebrations. By mapping GC–MS/O chemical profiles and intersection matrices against sensory ethnography, each storyline demonstrates how specific volatile organic compounds (VOCs) anchor individual cultural roles, defining unique, persistent, and shared olfactory landscapes.

3.1. Storyline 1: The Day of the Baiana

The Baiana de Acarajé serves as the paramount sacred, cultural, and matriarchal custodian of the celebration [36]. Her 48-hour journey embodies a centuries-old *ofício*, officially recognized by IPHAN in the *Livro dos Saberes* as intangible cultural heritage, that traces a transformation from high-heat culinary frying to cold botanical maceration, domestic laundering, and the public ritual washing of the church stairs (Fig. 2) [2, 36]. Across her entire 6-node trajectory, her active workspace encompasses 115 total volatile species.

Day 1 - Culinary Preparation, Maceration, and Laundering:. Her trajectory opens during the morning of Day 1 at her street stall at **Tabuleiro Baiana** (Table S14; GPS: −12.971, −38.508). Operating a portable food display rooted in the historical lineage of 19th-century *ganhadeiras*, her *tabuleiro* represents

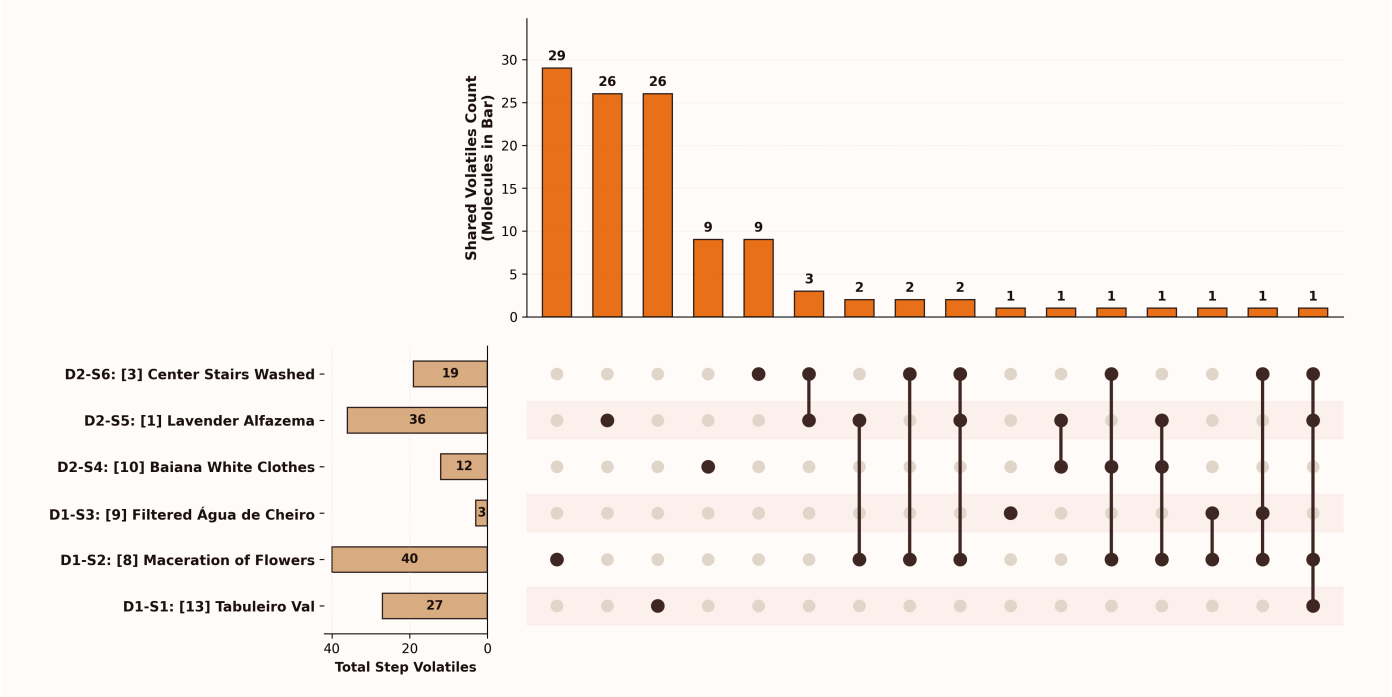


Fig. 2. **Volatile profile intersections across the Baiana do Acarajé's journey.** Olfactory score diagram illustrating the volatile intersections across the 6 key stages of the Baiana do Acarajé's 48-hour trajectory.

an autonomous space of Afro-Brazilian female economic resilience and communal sustenance [36]. Frying black-eyed pea dough (*acarajé*) in hot, unrefined red palm oil (*dendê de pilão*) establishes a heavily lipophilic profile (Table S13) anchored by 19 compounds (Bar #3: 1,2-propanediol, 3-(hexadecyloxy)-, diacetate, 1-hentetracontanol, 3-octadecanone, eucalyptol). While industrial palm oil has increasingly displaced regional production, her craft symbolically relies on the rare, unrefined *dendê de pilão*, a traditional mortar-and-pestle-pressed oil rich in β-carotenes, palmitic acid, and volatile thermolysis markers [36]. The headspace exhibits greasy, waxy, and roasted fatty notes driven by *E*-2-decenal, combined with ground spices (*tempero baiano* with cumin, black pepper, ginger), fried onions, sulfurous garlic (diallyl disulfide), and dried sea shrimp (*camarão seco*) [36].

In the early afternoon, she visits the **Feira de São Joaquim** (GPS: $-12.952, -38.502$), a historic trading hub that acts as a repository for Afro-Brazilian ethnobotanical diversity [36]. She collects fresh ritual plant bundles: *mirra* (*Commiphora sp.*), *palma-de-rainha* (*Tanacetum vulgare*), *alfazema* (*Lavandula angustifolia*), *levante* (*Hyptis brevipes*), *manjericão* (*Ocimum basilicum*), and *arruda* (*Ruta graveolens*) (Fig. 3). She brings these to the **Memorial das Baianas** (GPS: $-12.973, -38.512$), managed by the *Associação das Baianas de Acarajé* (ABAM) [36].

During cold manual maceration in metal basins over 3 to 6 hours (**Maceration of Flowers**, Fig. 4, Table S8), manual bruising activates 40 total volatiles. This physical transition purges culinary lipid compounds and introduces 33 unique green, herbal, and camphoraceous molecules (Bar #1: 33 compounds, including 2-hexenal, 3-hexen-1-ol, β-myrcene, β-phellandrene,



Fig. 3. **Selection of individual botanical leaves.** Representative ritual botanical leaves selected from Feira de São Joaquim and prepared for cold maceration at Memorial das Baianas.

(-)-β-pinene, 3-carene, D-limonene, *p*-cymene, eucalyptol, linalool, isoterpinolene, L-fenchone, β-thujone, menthol, L-menthone, menthone, camphor, isoborneol, estragole, geraniol, verbenone, pulegone, isobornyl acetate, trans-anethole, 4-methoxybenzaldehyde, safrole, piperitenone, and γ-cadinene), responsible for fresh chlorophyllic, minty, and thymol notes.



Fig. 4. **Soaking of fresh ritual botanicals.** Bundles of fresh ritual botanicals (*palma-de-rainha*, *levante*, *manjericão*, and *arruda*) undergoing initial cold-water soaking and active Tenax® TA headspace sampling at Memorial das Baianas.

To mitigate liquid water condensation on the Tenax® TA bed during high-humidity soaking sampling, sorbent tubes were positioned at an increased standoff distance from the basins. Once dark and saturated, the extract is filtered to separate solid leaves from liquid, and poured into porous terracotta clay pots (*quartinhas*, Fig. 5) for 12-hour overnight saturation (**Filtered Água de Cheiro**, Fig. 6, Table S9) [36]. Filtering solid plant debris narrows the active headspace profile down to 3 core compounds (acetic acid, 2-butoxyethanol, and carbitol), with 2 compounds acting as unique markers of the filtered liquid state (Bar #9: 2 compounds). Porous terracotta vessels facilitate slow liquid evaporation; porous clay wall adsorption selectively retains heavier lipophiles while releasing an anisic, sweet tea, and herbal-floral headspace.

Late that evening, she launders her traditional 18th-century style ritual attire (**Baiana White Clothes**, 12 volatiles, Table S10) [36]. Hand-washing, starched ironing, and preparing her frilly white skirts (*saias*, Fig. 7) with a secret, ancestral liquid recipe passed down through generations generate an aldehydic, coumarinic, and white-floral olfactory footprint [36]. This step introduces 11 synthetic fabric-softener and laundry fixative markers (Bar #4: 11 compounds, including 2-carene, ethylhexanol, D-limonene, *p*-cymene, dihydromyrcenol, cedrol, galaxolide, versalide, homosalate, α-terpinyl acetate, patchouli alcohol, and 4-tert-butylcyclohexylacetate).



Fig. 5. **Porous terracotta clay pots (*quartinhas*).** Porous terracotta clay pots filled with filtered *água de cheiro* at Memorial das Baianas before the ritual procession.



Fig. 6. **Filtered *água de cheiro* product.** Filtered product of manual bruising and cold maceration of ritual plants in large metal basins at Memorial das Baianas, generating concentrated dark green *água de cheiro*.



Fig. 7. **Ancestral starched ironing.** Hand-ironing the starched white lace skirt (*saia*) of a Baiana do Acarajé using a secret ancestral liquid mixture.

Day 2 - The Ritual Washing at the Colina Sagrada:. At sunrise on Day 2, dressed in immaculate white representing purity and spiritual devotion to Oxalá, she pours commercial lavender cologne (**Lavender Alfazema**, Fig. 8, 36 volatiles; GPS: $-12.988, -38.517$; $T = 29.5\,^{\circ}\text{C}$, $H = 69\%$, $W = 0$ m/s) over her shoulders and into the clay pot. Standardizing environmental parameters across nodes confirms tropical ambient heat (29.5–32.5 °C) drives volatile volatilization. Lavender splash floods the headspace with 29 unique monoterpenic compounds (Bar #2: 29 compounds, including α-pinene, camphene, (-)-β-pinene, 3-carene, α-terpinene, D-limonene, *o*-cymene, eucalyptol, dipropylene glycol, linalool, terpinolene, β-terpineol, phenylethyl alcohol, benzyl acetate, 4-terpineol, camphor, α-terpineol, lavandulyl acetate, pseudolimonene, eugenol, α-guaiene, caryophyllene, and thujopsene), establishing shared monoterpene overlap with macerated herbs (Bar #11: 2 compounds) and laundered clothes (Bar #12: 1 compound).



Fig. 8. **Commercial lavender cologne (*Seiva de Alfazema*).** Commercial lavender cologne bottle (118 mL) used extensively by revellers and Baianas during the *Lavagem do Bonfim*.

Reaching the **Center of the Stairs Washed** (19 volatiles; GPS: $-12.924, -38.508$; $T = 32.5\,^{\circ}\text{C}$, $H = 63\%$, $W = 0.4$ m/s, Tables S3 and S11), she leads the procession to the church forecourt. She tips her terracotta pot (Figs. 9 and 10), pouring *água de cheiro* over stone steps and scrubbing vigorously with straw brooms.

Mechanical friction, wet granite, and tropical heat release 10 unique volatile markers (Bar #5: 10 compounds, including α,3-dimethylstyrene, β-pinene, 2-ethylhexanol, D-sylvestrene, *p*-cymene, α-terpineol, endo-isobornyl acetate, α-terpinyl acetate, vinyl acetate, and longifolene), alongside shared floral-herbal notes from lavender cologne (Bar #7: 3 compounds, including benzyl acetate, eugenol, and phenylethyl alcohol). This climax bridges botanical maceration (Bar #10: 2 compounds, α-pinene and isoterpinolene; Bar #8: 2 compounds, camphor and linalool) with her *tabuleiro* roots through persistent eucalyptol (Bar #20) and background sulfur dioxide (Bar #21). Field interviews confirm community members perceive this atmospheric



Fig. 9. **Decorated terracotta *quartinhas*.** Terracotta *quartinhas* decorated with fresh yellow blossoms and *água de cheiro* ready for the washing of the stairs.

surge as an embodied sensory threshold of purification, ancestral memory, and matriarchal resistance [36].



Fig. 10. **Baianas assembled on Basilica steps.** Baianas de Acarajé dressed in immaculate white lace skirts assembled on the steps of the Basilica of Bonfim with straw brooms and flower bundles during the sacred stair washing ritual.

3.2. Storyline 2: The Day of the Father (Priest / Deacon)

The ecclesiastical storyline traces the formal Catholic liturgical domain inside the Basilica of Bonfim, capturing the spatial transition from ambient outdoor air to sanctuary incense combustion and the balcony blessing above the public forecourt (Fig. 11). Across his 4-node trajectory, the Father's domain comprises 35 total unique volatile species.

Day 1 - Liturgical Preparation and Novena Mass:. The Father's trajectory opens on the exterior forecourt of the Basilica (**Stairs of Bonfim**, Fig. 12, 5 volatiles, Table S6; GPS: $-12.924, -38.508$). Ambient outdoor street air exhibits low-boiling hydrocarbon species, with 3 compounds unique to this initial outdoor node (Bar #5: 3 compounds, 2-methylbutane, pentene, and tetrahydrofuran). These background urban air markers persist across outdoor nodes.

Entering the nave for the final Novena service (**Beginning of Mass**, 3 volatiles, Table S4; GPS: $-12.924, -38.508$), the atmosphere shifts toward liturgical architecture and floral offerings.

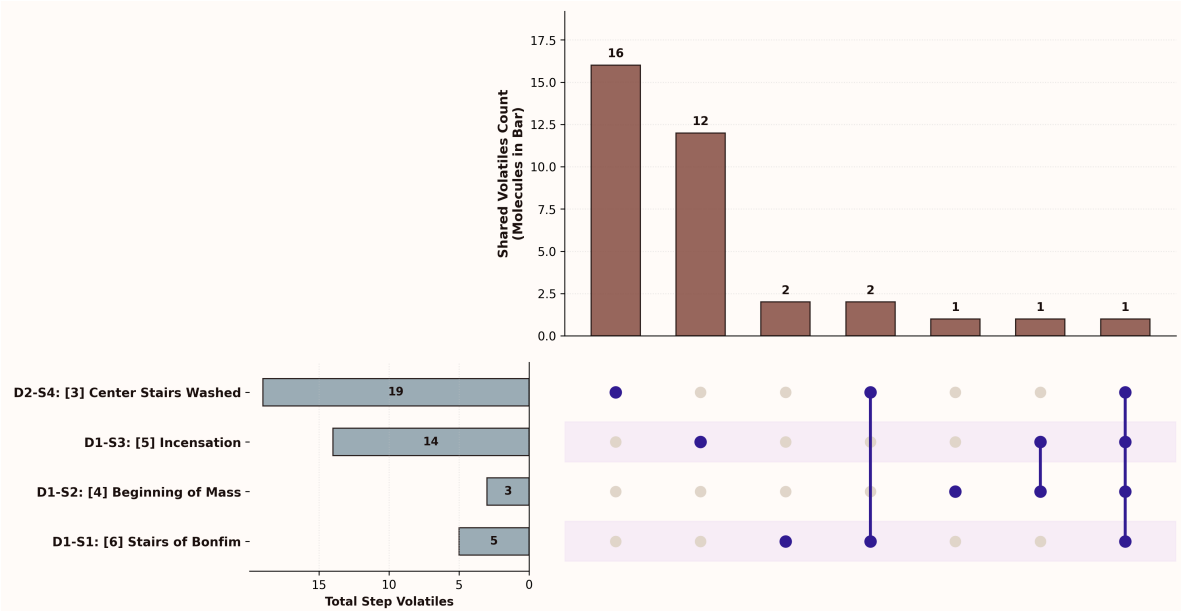


Fig. 11. **Volatile profile intersections across the Priest's journey.** Olfactory score diagram illustrating the volatile intersections across the 4 key stages of the Priest's 48-hour trajectory.



Fig. 12. **Exterior forecourt of Bonfim Basilica at night.** Exterior forecourt of the Basilica of Nosso Senhor do Bonfim at night during the final Novena Mass.

Freshly cut orange lilies and red roses placed around the altar (Fig. 13) release indolic, benzyl acetate, phenylethyl alcohol, and ylang-ylang notes recorded during in-situ sensory evaluation. This step introduces 1 unique indoor marker (Bar #5: 1 compound, carbitol) alongside acetic acid and 2-butoxyethanol.

During the ceremonial liturgy (**Incensation**, 14 volatiles, Table S5; GPS: $-12.924, -38.508$), glowing charcoal inside silver thuribles combusts two distinct resins: yellow frankincense resin (*Roma*) and pink rose resin (*Rosas de Fátima*), Figs. 14 and 15. The burning thurible fills the nave with dense, balsam-heavy smoke, introducing 12 unique resinous, phenolic, and aromatic compounds (Bar #2: 12 compounds, including sulcatone, tetraethylene glycol diethyl ether, 4-methoxycinnamaldehyde, octyl acetate, naphthalene, 2-phenoxyethanol, safrole, patchouli alcohol, isopropyl myristate, 3-(1,3-benzodioxol-5-yl)-2-propenal, octacosanol, and 2-butoxyethanol). In-situ sensory evaluations recorded intense



Fig. 13. **High altar of Bonfim Basilica.** The high altar of the Basilica of Nosso Senhor do Bonfim decorated with fresh orange lilies and red roses for the Novena service.

olibanum, dry cedarwood, and palo santo notes.



Fig. 14. **Commercial incense resins inside sacristy.** Yellow frankincense resin (*Roma*, right) yielding olibanum and cedarwood notes, and pink rose-dyed resin (*Rosas de Fátima*, left).



Fig. 15. **Silver incense boat (*navicula*) and thurible.** Ornate silver incense boat filled with mixed commercial resin blend alongside the liturgical thurible inside the sacristy.

Day 2 - The Ecclesiastical Blessing:. On the morning of the *Lavagem*, as the procession reaches the *Colina Sagrada*, the Father steps onto the high balcony above the front doors to deliver a formal blessing over the assembled crowds. During the climax of the stair washing (**Center Stairs Washed**, 19 volatiles, Table S3; GPS: $-12.924, -38.508$), the warm, resinous smoke drifting out from the sanctuary nave intersects with the cool, herbal vapors rising from the stairs below.

This convergence is defined by 16 unique outdoor washing compounds (Bar #1: 16 compounds, including α-pinene, β-pinene, α-terpineol, α-terpinyl acetate, α,3-dimethylstyrene, benzyl acetate, eugenol, and eucalyptol), 2 shared persistent molecules from the forecourt entrance (Bar #4: 2 compounds, 2-ethylhexanol and 4-chlorobutyrophenone), and 1 universal keystone molecule (Bar #7: 1 compound, acetic acid) that spans all 4 stages of the Priest's journey simultaneously.

3.3. Storyline 3: The Day of the Participant

The participant (reveller) experiences the broadest, most dynamic sensory trajectory, moving across ten distinct microenvironments spanning maritime, culinary, secular, and sacred spaces (Fig. 16), capturing 120 total volatile species. Field intercept interviews ($n = 52$) demonstrate that his/her physical progression along the 8-kilometer route represents an intergenerational "walk of faith" (*"caminhada da fé"*), connecting family memory across generations.

Day 1 - Maritime Procession, Culinary Feasting, and Evening Liturgy:. The reveller's trajectory opens aboard the **Nautical Procession** across the *Baía de Todos-os-Santos* (23 volatiles, Table S2; GPS: $-12.912, -38.491$). Coastal marine aerosol and fuel combustion yield 29 unique volatiles (Bar #1: 29 compounds, including 1-ethyl-3-methylcyclopentane, 1-tert-butoxy-3-methylcyclohexene, 5-methyl-1-undecene, nonane, 1-hexadecanol, diethylcyclopentane, 4-methylnonane, 3,7,11-trimethyl-1-dodecanol, 13-heptadecyn-1-ol, decane, m-menthane, 1-heptacosanol, 5-octadecenal, 2-hexyldecanol, 1-tridecanol, 2-tolyloxirane, 2-phenylbutanal, naphthalene, 4,7-dimethylindan, benzocycloheptene, and azulene).

Disembarking for lunch, he/she partakes in a communal **Feijoada Feast**, Fig. 17 (11 volatiles, Table S7; GPS: $-13.008, -38.489$). The salty, cooked-meat, smoked-spice, and bay leaf notes of the stew purge maritime fuel compounds, introducing 7 unique culinary volatiles (Bar #6: 7 compounds, amyl nitrite, 2,3-butanedione [diacetyl], 2,3-dimethylpentane, propanoic acid, acetoin, tetrachloroethylene, 16-octadecenal, and p-creosol). Intercepts confirm revellers pair this stew with seafood (*arroz de polvo*) and beer (*cerveja*), bridging formal culinary tradition with social conviviality.

In the late afternoon, he/she climbs to the **Stairs of Bonfim** (5 volatiles, Table S6; GPS: $-12.924, -38.508$), catching 3 ambient outdoor notes (2-methylbutane, pentene, tetrahydrofuran; Bar #9). Entering the nave for **Mass Liturgy** (3 volatiles, Table S4), 2 unique indoor notes emerge (carbitol and 2-butoxyethanol; Bar #10). During **Incense Smoke** (14 volatiles, Table S5), he/she absorbs 10 unique resinous compounds (Bar #4: 10 compounds, including isopropyl myristate, 4-methoxycinnamaldehyde, tetraethylene glycol diethyl ether, octyl acetate, and 3-(1,3-benzodioxol-5-yl)-2-propenal).

Day 2 - The 8-Kilometer Pilgrimage and Final Convergence:. At 6:00 AM on Day 2, dressed in light white cotton, he/she joins multi-generational families departing from Basílica de Nossa Senhora da Conceição da Praia (Fig. 18); GPS start: $-12.973, -38.513$; GPS end: $-12.957, -38.503$). As revealed in field interviews, walking this 8-kilometer "walk of faith" (*"caminhada da fé"*) represents an essential annual threshold to

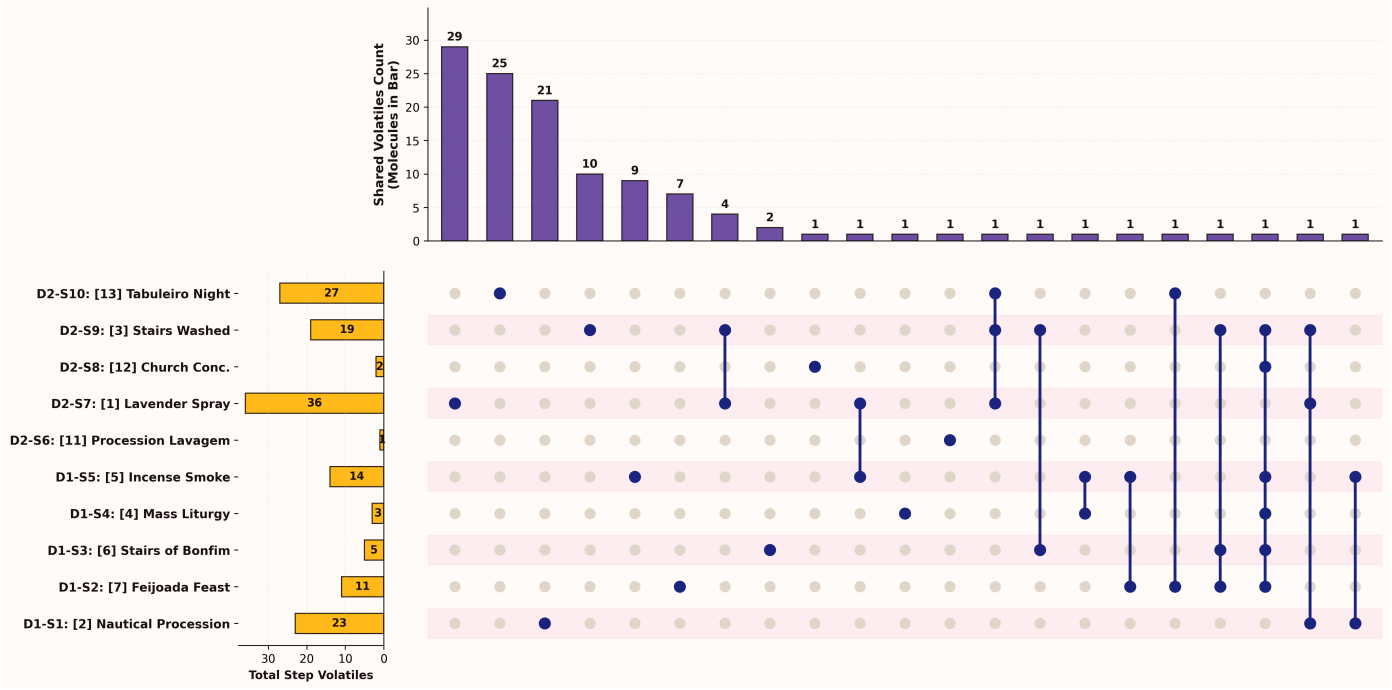


Fig. 16. **Volatile profile intersections across the Reveller's journey.** Olfactory score diagram illustrating the volatile intersections across the 10 key stages of the Reveller's 48-hour trajectory.



Fig. 17. **Large-scale preparation of traditional *feijoada*.** Black beans cooked with salted pork, smoked sausages, and bay leaves, yielding rich, savory, smoked-spice volatile notes.

start the new year with protection, health, and peace. Street heat purges church incense, introducing 1 unique marker (Bar #19: carbon dioxide) and shared alkylbenzene/hydrocarbon volatiles from nautical bay air (Bar #8: 3 compounds, methanesulfonyl chloride, heptane, octane, and 1,2,4-trimethylbenzene). Trace CO2 detected in chromatographic runs was identified as a system/cryo-cooling artifact originating from the liquid CO2 cooling mechanism of the PTV inlet rather than an adsorbed air component, and was consequently excluded from authentic sample profiles.

Along the route, he/she receives a splash of commercial lavender cologne (**Lavender Spray**, 36 volatiles, Table S1), flooding the air with 25 unique monoterpenes (Bar #2: 25 compounds, including α-pinene, β-pinene, 3-carene, 4-terpineol, α-guaiene, and camphene). Intercepted participants rated intensity at 8.5/10 and hedonicity at 9.6/10, describing *alfazema* and *arruda* as a "smell of strength, determination, and ances-



Fig. 18. **Historical facade of Basílica da Conceição da Praia.** Historical facade in Lower City Salvador, marking the official 8-km starting point for the procession.

trality" (*"cheiro de força, de garra e de ancestralidade"*). This splash creates a synthetic resinous bridge to church incense via patchouli alcohol and to the maritime bay via benzyl acetate.

At the hill, Fig. 19 (**Church Conc.**, 2 volatiles, Table S12; GPS: −12.926, −38.508), the dense crowd releases 1 botanical marker (Bar #8: *Z*-ocimene). At the foot of the steps (**Stairs Washed**, 19 volatiles, Table S3), a Baiana sprays *água de cheiro* over his/her head from the movement and impact of her broom, Fig. 20, surrounding him/her with 9 stair-washing compounds (Bar #5: 9 compounds, α,3-dimethylstyrene, β-pinene, α-terpineol, and vinyl acetate) and shared monoterpene-floral notes from his/her earlier lavender spray (Bar #7: 4 compounds, camphor, eugenol, linalool, phenylethyl alcohol).



Fig. 19. **Public crowd concentration at *Colina Sagrada*.** Public crowd concentration in front of the Basilica of Bonfim on the morning of the *Lavagem*.



Fig. 20. **Baianas gathered on upper church landing.** Baianas de Acarajé dressed in white gathered on the upper landing during the ritual stair washing.

He/She completes the 48-hour journey at **Tabuleiro Night**, Fig. 21 (19 volatiles, Table S13; GPS: −12.971, −38.508), eating a hot *acarajé* or *abará* and street-fried popcorn (*pipoca*). The sizzling *dendê* oil reintroduces lipophilic frying compounds (Bar #3: 21 compounds, including 1-hentetracontanol, 3-octadecanone, and fatty esters), connecting back to his/her procession march via methanesulfonyl chloride and his/her earlier lavender spray via eucalyptol.



Fig. 21. **Street food stall (*tabuleiro*) during festival night.** Street food stall displaying fresh *acarajé* fried in hot *dendê* oil alongside *vatapá* and dried sea shrimp.

4. Discussion

The convergence of the three character trajectories generates a dynamic, syncretic smellscape map centered on the forecourt, sanctuary, and public stairs of the Basilica of Bonfim, summarized in Table 2 across spatial nodes, fragrance notes, and chemical descriptors. To visualize how these individual lives intersect across the 48-hour timeline, Fig. 22 maps spatio-temporal encounters and volatile handoffs between characters. Day 1 focuses on liturgical and culinary preparation: the Baiana works at her *tabuleiro* and macerates botanicals, the Priest performs sanctuary incensations, and the Reveller joins the nautical procession and *feijoada* feast. These parallel paths converge on Day 2 during the public procession, lavender spraying, and sacred stair washing at the granite steps.

At the overall character level, global chemical overlap across all three participants reveals the overarching architecture of the event smellscape, as illustrated in Fig. 23. The Reveller carries the largest overall volatile load (120 total compounds), reflecting broad physical mobility across maritime, culinary, liturgical, and street procession environments. The Baiana contributes 115 total volatiles anchored by fried palm oil lipids, macerated botanicals, and laundry fixatives, while the Priest maintains 35 total compounds centered on sanctuary incensation and altar florals. Evaluating multi-character intersections in Fig. 23 identifies the shared molecular core binding these distinct roles together. The largest intersection bar (55 compounds) belongs exclusively to shared volatile species between the Baiana and the Reveller, driven by street-level culinary frying (*dendê* oil aldehydes and lipid esters), commercial lavender cologne (*Seiva de Alfazema* monoterpenes), and outdoor procession air. A second major intersection (37 compounds) contains volatiles shared between the Reveller and the Priest, representing the leakage of indoor sanctuary incense smoke, candles, and altar florals into the public crowd. 42 compounds represent unique volatile species belonging exclusively to the Baiana's private botanical maceration and laundry preparations, while 30 compounds are unique to the Reveller's journey.

Table 2: Binary and descriptive matrix of multisensory profiles converging at the *Lavagem do Bonfim*.

Character Node	Physical/Spatial Source	Primary Fragrance Notes	Identified Volatile/Chemical Descriptors
Baiana	*Água de Cheiro* Maceration	Herbal, fresh, minty, lavender, spicy	Linalool, eugenol, thymol, camphor, hexenol-cis-3, 2-hexenal
	Starched White Garments	Aldehydic, white floral, coumarinic	Cedrol, dihydromyrcenol, galaxolide, coumarin, patchouli alcohol
Father	Liturgical Incense Resin	Resinous, woody, dry, spicy, olibanum	Cedrol, caryophyllene, 2-phenoxyethanol, olibanum, palo santo notes
	Altar Floral Decorations	Floral, indolic, rose, sweet	Benzyl acetate, indole, phenylethyl alcohol, ylang-ylang notes
Reveller	*Acarajé* / *Dendê* Oil Stalls	Waxy, nutty, fried, sulfurous, spicy	*E*-2-decenal, diallyl disulfide, 3-octadecanone, 1-hentetracontanol
	Maritime Environment	Salty, peppery, ozonic	Alkylbenzenes, 1,2,4-trimethylbenzene, naphthalene, marine aerosol
	Crowd & Celebration	Lavender cologne, alcoholic, sweaty	Linalool, camphor, *D*-limonene, ethanol, human sweat notes

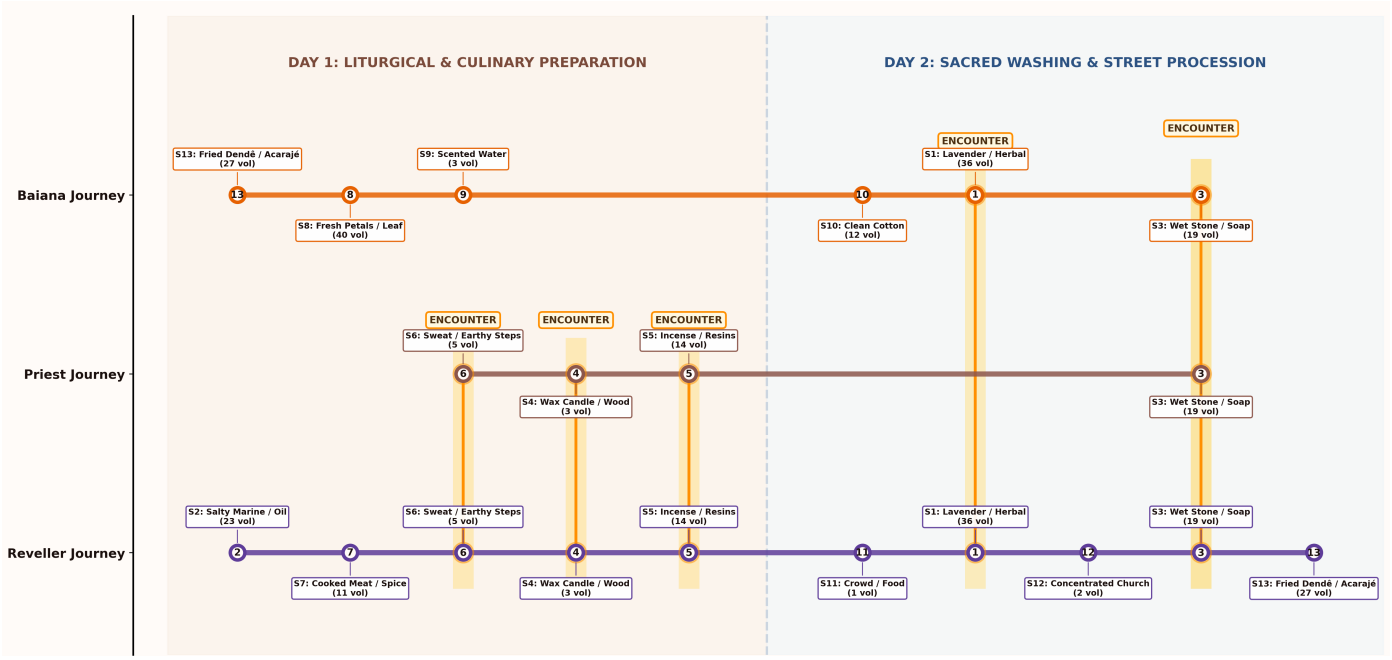


Fig. 22. **Deconflicted spatio-temporal smellscape map of the *Lavagem do Bonfim*.** Spatio-temporal encounter map tracing 48 h that binds these distinct rolester moments for the Baiana, Priest, and Reveller.

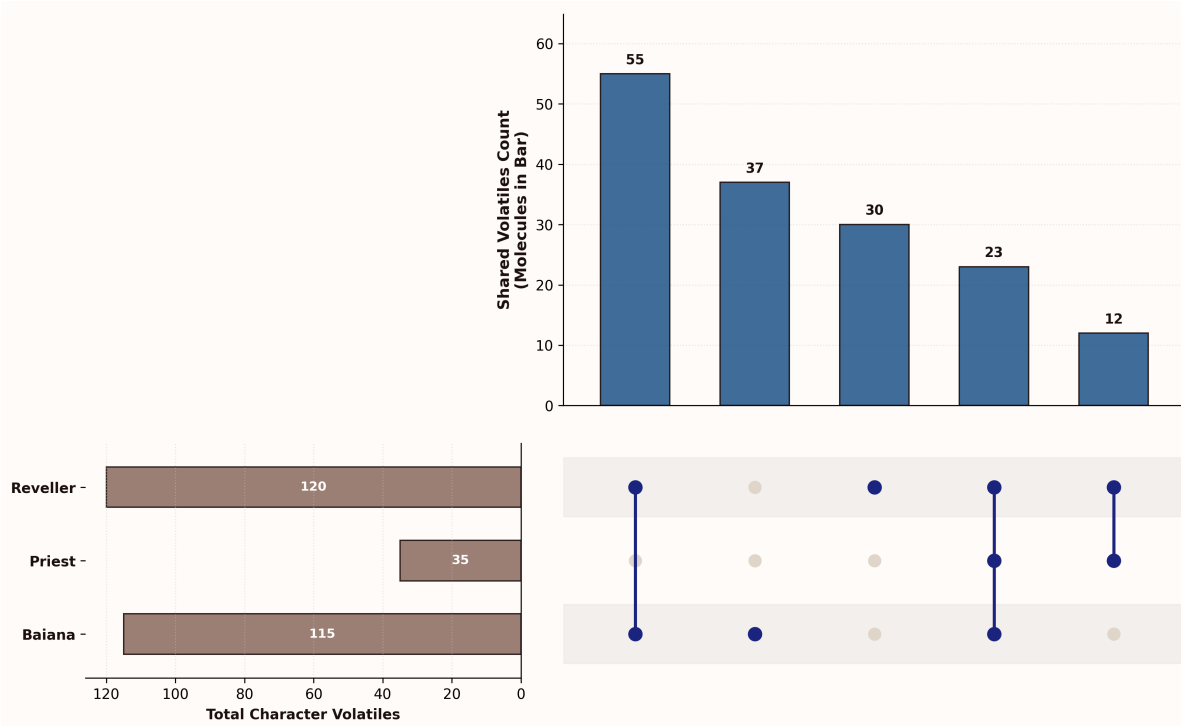


Fig. 23. **Overall character volatile intersections across the 48-hour timeline.** Olfactory score diagram illustrating overall character intersections across Baiana, Priest, and Reveller trajectories.

Most importantly, the central 3-way intersection in Fig. 23 isolates 23 universal core molecules present across all three character archetypes simultaneously (Bar #4: 23 compounds). This 23-compound suite, anchored by monoterpenes and terpenoids (α-pinene, β-pinene, camphor, D-sylvestrene, eucalyptol, isoterpinolene, linalool, *p*-cymene, α-terpineol, α-terpinyl acetate, endo-isobornyl acetate), aromatic esters, floral notes, and resinous fixatives (benzyl acetate, phenylethyl alcohol, eugenol, safrole, patchouli alcohol, longifolene, vinyl acetate, ethyl acetate), alongside volatile herbal extracts (acetic acid, 2-butoxyethanol, carbitol, 2-ethylhexanol), defines the true chemical fingerprint of the *Lavagem do Bonfim*. This 23-molecule core represents an undeniable multisensory synthesis where Afro-Brazilian herbal maceration, Catholic resinous incense, and public street celebration merge into an indivisible atmospheric unit.

Disaggregating this overall intersection by character and day provides deeper temporal resolution, as shown in Fig. 24. On Day 1, the Reveller carries 49 total volatiles during his maritime and culinary journey, the Baiana processes 67 compounds during *tabuleiro* frying and botanical maceration, and the Priest generates 19 compounds during Novena incensation. On Day 2, the Reveller's volatile load rises to 77 compounds during the 8-kilometer march, the Baiana's load reaches 58 compounds during white dress laundering and stair washing, and the Priest's load comprises 19 compounds during the public blessing.

Analyzing individual bar intersections in Fig. 24 reveals the precise temporal mechanics of volatile persistence. The largest individual intersection bars (28 compounds each) consist of volatile species belonging exclusively to the Reveller on Day 2, and shared volatiles between Reveller (Day 2) and Baiana (Day 1). 26 compounds represent Day 1 baseline entries for the Baiana's *tabuleiro* and botanical maceration, while 25 compounds represent Day 2 entries for the Reveller's nautical procession and *feijoada* feast. 12 compounds persist continuously across the Baiana's Day 1 and Day 2 activities, demonstrating how her private botanical maceration at Memorial das Baianas directly feeds into public stair washing. Similarly, 9 compounds persist across the Reveller's Day 1 and Day 2 journeys, establishing chemical continuity between maritime feasting and processional march. 6 compounds are shared between the Reveller (Day 2) and the Priest (Day 2), capturing the exact moment when processional crowd air meets sanctuary incense during balcony blessing. 3 compounds are shared across Baiana (Day 1), Baiana (Day 2), Reveller (Day 1), and Reveller (Day 2), representing the persistent street-level presence of fried *dendê* oil and commercial lavender cologne. Finally, a single volatile species (acetic acid) is present across all 6 character-day nodes simultaneously. Rather than acting as a dominant odorant, this persistent organic acid reflects a shared chemical background derived from botanical leaf maceration, food acidulation, and ambient microbial processes, serving as an underlying marker of organic human activity across the entire festival landscape.

Across the macro-ritual evolution of the festival (Fig. 25), Phase 1 (Preparation) contributes the largest pool of unique volatiles (74), driven by the raw lipid matrix of fried *dendê* oil at street stalls, raw botanical leaves macerated at Memorial das Baianas, and maritime fuel emissions during the nautical procession. As the festival advances into indoor sacred liturgy (Phase 2, 42 compounds) and outdoor public procession

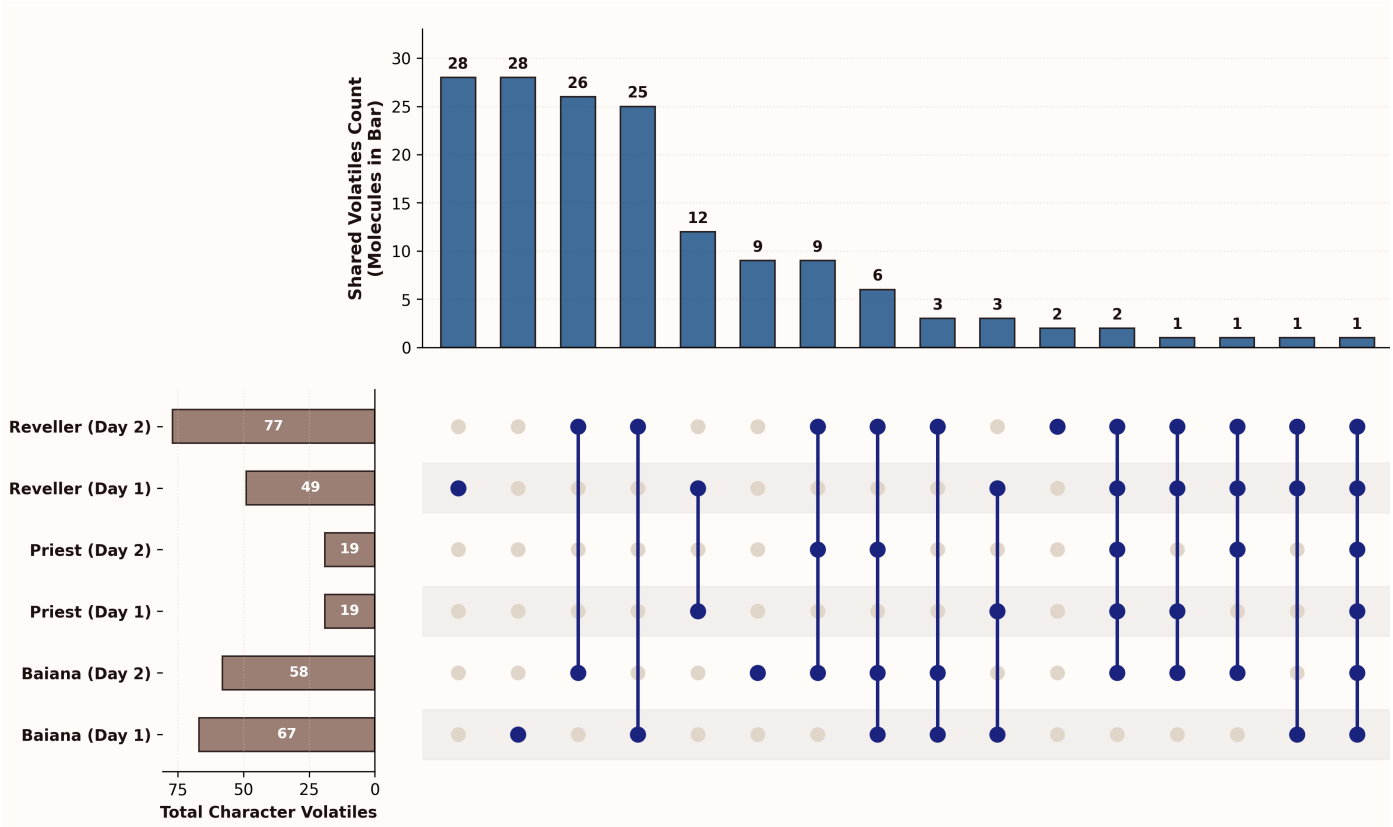


Fig. 24. **Detailed character and day volatile intersections.** Olfactory score diagram illustrating detailed intersections across character and day nodes.

(Phase 3, 51 compounds), 35 volatiles emerge as unique markers of the public procession, while 20 compounds are shared exclusively between preparation and public procession (driven by monoterpenes and floral esters from *água de cheiro* and commercial lavender sprays). Crucially, the chemical continuity bridging all three macro-phases simultaneously (Fig. 25) is anchored by persistent resinous fixatives, herbal extracts, and organic baseline markers, most notably patchouli alcohol, safrole, 2-butoxyethanol, carbitol, and acetic acid, providing an uninterrupted chemical backbone that physically links private preparation and indoor sanctuary liturgy to public street celebration.

The botanical pathway managed by the Baianas demonstrates how raw plant processing scales into a public cleansing threshold. Fig. 26 delineates the volatile overlap between botanical flower maceration (**Maceration of Flowers**), filtered herbal water (**Filtered Água de Cheiro**), and final stair cleansing (**Center Stairs Washed**). Raw botanical maceration yields 40 total volatile species (Fig. 26), dominated by green, chlorophyllic, and minty notes (2-hexenal, 3-hexen-1-ol, β-myrcene, α-pinene, eucalyptol, linalool, camphor, and estragole). Filtering plant debris and storing liquid extract in terracotta vessels narrows the active headspace down to 3 compounds (*acetic acid*, *2-butoxyethanol*, and *carbitol*), retaining key botanical extraction markers (*2-butoxyethanol* and *acetic acid*). When *água de cheiro* is poured onto granite steps, thermal friction and mechanical scrubbing re-activate 12 unique stair-washing compounds alongside 6 shared botanical monoterpenes (α-pinene, *p*-cymene, eucalyptol, linalool, camphor, and isoterpinolene) that establish direct chemical continuity between raw leaf maceration at Memorial das Baianas and the public washing climax at the church forecourt.

Evaluating these botanical transfers across three-way Venn diagrams in the Supporting Information demonstrates that key botanical extraction markers (*2-butoxyethanol* and *acetic acid*) persist continuously from Memorial das Baianas through the 8-kilometer march (Figure S12, Table S24), while filtered water and raw leaf maceration directly link cold preparation to crowd arrival at the forecourt (Figure S13, Table S26). Filtering *água de cheiro* establishes a tight, concentrated core comprising the filtered water profile that remains chemically active from the procession march to the church forecourt (Figure S14, Table S27). Furthermore, comparing botanical maceration, washed stairs, and sanctuary incensation reveals that 7 shared volatile monoterpenes (α-pinene, β-pinene, camphor, eucalyptol, linalool, *p*-cymene, and isoterpinolene) bridge the Baiana's herbal preparation with the Father's burning incense (Figure S6, Table S19), while resinous smoke and herbal infusions share an underlying aromatic profile anchored by safrole, patchouli alcohol, 2-butoxyethanol, carbitol, and acetic acid (Figure S11, Table S24).

Comparing commercial lavender cologne, washed stairs, and ambient stairs confirms that the stair-washing headspace is an explicit chemical mixture, where 6 monoterpenes and

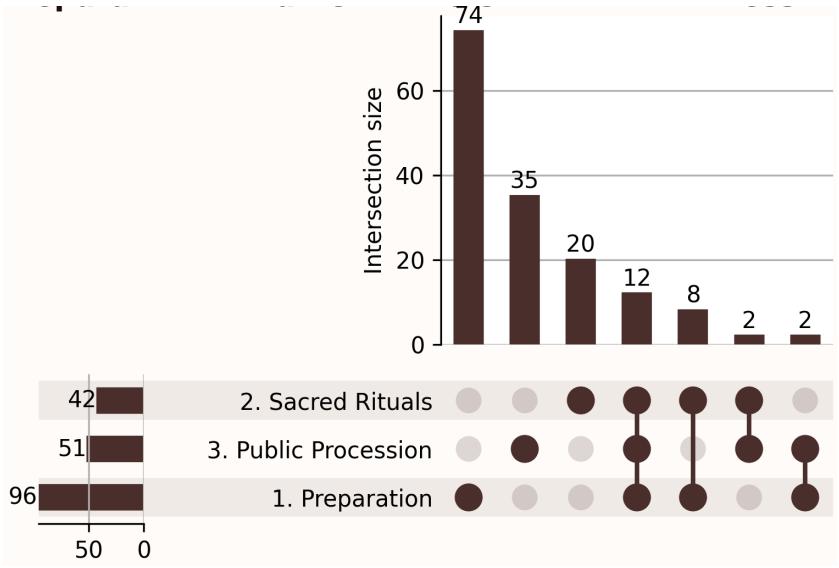


Fig. 25. **Volatile profile evolution across macro-ritual phases.** Intersections across Preparation (Phase 1), Sacred Rituals (Phase 2), and Public Procession (Phase 3).

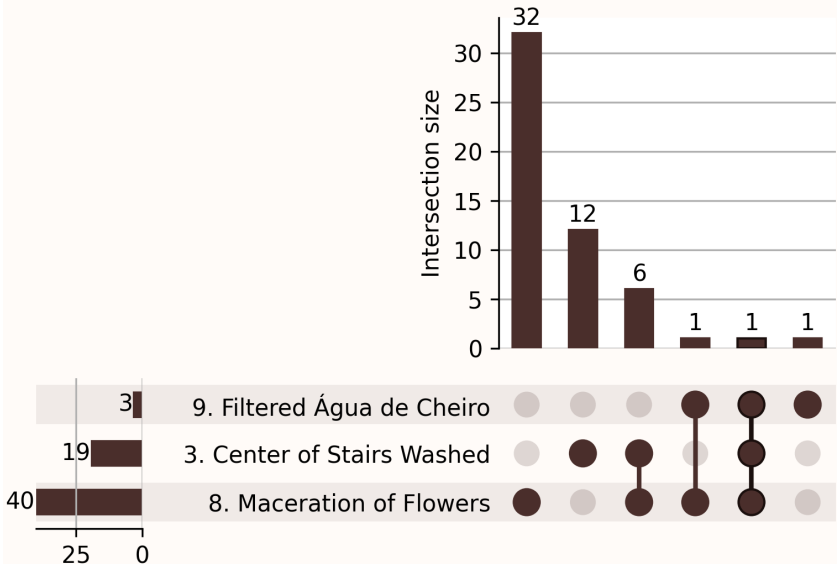


Fig. 26. **Volatile intersections across the botanical cleansing pathway.** Intersections between botanical flower maceration (8), filtered *água de cheiro* (9), and central stair washing (3).

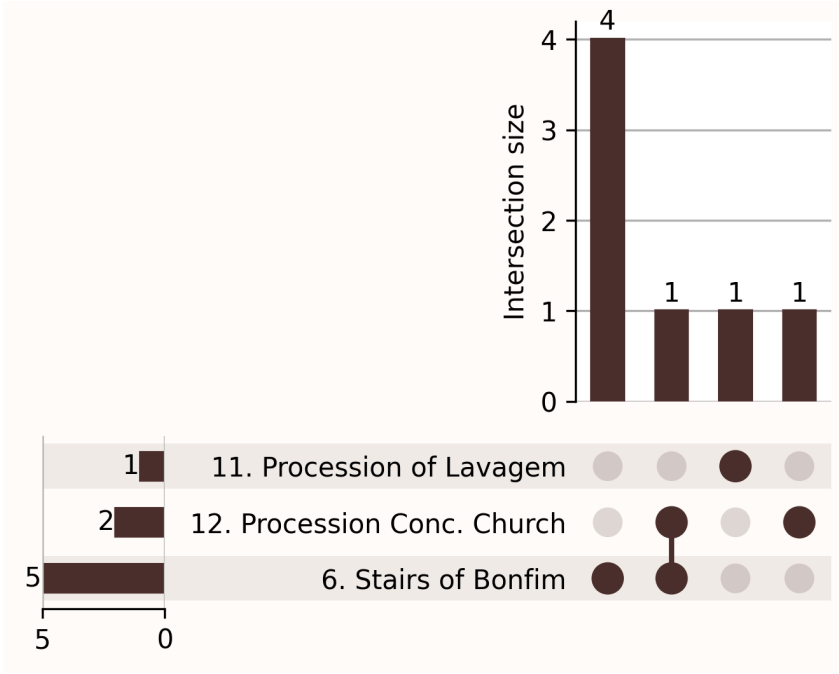


Fig. 27. **Volatile intersections at the church forecourt convergence.** Intersections between procession march (11), church forecourt concentration (12), and ambient church steps (6).

floral esters (benzyl acetate, camphor, eucalyptol, eugenol, linalool, phenylethyl alcohol) are contributed directly by commercial *Seiva de Alfazema*, while organic extraction notes (2-ethylhexanol, ethyl acetate, and acetic acid) represent shared background air (Figure S1, Table S14). Additional Venn evaluations confirm that lavender cologne shares core monoterpenes (α-pinene, β-pinene, 3-carene, D-limonene) with botanical maceration (Figure S3, Table S16), a persistent resinous fixative (patchouli alcohol) with the procession march (Figure S2, Table S15), and shared floral esters with church forecourt concentration (Figure S4, Table S17).

The spatial convergence of the procession at the Basilica forecourt creates a distinct chemical transition between mobile street march emissions, ambient outdoor air, and forecourt crowd concentration, detailed in Fig. 27. The processional march along the 8-kilometer route contributes a single unique crowd combustion marker (Bar #3: 1 compound, CO_2), reflecting the physical respiratory density of moving participants. Ambient outdoor air at the church steps exhibits 4 unique low-boiling species (Bar #1: 4 compounds, 2-methylbutane, tetrahydrofuran, 2-ethylhexanol, and ethyl acetate), while crowd arrival at the forecourt releases 1 unique botanical marker volatilized by crowd friction and foot traffic (Bar #4: 1 compound, *Z*-ocimene). Linking the ambient steps to the forecourt concentration is a single shared organic extraction baseline (Bar #2: 1 compound, acetic acid), establishing a clear spatial boundary where background street air transitions into the concentrated forecourt environment.

Three-way Venn analyses in Supporting Information provide further spatial resolution across key ritual intersections:

- **Washed Stairs, Ambient Stairs, and Procession March (Figure S7, Table S20):** Comparing washed steps, ambient stairs, and the processional march reveals 16 unique washing compounds on the granite steps (α,3-dimethylstyrene, β-pinene, D-sylvestrene, α-terpineol, endo-isobornyl acetate, α-terpinyl acetate, vinyl acetate, longifolene, camphor, linalool, eugenol, benzyl acetate, phenylethyl alcohol), 2 unique ambient street notes (2-methylbutane, tetrahydrofuran), and 1 unique crowd combustion marker (CO_2). Organic extraction markers (2-ethylhexanol, ethyl acetate, acetic acid) link the ambient steps directly to the stair washing climax.
- **Washed Stairs, Ambient Stairs, and Church Concentration (Figure S8, Table S21):** As crowds assemble at the forecourt, shared organic extraction notes (2-ethylhexanol, ethyl acetate) link ambient steps to the washed stairs, leaving 16 unique compounds belonging exclusively to the washed granite steps, 2 unique ambient notes (2-methylbutane, tetrahydrofuran), and 1 unique crowd-released botanical marker (*Z*-ocimene), with acetic acid acting as the single 3-way universal core marker.
- **Ambient Stairs, Procession March, and Church Concentration (Figure S13, Table S26):** Comparing ambient steps, procession march, and church forecourt concentration isolates 4 unique ambient air species (2-methylbutane, tetrahydrofuran, 2-ethylhexanol, ethyl acetate), 1 unique processional crowd marker (CO_2), and 1 unique forecourt botanical marker (*Z*-ocimene), with acetic acid linking the ambient steps to the forecourt crowd arrival.
- **Beginning of Mass, Incensation, and Ambient Stairs (Figure S9, Table S22):** Indoors, 12 unique resinous

and aromatic smoke species define sanctuary incensation (sulcatone, tetraethylene glycol diethyl ether, 4-methoxycinnamaldehyde, octyl acetate, naphthalene, 2-phenoxyethanol, safrole, patchouli alcohol, isopropyl myristate, 3-(1,3-benzodioxol-5-yl)-2-propenal, octacosanol), 1 unique marker defines the mass opening (carbitol), and 4 unique notes mark ambient stairs. Shared 2-butoxyethanol and acetic acid bridge indoor mass liturgy, thurible incensation, and exterior stairs, proving sanctuary incense smoke leaks through open church doors to blend with exterior air.

- **Washed Stairs, Ambient Stairs, and Filtered Water (Figure S6, Table S19):** Comparing washed stairs, ambient stairs, and filtered *água de cheiro* demonstrates that shared extraction markers (2-ethylhexanol, ethyl acetate) link ambient steps to washed stairs, while carbitol and 2-butoxyethanol define the liquid terracotta extract, and acetic acid forms the universal core across all three spatial nodes.

- **Washed Stairs, Botanical Maceration, and Sanctuary Incensation (Figure S10, Table S23):** Evaluating the core syncretic threshold demonstrates that 6 shared monoterpenes (α-pinene, *p*-cymene, eucalyptol, linalool, camphor, isoterpinolene) directly connect raw leaf maceration at Memorial das Baianas to the public stair washing climax, while safrole and 2-butoxyethanol bridge botanical maceration with thurible incensation, and acetic acid spans all three sacred domains simultaneously.

Beyond spatial encounters, individual character smellscapes exert profound, multi-directional influences upon one another, shaping the main event through mutual chemical contamination and perceptual enhancement. The Priest's indoor sanctuary incensation does not remain confined to the nave; instead, continuous thurible swinging releases volatile sesquiterpenes (α-pinene, caryophyllene, cedrol, olibanum notes) that drift through open church doors, coating granite steps before washing begins. When the Baiana arrives on Day 2 and pours *água de cheiro* onto stone steps, thermal friction and mechanical scrubbing volatilize her monoterpenes (linalool, camphor, eucalyptol) and green aldehydes (2-hexenal), which instantly mix with lingering indoor incense smoke. This mutual influence creates the iconic syncretic threshold: cool, fresh herbal steam of Candomblé purification water directly alters warm, resinous Catholic incense lingering on granite.

Simultaneously, the Reveller acts as a physical vector of volatile transfer between street gastronomy, processional crowds, and sacred space. As the Reveller moves from *dendê* frying stalls (*tabuleiros*) to the 8-kilometer march, he/she carries lipophilic frying aldehydes (*E*-2-decenal) and sulfurous garlic notes on clothing, while continually spraying commercial lavender cologne (*Alfazema*) into the surrounding air. As thousands of revellers assemble at the church forecourt, their collective lavender spraying creates a dense, airborne monoterpene cloud that engulfs the Baianas' herbal water and the Priest's balcony blessing alike. The individual characters do not merely occupy separate spaces; their physical movements and ritual actions continuously contaminate, modify, and enrich one another's scent footprints, transforming discrete personal practices into the singular, unified, and community-validated smellscape of the *Lavagem do Bonfim*.

This study demonstrates that Intangible Cultural Heritage (ICH) can be empirically captured, mapped, and preserved by framing individual sensory choices as micro-level actuators of macro-level cultural continuity. By fusing advanced analytical chemistry (active Tenax® TA headspace sampling, GC–MS/O, linear retention index matching, and blank/packaging contaminant filtering) with sensory ethnography, participatory interviews, and street intercept surveys (n = 52), the complex, syncretic smellscape of the *Lavagem do Bonfim* during January 2025 was successfully documented.

Translating this interdisciplinary methodology into three distinct narrative storylines, the Baiana do Acarajé, the Catholic Father, and the Participant/Reveller, reveals how individual practices synthesize across spatial nodes and 48-hour temporal sequences. The Baiana acts as the botanical, culinary, and matriarchal anchor through *dendê* frying lipids, fresh leaf maceration, ancestral laundry preparations, and *água de cheiro* stair cleansing. The Father provides the sacred liturgical anchor through sanctuary frankincense and rose incensations, altar florals, and balcony blessings. The Reveller serves as the dynamic multisensory integrator, carrying and mixing volatiles across maritime, feast, procession, and street stall environments.

Inter-character intersection analyses isolate a universal 23-compound chemical fingerprint (α-pinene, β-pinene, camphor, D-sylvestrene, eucalyptol, isoterpinolene, linalool, *p*-cymene, α-terpineol, α-terpinyl acetate, endo-isobornyl acetate, benzyl acetate, phenylethyl alcohol, eugenol, safrole, patchouli alcohol, longifolene, vinyl acetate, ethyl acetate, acetic acid, 2-butoxyethanol, carbitol, 2-ethylhexanol) that binds Afro-Brazilian cleansing water, Catholic resinous smoke, and public street celebration into an indivisible sensory unit. Community narratives confirm that this volatile threshold is perceived not as a static background, but as a living, embodied scent of strength, tenacity, and ancestry *"cheiro de força, de garra e de ancestralidade"*.

Distinguishing authentic cultural odorants from urban environmental baselines is critical when defining the sensory fingerprint of an open-air living event. By applying rigorous 3x blank filtering and purging ambient combustion products (e.g., benzene, toluene, xylene), the isolated 23-compound universal core represents the true, unadulterated sensomic fingerprint of the Lavagem do Bonfim. Rather than reflecting generic urban air, this 23-molecule suite consists strictly of authentic botanical monoterpenes (α-pinene, β-pinene, eucalyptol, linalool, camphor, p-cymene), floral esters and resinous fixatives (benzyl acetate, phenylethyl alcohol, eugenol, safrole, patchouli alcohol, longifolene), and organic fermentation/extraction products (acetic acid, 2-butoxyethanol, carbitol) that physically bridge Candomblé leaf maceration, Catholic thurible incense, and public lavender spraying into an indivisible cultural atmosphere.

Ultimately, this multisensory investigation achieves its primary objective: constructing the first empirical, chemically val-

idated smellscape map of the *Lavagem do Bonfim* by systematically linking volatile organic emissions to the lived, ancestral experiences of its key custodians. By capturing how volatile heritage moves, transforms, and interlocks across spatial nodes and participant roles, this framework transcends static chemical archiving. It demonstrates that intangible cultural heritage is preserved not as isolated chemical formulas, but as a dynamic, living, and community-validated sensory archive. Moving beyond ocularcentric paradigms and static museum archiving, this multisensory documentation framework provides heritage professionals, urban planners, and local communities with an innovative, replicable blueprint to systematically capture and protect endangered cultural landscapes across global traditions.

Author Contributions

Conceptualization: L.P.Q., E.P., C.B., I.B.R.N.; Methodology: L.P.Q., E.P., I.B.R.N.; Validation: L.P.Q., E.P.; Formal analysis: L.P.Q., B.C.L.R, E.P.; Investigation: L.P.Q.; Resources: M.S., I.B.R.N.; Data Curation: L.P.Q., E.P.; Writing - Original Draft: L.P.Q.; Writing - Review & Editing: B.C.L.R., C.B., E.P., M.S., A.M.R., I.B.R.N.; Visualization: L.P.Q.; Supervision: A.M.R., C.B., I.B.R.N.; Project administration: I.B.R.N.; Funding acquisition: A.M.R., I.B.R.N.; All authors have read and agreed to the published version of the manuscript.

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Data Availability

The data that support the findings of this study are available from the corresponding author, L.P.Q., upon reasonable request.

Conflicts of Interest

The authors declare no conflict of interest.

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Supplementary Material

Table S1: Chemical profiling and sensory descriptors for Commercial Lavender Perfume (*Alfazema*).

RT (min)	CAS	Area	Compound	Smell (Literature)	Smell (POM)
13.27	4254-15-3	1.39×10^8	s-1,2-propanediol	–	meaty, sulfurous
16.20	80-56-8	2.98×10^8	α-pinene	pine, turpentine, fresh, green, terpy	mint
16.68	79-92-5	7.46×10^7	camphene	camphoraceous, cooling, piney wood	mint
17.19	18172-67-3	1.49×10^8	(-)-β-Pinene	camphor, eucalyptus, herbal, pine	mint
17.65	13466-78-9	9.50×10^6	3-carene	citrus, cypress, pine, resinous	odorless
17.75	99-86-5	1.71×10^7	α-terpinen	balsamic, bitter, camphoraceous, pine	odorless
17.80	5989-27-5	3.03×10^8	d-limonene	citrus, fresh, lemon, minty, orange	herbal, mint
17.89	527-84-4	2.53×10^8	o-cymene	–	earthy, phenolic
18.17	470-82-6	1.05×10^8	Eucalyptol	camphor, citrus, eucalyptus, fresh	odorless
18.34	106-62-7	2.19×10^8	dipropylene glycol	alcoholic, odorless, sweet	meaty, sulfurous
18.55	106-62-7	3.17×10^7	dipropylene glycol	alcoholic, odorless, sweet	meaty, sulfurous
18.75	78-70-6	5.16×10^8	Linalool	bergamot, french lavender, floral, sweet	odorless
18.93	586-62-9	8.98×10^7	terpinolen	sweet, pine, balsamic, bitter	odorless
19.83	10522-34-6	1.11×10^8	nonyl-2-methylpropanoate	–	odorless
20.32	138-87-4	3.36×10^7	β-terpineol	herbal, sour, sweet, woody	mint
20.45	60-12-8	5.18×10^7	Phenylethyl alcohol	rose, pure pea, roselike	odorless
20.99	140-11-4	4.56×10^7	Benzyl acetate	pear, flowery, jasmine, gardenia, floral	meaty, roasted
21.14	562-74-3	4.75×10^7	4-terpineol	pine, balsamic, bitter, camphoraceous	odorless
21.25	76-22-2	3.88×10^8	Camphor	fragrant, aromatic, solvent, terpenic	odorless
21.39	10482-56-1	3.30×10^8	α-terpieol	–	odorless
21.46	115-95-7	2.69×10^8	bergamiol	floral-fruity, bergamot, pear, sweet	odorless
21.53	586-81-2	9.24×10^7	pi-terpineol	balsamic, bitter, camphoraceous, pine	odorless
22.21	499-97-8	2.95×10^7	pseudolimonene	aromatic, camphoraceous, citrus, herbal	herbal, mint
22.89	10198-23-9	4.71×10^8	β-terpinylacetate	balsamic, bitter, camphoraceous, pine	odorless
23.46	31187-53-8	5.54×10^7	neoisothujylalcohol	–	Unmapped
23.72	5655-61-8	3.32×10^8	endo-Isobornylacetate	–	odorless
24.28	89-49-6	1.89×10^8	Isopulegylacetate	–	odorless
24.85	80-26-2	2.11×10^9	α-terpineol acetate	balsamic, bitter, camphoraceous, pine	odorless
25.06	5986-55-0	4.10×10^7	Patchouli alcohol	camphoraceous, earthy, patchouli, woody	odorless
26.25	97-53-0	5.07×10^7	Eugenol	cloves, warm, spicy, floral, carnation	meaty
27.51	128-51-8	3.94×10^7	Nopylacetate	–	odorless
27.66	3691-12-1	4.04×10^7	α-guaiene	balsamic, dry, guaiacwood, powdery	odorless
27.96	87-44-5	9.65×10^7	Caryophyllene	cedar, fresh, sharp, spicy, woody	mint
28.91	470-40-6	4.06×10^7	Thujopsene	dry, spicy, woody	odorless
30.11	1405-16-9	3.92×10^7	Patchoulene	–	odorless
30.96	88-84-6	5.59×10^7	β-guaiene	balsamic, dry, guaiacwood, powdery	odorless
31.17	93-16-3	3.94×10^7	Isohomogenol	–	roasted

Table S2: Chemical profiling and sensory descriptors for Nautical Procession (*Baía de Todos-os-Santos*).

RT (min)	CAS	Area	Compound	Smell (Literature)	Smell (POM)
13.52	2613-65-2	3.95×10^6	1-ethyl-3-methyl-cyclopentane	–	odorless
13.84	40648-24-6	8.33×10^6	1-tert-Butoxy-3-Methylcyclohexene	citrus	odorless
14.39	74630-38-9	4.62×10^7	5-methyl-1-undecene	–	odorless
14.80	111-84-2	1.48×10^8	Nonane	gasoline, fatty, lamb, meaty, savory	odorless
15.04	36653-82-4	2.19×10^7	1-hexadecanol	odorless, bland, clean, fat, floral	odorless
15.66	932-40-1	1.48×10^7	diethylcyclopentane	–	odorless
15.73	–	5.42×10^7	4-methyl-nonane	gasoline, hydrocarbon	Unmapped
15.88	6750-34-1	3.13×10^7	3,7,11-Trimethyl-1-dodecanol	citrus, coconut, earthy, fatty, soapy	odorless
16.11	56554-77-9	1.40×10^7	13-heptadecyn-1-ol	–	odorless
16.30	124-18-5	9.61×10^7	decane	amber, floral, musk, sandalwood, sweet	odorless
16.67	13837-66-6	2.24×10^7	m-menthane	–	odorless
16.74	2004-39-9	9.32×10^6	1-heptacosanol	–	odorless
17.15	56554-88-2	9.97×10^6	5-octadecenal	–	odorless
17.23	2425-77-6	1.76×10^7	2-hexyl-decanol	–	odorless
17.46	112-70-9	8.52×10^6	1-tridecanol	earthy, musty, fruity, moldy, sweet	odorless
18.34	2783-26-8	2.85×10^7	2-tolyloxirane	spice	roasted
19.90	91531-36-1	3.11×10^7	5,9,9-trimethyl-Spiro[3.5]nona-5,7-dien-1-one	–	odorless
20.45	2439-43-2	6.28×10^7	2-phenylbutanal	floral, fruity, green	odorless
21.00	140-11-4	7.61×10^6	Benzyl acetate	pear, flowery, jasmine, sweet floral	meaty, roasted
21.64	119-64-2	2.08×10^7	Naphthalene	benzene & menthol-like, moldy, brothy	odorless
21.93	6682-71-9	7.36×10^6	4,7-dimethylindan	varnish	phenolic
22.62	1075-16-7	4.44×10^6	Benzocycloheptene	–	odorless
22.75	275-51-4	1.07×10^7	azulene	earthy, musty, woody	odorless

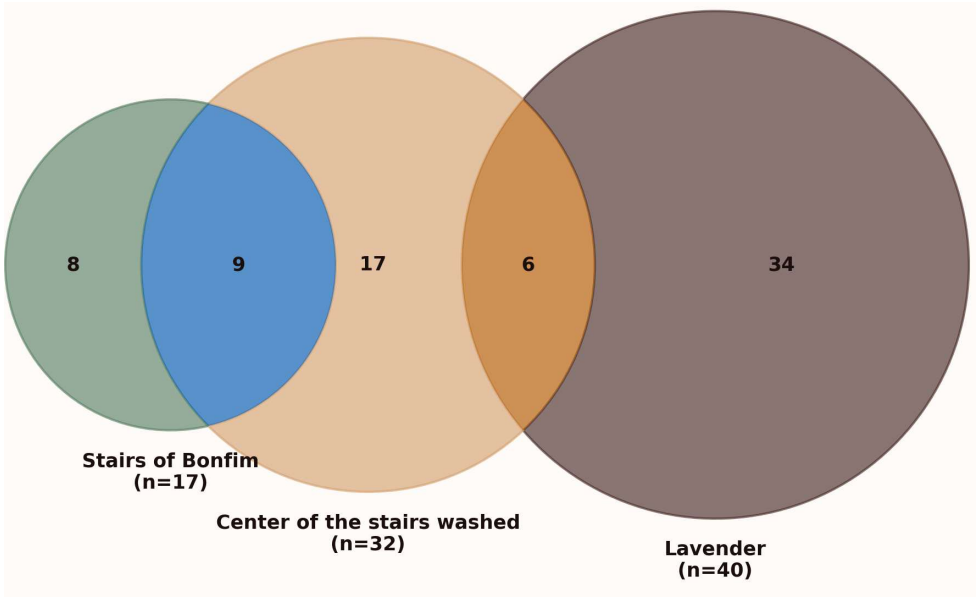


Fig. S1. Three-way Venn diagram detailing volatile intersections between Commercial Lavender Cologne, Center Stairs Washed, and Ambient Stairs.

Table S3: Chemical profiling, olfactometry, and sensory descriptors for Center of Church Stairs Washed.

RT (min)	CAS	Area	Compound	Smell (Literature)	GC-O Smell	Confidence
9.98	64-19-7	7.40×10^6	Acetic acid	pungent, sour, vinegar, mercaptan	sweet, cinnamon	Level 2
10.51	108-05-4	5.81×10^5	Vinyl acetate	sharp, irritating, fruity, rummy	sweet, cinnamon	Level 2
10.78	141-78-6	3.93×10^7	Ethyl acetate	ether, pineapple, cognac, rummy	sweet, cinnamon	Level 2
16.21	80-56-8	2.81×10^6	a-pinene	pine, turpentine, fresh, green	sweet, fruity, herbal	Level 2
16.68	127-91-3	4.74×10^6	β-pinene	turpentine, dry, woody, piney	warm, sweet, cinnamon	Level 2
17.46	104-76-7	6.57×10^6	2-ethyl-hexanol	oily, sweet, floral, rose	slightly, woody	Level 2
17.80	1461-27-4	2.20×10^7	D-sylvestrene	citrus, fresh, piney, herbal	fresh, citrus	Level 2
17.89	99-87-6	2.13×10^6	p-cymene	sweetish, citrus, cilantro, cumin	herbal, fresh	Level 2
18.18	470-82-6	1.02×10^7	Eucalyptol	camphoraceous, eucalyptus, fresh	cooling, eucalyptus	Level 2
18.74	78-70-6	5.56×10^7	Linalool	citrus, floral, fresh, lavender	lavender, floral	Level 1
18.94	586-63-0	3.70×10^6	Isoterpinolene	balsamic, bitter, pine	fresh, flowery	Level 2
20.45	60-12-8	1.47×10^7	Phenylethyl alcohol	rose, honey-like, floral	rose, floral	Level 2
21.00	140-11-4	3.84×10^6	Benzyl acetate	pear, flowery, jasmine, gardenia	sweet, floral	Level 2
21.25	76-22-2	4.59×10^7	Camphor	camphoraceous, cooling, minty	camphoraceous, mint	Level 1
21.39	98-55-5	4.35×10^7	a-terpineol	anise, citrus, floral, lilac	piney, floral	Level 2
23.73	5655-61-8	1.20×10^7	endo-Isobornyl acetate	piney, camphoraceous, herbal	sweet wood	Level 2
24.81	80-26-2	1.58×10^8	a-terpinyl acaetate	balsamic, bitter, camphoraceous	piney, herbal	Level 2
26.27	97-53-0	9.96×10^6	Eugenol	cloves, warm, spicy, floral	warm spice, cloves	Level 2
28.11	475-20-7	4.74×10^6	Longifolene	piney, woody, dry	dry cedar, woody	Level 2

Table S4: Chemical profiling, olfactometry, and sensory descriptors for Beginning of Mass Liturgy.

RT (min)	CAS	Area	Compound	Smell (Literature)	GC-O Smell	Confidence
9.93	64-19-7	4.58×10^6	Acetic acid	mercaptan, sour, vinegar	rancid, acidic, cheesy	Level 2
15.75	111-76-2	5.23×10^6	2-butoxy-ethanol	ether, rancid, sweet, medicinal	yeast, fermented	Level 2
17.54	111-90-0	2.43×10^7	Carbitol	–	woody, dusty	Level 2

Table S5: Chemical profiling, olfactometry, and sensory descriptors for Altar Incensation (*Thurible Smoke*).

RT (min)	CAS	Area	Compound	Smell (Literature)	GC-O Smell	Confidence
9.96	64-19-7	5.95×10^6	Acetic acid	pungent, sour, vinegar, mercaptan	woody, church-like, old	Level 2
15.74	111-76-2	2.72×10^7	2-butoxy-ethanol	ether, rancid, sweet, medicinal	sweet, herbal, spicy	Level 2
17.05	110-93-0	5.29×10^6	Sulcatone	fatty, green, citrus	nonanal-like, citrus	Level 2
17.49	4353-28-0	2.74×10^7	Tetraethylene glycol diethyl ether	waxy, ethereal	woody (intense), warm	Level 2
17.89	99-87-6	3.48×10^6	Unidentified	–	herbal, dry wood	Level 4
18.04	1963-36-6	4.25×10^7	4-methoxycinnamaldehyde	spicy, sweet, balsamic	sweet cinnamon, resinous	Level 2
20.33	112-14-1	4.36×10^6	Octyl acetate	fruity, floral, waxy	orange peel, waxy	Level 2
22.75	91-20-3	2.26×10^6	Naphthalene	tarry, pungent, aromatic	mothball, pungent	Level 2
22.83	122-99-6	1.17×10^7	2-phenoxy-ethanol	aromatic, alcohol, sweet	honey-like, floral	Level 2
24.50	94-59-7	8.51×10^6	Safrole	sassafras, anisic, spicy, sweet	warm spicy, sassafras	Level 2
25.06	5986-55-0	1.65×10^7	Patchouli alcohol	camphoraceous, earthy, patchouli	woody, earthy, patchouli	Level 2
25.38	110-27-0	9.02×10^6	Isopropyl myristate	faint oily, waxy	waxy, clean	Level 2
27.56	58095-77-5	9.80×10^7	3-(1,3-Benzodioxol-5-yl)-2-propenal	spicy, cinnamon, balsamic	heavy balsam, incense	Level 2
32.95	557-61-9	3.99×10^7	Octacosanol	waxy, odorless	faint wax, candle-like	Level 2

Table S6: Chemical profiling and sensory descriptors for Stairs of Bonfim Church (*Ambient Outdoor Air*).

RT (min)	CAS	Area	Compound	Smell (Literature)	Smell (POM)
7.91	78-78-4	1.53×10^6	2-methyl-butane	gasoline	ethereal, gassy, solvent
9.90	64-19-7	5.83×10^6	Acetic acid	pungent, sour, vinegar, mercaptan	meaty, sulfurous
10.77	141-78-6	4.23×10^6	Ethyl acetate	ether, pineapple, cognac, rummy	meaty, sulfurous
11.34	109-99-9	4.82×10^6	tetrahydro-furan	ether, fruity, burnt, smoke, spice	sweet
17.45	–	7.33×10^6	2-ethyl-hexanol	–	cheesy

Table S7: Chemical profiling and sensory descriptors for Feijoada Feast.

RT (min)	CAS	Area	Compound	Smell (Literature)	Smell (POM)
9.90	110-46-3	6.90×10^6	Amyl nitrite	fragrant, somewhat fruity	odorless
10.05	64-19-7	1.05×10^7	Acetic acid	pungent, sour, vinegar, mercaptan	meaty, sulfurous
10.51	431-03-8	8.47×10^6	2,3-butanedione	chlorine, buttery, caramel, sweet	odorless
10.77	141-78-6	1.30×10^6	Ethyl acetate	ether, pineapple, cognac, rummy	meaty, sulfurous
11.60	565-59-3	1.54×10^5	2,3-dimethylpentane	–	ethereal
11.68	79-09-4	1.16×10^6	propanoic acid	pungent, rancid, acidic, labdanum	cheesy, meaty
12.91	513-86-0	4.41×10^6	acetoin	buttery, bland, woody, yogurt	meaty, roasted
14.46	127-18-4	2.93×10^6	Tetrachloroethylene	ether, chloroform, chlorinated	sulfurous
18.85	56554-87-1	1.42×10^7	16-octadecenal	fatty	odorless
21.84	93-51-6	6.01×10^6	p-creosol	–	meaty, roasted
22.82	122-99-6	5.06×10^6	2-phenoxy-ethanol	aromatic, alcohol, ether, sweet	meaty

Table S8: Chemical profiling, olfactometry, and sensory descriptors for Botanical Maceration of Flowers.

RT (min)	CAS	Area	Compound	Smell (Literature)	GC-O Smell	Confidence
9.96	64-19-7	5.70×10^6	Acetic acid	pungent, sour, vinegar	acetic acid, really strong	Level 2
11.14	67-66-3	7.09×10^6	trichloromethane	etheric, nonirritating	sweat	Level 2
13.03	25237-79-0	3.82×10^5	TMS derivative	–	flower-like	Level 2
14.94	928-96-1	7.20×10^6	3-hexen-1-ol	grassy-green, freshly cut grass	banana, earthy	Level 2
15.12	6728-26-3	2.80×10^6	2-hexenal	green, apple, leafy, fresh	banana, earthy	Level 2
15.74	111-76-2	8.20×10^6	2-butoxy-ethanol	ether, rancid, sweet, medicinal	really sweet fruit, lactone	Level 2
16.21	80-56-8	3.04×10^8	a-pinene	pine, turpentine, fresh, green	lavender-like, fresh flower	Level 2
16.68	123-35-3	3.16×10^8	b-myrcene	terpene, anisic, balsamic, green	green fresh, grass	Level 2
16.89	555-10-2	1.32×10^7	b-phellandrene	–	mushroom, forest floor	Level 2
17.20	18172-67-3	3.89×10^7	(-)-β-Pinene	camphor, eucalyptus, herbal	green fresh, grass	Level 2
17.65	13466-78-9	1.22×10^7	3-carene	citrus, cypress, pine, resinous	burnt rubber, bitter	Level 2
17.80	5989-27-5	4.52×10^8	D-limonene	citrus, fresh, lemon, minty	humid, wet, flower, mint	Level 2
17.89	99-87-6	3.61×10^7	p-cymene	sweetish, citrus, cilantro, cumin	humid, wet, flower, mint	Level 2
18.18	470-82-6	3.22×10^8	Eucalyptol	camphoraceous, eucalyptus, fresh	humid, wet, flower, mint	Level 2
18.74	78-70-6	1.39×10^8	Linalool	bergamot, lavender, floral, sweet	humid, wet, flower, mint	Level 2
18.93	586-63-0	4.80×10^6	Isoterpinolene	balsamic, bitter, camphoraceous	fresh, flowery, white	Level 2
19.10	4045-44-7	6.93×10^6	Czclopentadiene	–	green, herbal, spicy	Level 2
19.65	7787-20-4	9.47×10^6	L-Fenchone	–	very wet, fresh, blue	Level 2
19.89	471-15-8	3.47×10^7	b-thujone	–	very wet, fresh, blue	Level 2
20.64	89-78-1	7.96×10^6	Menthol	peppermint, cooling, herbal	mold, damp	Level 2
20.71	14073-97-3	2.90×10^7	L-menthone	peppermint, menthol-like	food, mushroom	Level 2
21.08	10458-14-7	5.20×10^7	Menthone	fruity, herbaceous, tropical	spicy, savory, plastic-like	Level 2
21.24	76-22-2	5.12×10^7	Camphor	fragrant, aromatic, terpenic	spicy, savory, plastic-like	Level 2
21.36	124-76-5	4.30×10^7	Isoborneol	camphor, earthy, musty, moldy	mold, damp	Level 2
21.46	115-95-7	9.20×10^7	Linalzl acetate	floral-fruity, bergamot-lavender	very sweet, medicinal	Level 2
21.63	140-67-0	6.61×10^8	Estragole	anise-like, sweet, basil, spicy	spicy, savory, plastic-like	Level 2
21.83	547-60-4	1.19×10^7	trans-3-Pinanone	camphoraceous, fir needle, spicy	spicy, savory, plastic-like	Level 2
21.99	106-24-1	3.66×10^6	Geraniol	sweet rose, geranium, floral	sweet, medicinal	Level 2
22.80	80-57-9	6.06×10^7	Verbenone	celery, herbal, warm	very wet, blue, damp	Level 2
23.03	89-82-7	5.90×10^7	Pulegone	peppermint, camphoraceous	minty, cooling, toothpaste	Level 2
23.51	125-12-2	3.45×10^7	Isobornyl acetate	pine needles, camphoraceous	sweet	Level 2
23.92	4180-23-8	1.28×10^8	trans anethole	anise, licorice, medicinal	sweet	Level 2
24.33	123-11-5	2.09×10^7	4-methoxz-benzaldeyde	hawthorn, sweet powdery, vanilla	sweet	Level 2
24.54	94-59-7	1.06×10^9	Safrole	sassafras, anisic, spicy, sweet	minty fresh, solvent	Level 2
24.82	81601-03-8	6.86×10^6	Geranyl oleate	–	minty fresh, solvent	Level 2
24.93	107584-38-3	5.16×10^6	Dehydropipernonaline	–	minty fresh, solvent	Level 2
26.72	491-09-8	1.15×10^7	Piperitenone	minty, phenolic, sharp	baby diaper	Level 2
27.98	30220-46-3	6.62×10^6	Ingenol	–	plastic, softener, soft	Level 2
31.01	7448-86-4	9.09×10^6	p-methoxzacrzlophenone	–	mushroom, forest	Level 2
31.54	39029-41-9	4.10×10^7	y-cadinene	–	buttery, salty, popcorn	Level 2

Table S9: Chemical profiling, olfactometry, and sensory descriptors for Filtered *Água de Cheiro*.

RT (min)	CAS	Area	Compound	Smell (Literature)	GC-O Smell	Confidence
9.93	64-19-7	4.58×10^6	Acetic acid	mercaptan, sulfurous	acetic acid, vinegar	Level 2
15.75	111-76-2	5.23×10^6	2-butoxy-ethanol	ether, rancid, sweet, medicinal	sweet fruit, ripe kiwi	Level 2
17.54	111-90-0	2.43×10^7	Carbitol	–	mushroom, powder	Level 2

Table S10: Chemical profiling and sensory descriptors for Recently Washed Baiana White Clothes.

RT (min)	CAS	Area	Compound	Smell (Literature)	Smell (POM)
9.90	554-61-0	7.67×10^6	2-carene	–	odorless
17.45	104-76-7	7.85×10^6	ethylhexanol	oily, sweet, floral, rose	cheesy
17.80	5989-27-5	2.00×10^7	D-limonene	citrus, fresh, lemon, minty	herbal, mint
17.89	99-87-6	7.11×10^6	p-cymene	sweetish, citrus, cilantro, cumin	odorless
18.08	18479-58-8	1.29×10^7	dihydromyrcenol	citrus, floral, fresh, lavender	odorless
18.73	77-53-2	2.22×10^7	cedrol	woody-earthy, cedar, clean	odorless
21.44	1222-05-5	6.08×10^6	Galaxolide	musk, ether, floral, sweet	odorless
22.56	88-29-9	1.19×10^7	versalide	ambrette, floral, musk, sweet	odorless
24.28	118-56-9	1.78×10^7	Homosalate	medicinal, mentholic	odorless
24.78	80-26-2	1.76×10^7	α-terpinylacetate	balsamic, bitter, camphoraceous, pine	odorless
25.05	5986-55-0	3.20×10^7	patchouli alcohol	camphoraceous, earthy, patchouli	odorless
25.37	32210-23-4	2.12×10^7	4-tert-butylcyclohexylacetate	–	odorless

Table S11: Chemical profiling and sensory descriptors for Left Side of Church Stairs (*Ambient Forecourt*).

RT (min)	CAS	Area	Compound	Smell (Literature)	Smell (POM)
6.67	7446-09-5	2.20×10^6	Sulfur dioxide	stinging, suffocating	odorless
9.98	64-19-7	6.98×10^6	Acetic acid	mercaptan, sulfurous	meaty
10.94	78-83-1	1.39×10^6	2-methyl-1-propanol	sweet, musty, wine	cheesy
11.99	71-43-2	1.88×10^6	Benzene	aromatic, gasoline, phenolic	burnt
17.72	100-52-7	4.86×10^6	benzaldehyde	almond, bitter, cherry	odorless
19.60	939-52-6	3.61×10^6	4-chlorobutyrophenone	buttery, camphoraceous	meaty

Table S12: Chemical profiling and sensory descriptors for Church Forecourt Concentration.

RT (min)	CAS	Area	Compound	Smell (Literature)	Smell (POM)
9.95	64-19-7	5.35×10^6	Acetic acid	pungent, sour, vinegar, mercaptan	meaty, sulfurous
17.53	29714-87-2	2.90×10^7	Ocimene	camphoraceous, celery, citrus, green, herbal	odorless

Table S13: Chemical profiling, olfactometry, and sensory descriptors for Tabuleiro Baiana Val.

RT (min)	CAS	Area	Compound	GC-O Smell / Olfactory Note	Confidence
6.67	7446-09-5	5.99×10^{6}	Sulfur dioxide	No Smell Detected	Level 3
9.06	124-63-0	4.17×10^{7}	Methanesulfonyl chloride	flowery perfume	Level 2
9.89	110-46-3	9.95×10^{7}	Amyl nitrite	very faint burnt	Level 2
10.50	108-05-4	2.13×10^{8}	Acetic acid ethenyl ester	very sweet, mild, neutral	Level 2
10.63	372-38-3	2.22×10^{7}	Benzene, 1,2,4-trifluoro-	very sweet, mild, neutral	Level 2
11.61	565-59-3	1.44×10^{7}	Pentane, 2,3-dimethyl-	very sweet, mild, neutral	Level 2
12.68	4254-15-3	1.73×10^{6}	1,2-Propanediol, 3-(hexadecyloxy)-, diacetate	hot burnt ashes, smoke-like	Level 2
13.25	2050-08-0	9.23×10^{7}	n-Amyl isovalerate	hairdresser treatment-like	Level 2
15.34	100-41-4	8.78×10^{0}	Ethylbenzene	new plastic toy	Level 2
15.95	106-42-3	4.75×10^{6}	p-Xylene	mild, non-sharp, food-like	Level 2
16.29	57817-89-7	4.48×10^{7}	Stevioside	hazelnut	Level 2
16.42	593-08-8	1.35×10^{6}	3-Octadecanone	hazelnut	Level 2
16.90	620-14-4	6.51×10^{7}	Benzene, 1-ethyl-3-methyl-	plastic	Level 2
17.05	470-82-6	8.18×10^{7}	Eucalyptol	intense burnt plastic	Level 2
19.45	112-40-3	1.21×10^{2}	Dodecane	burnt food, coal-like	Level 2
20.66	38232-01-8	1.94×10^{0}	1-Hentetracontanol	aldehydic, fatty, citrus	Level 2
23.48	38232-01-8	3.13×10^{1}	1-Hentetracontanol (isomer)	waxy, sweet	Level 2
24.26	4270-51-2	2.34×10^{1}	Cholic acid, triacetate	medicinal, vanilla pudding	Level 2
27.52	1633-99-2	8.19×10^{1}	Pyridine derivative	slightly stale, unpleasant	Level 2

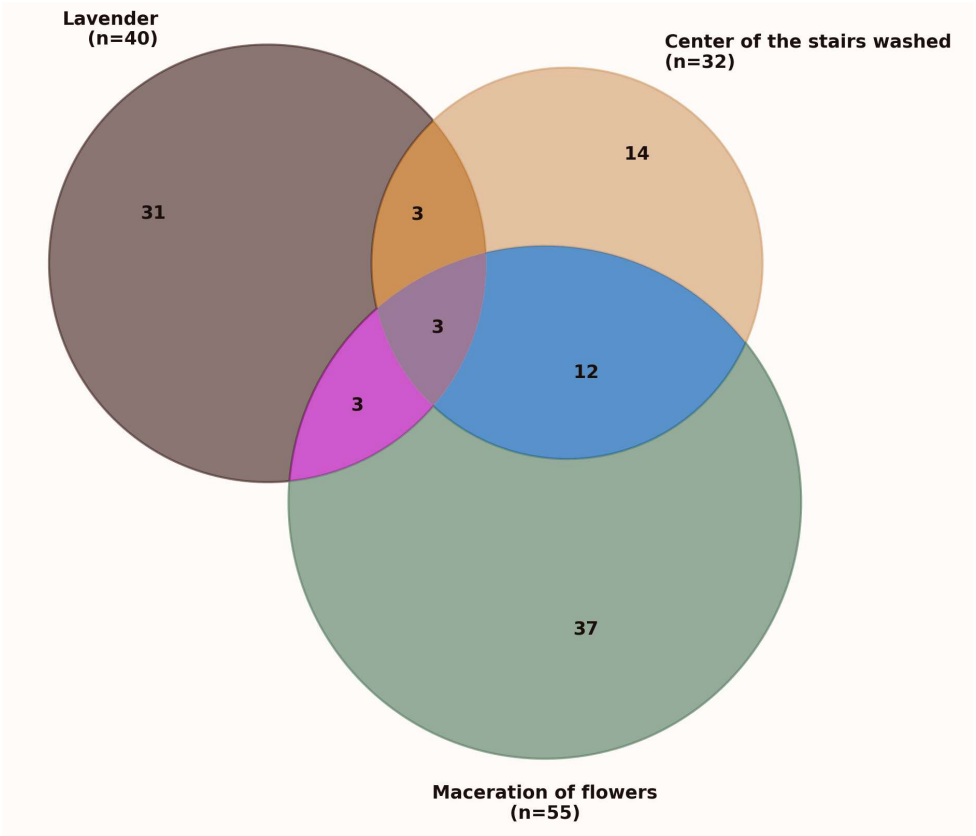


Fig. S2. Three-way Venn diagram detailing volatile intersections between Commercial Lavender Cologne, Center Stairs Washed, and Botanical Maceration of Flowers.

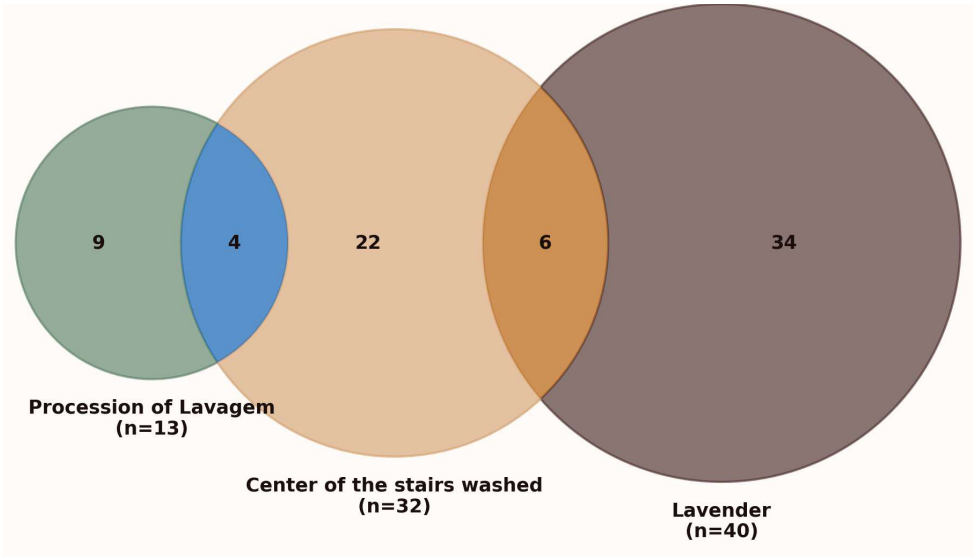


Fig. S3. Three-way Venn diagram detailing volatile intersections between Commercial Lavender Cologne, Center Stairs Washed, and Procession March.

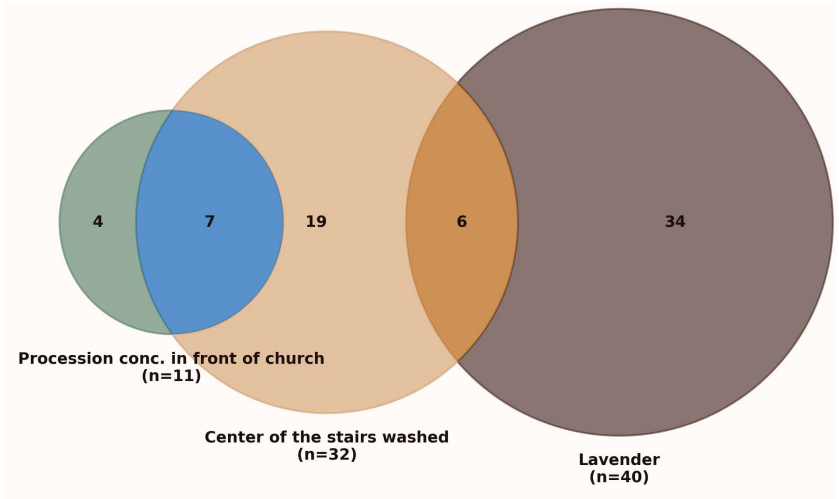


Fig. S4. Three-way Venn diagram detailing volatile intersections between Commercial Lavender Cologne, Center Stairs Washed, and Church Forecourt Concentration.

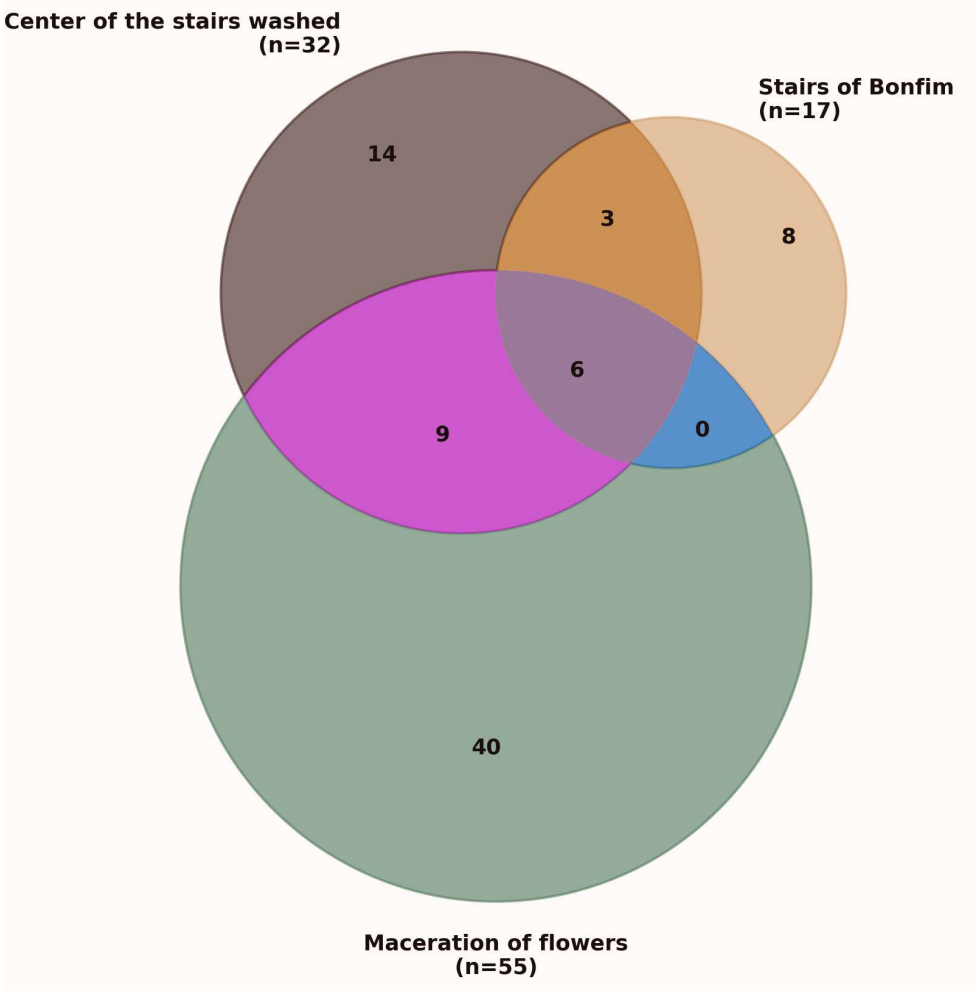


Fig. S5. Three-way Venn diagram detailing volatile intersections between Center Stairs Washed, Ambient Stairs, and Botanical Maceration of Flowers.

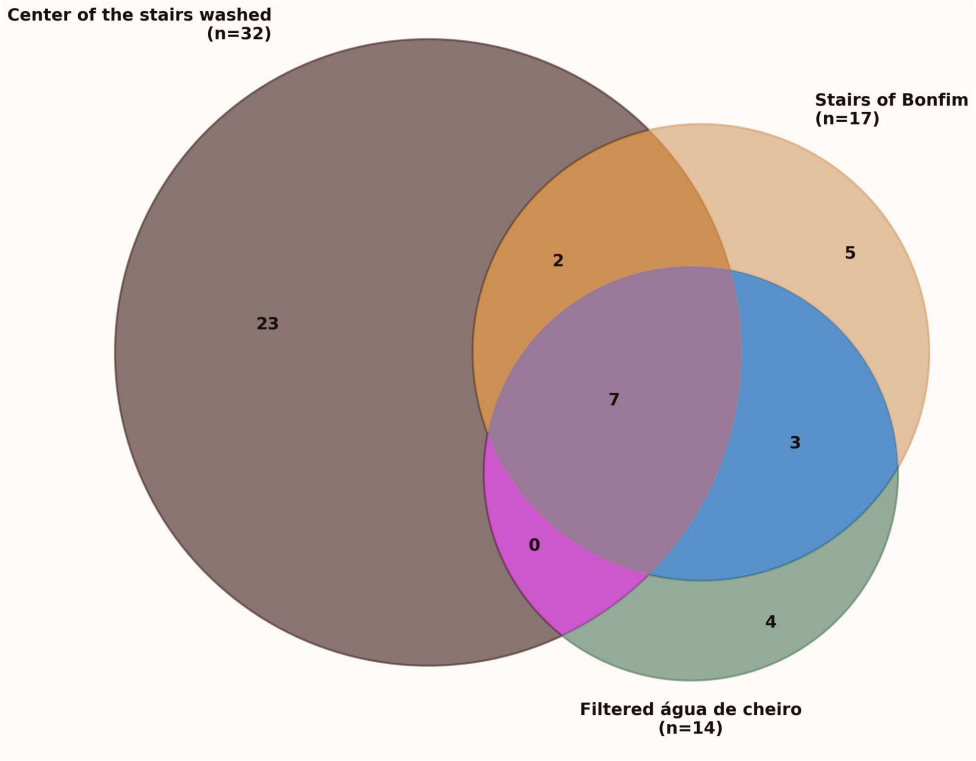


Fig. S6. Three-way Venn diagram detailing volatile intersections between Center Stairs Washed, Ambient Stairs, and Filtered *Água de Cheiro*.

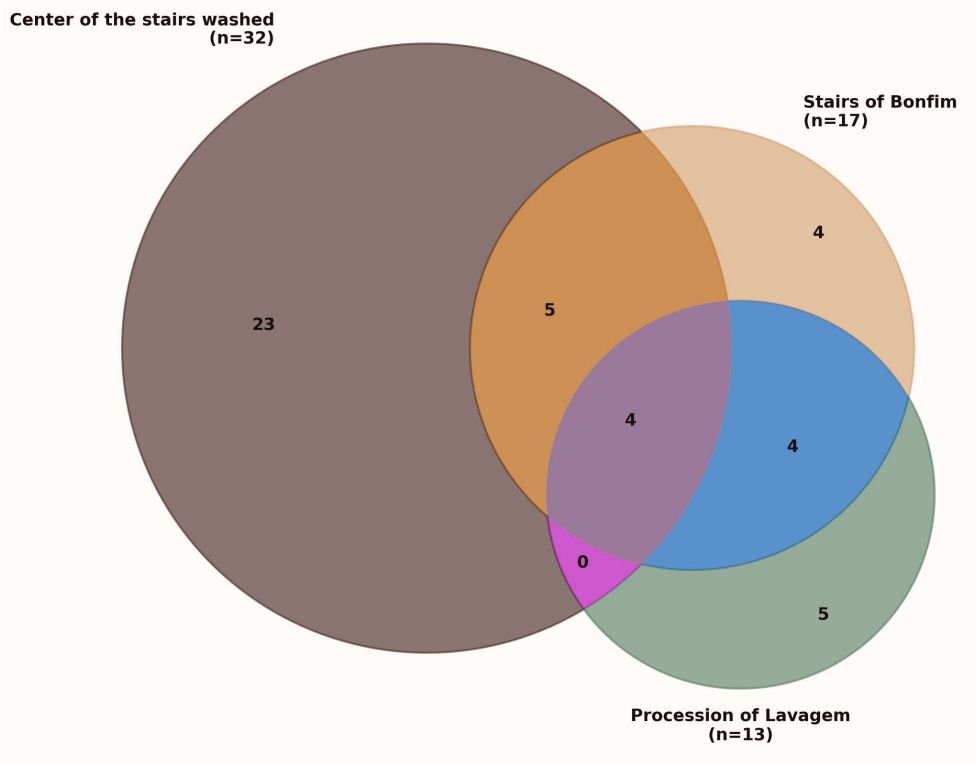


Fig. S7. Three-way Venn diagram detailing volatile intersections between Center Stairs Washed, Ambient Stairs, and Procession March.

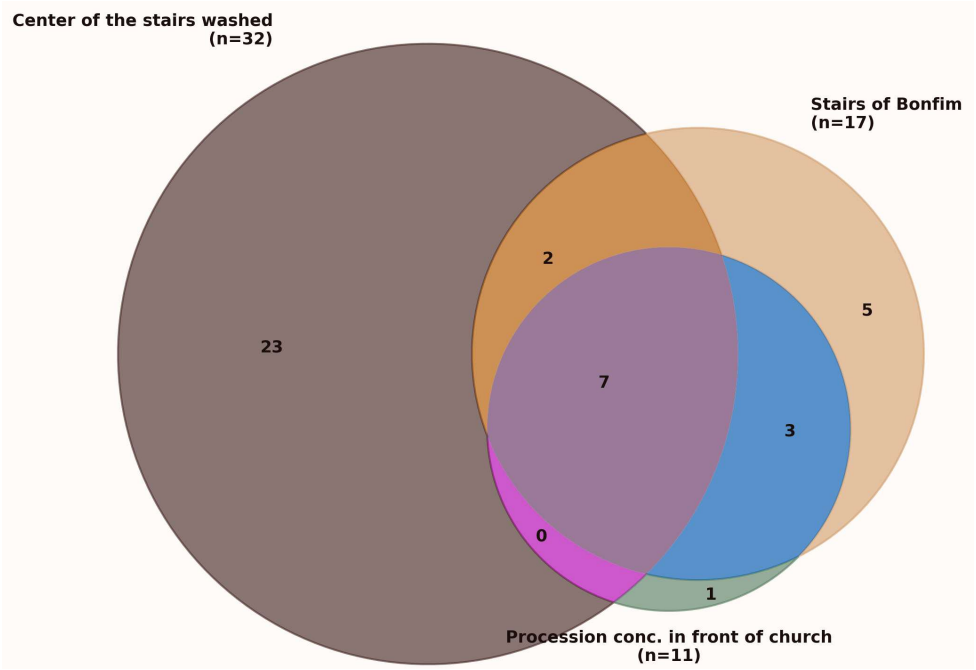


Fig. S8. Three-way Venn diagram detailing volatile intersections between Center Stairs Washed, Ambient Stairs, and Church Forecourt Concentration.

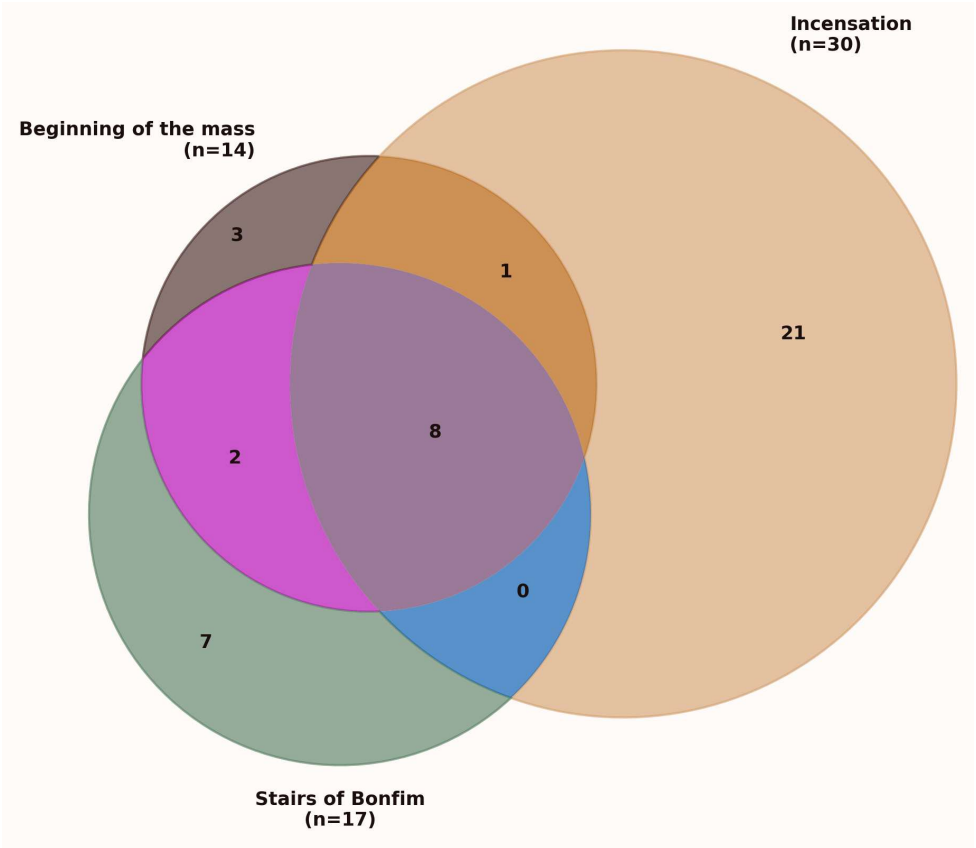


Fig. S9. Three-way Venn diagram detailing volatile intersections between Beginning of Mass Liturgy, Altar Incensation, and Ambient Stairs.

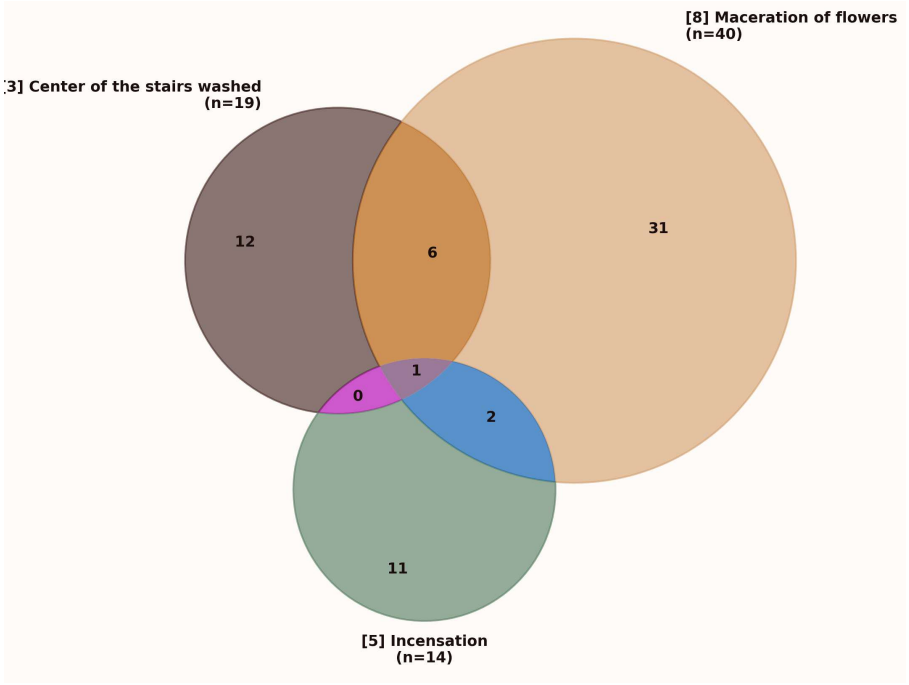


Fig. S10. Three-way Venn diagram detailing volatile intersections between Center Stairs Washed, Botanical Maceration of Flowers, and Altar Incensation.

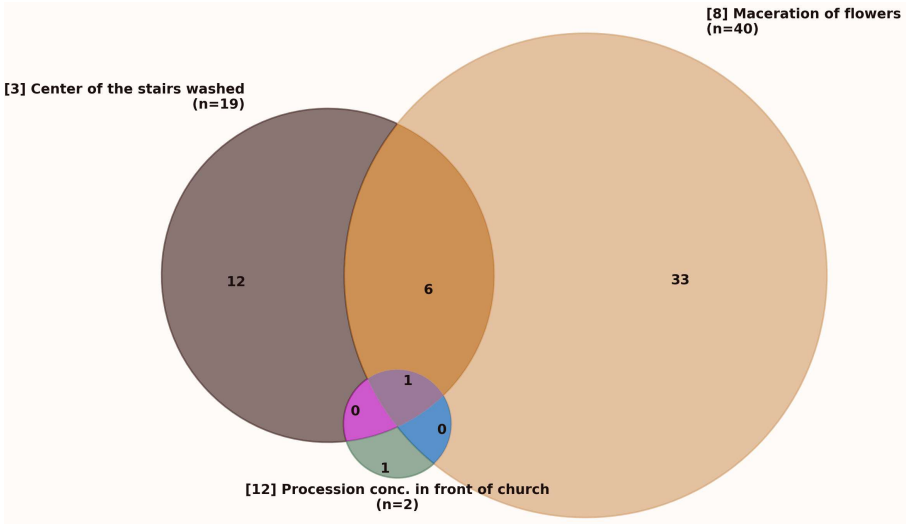


Fig. S11. Three-way Venn diagram detailing volatile intersections between Center Stairs Washed, Botanical Maceration of Flowers, and Church Forecourt Concentration.

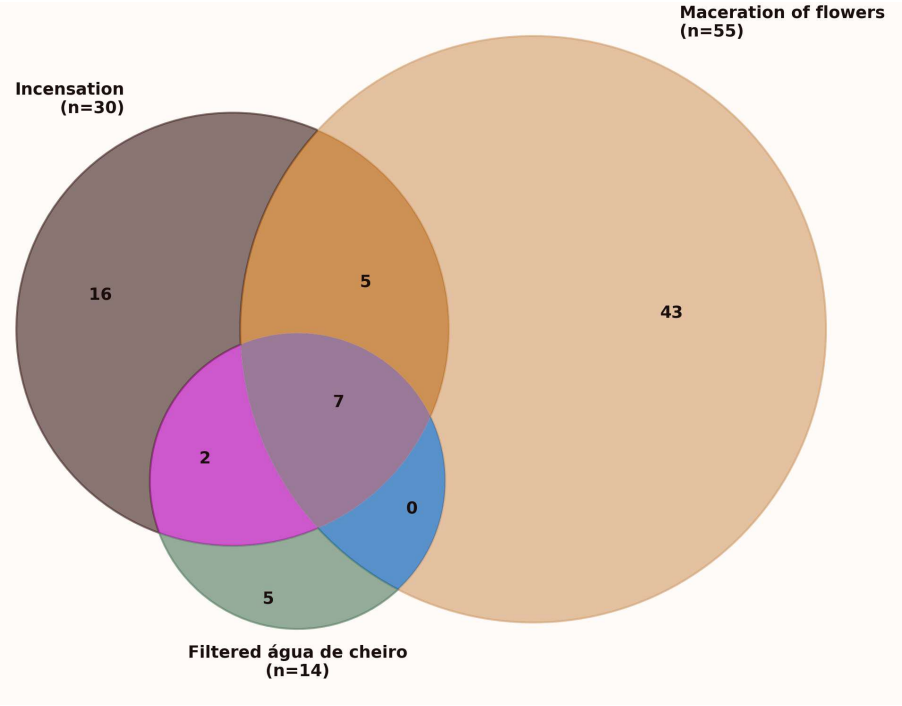


Fig. S12. Three-way Venn diagram detailing volatile intersections between Altar Incensation, Botanical Maceration of Flowers, and Filtered *Água de Cheiro*.

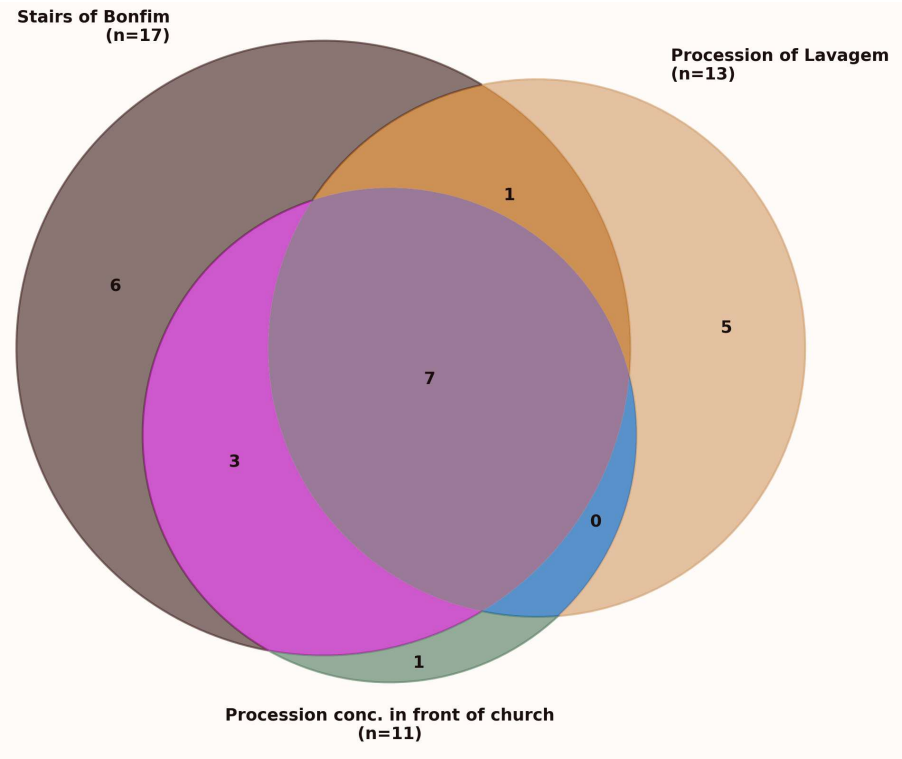


Fig. S13. Three-way Venn diagram detailing volatile intersections between Ambient Stairs, Procession March, and Church Forecourt Concentration.

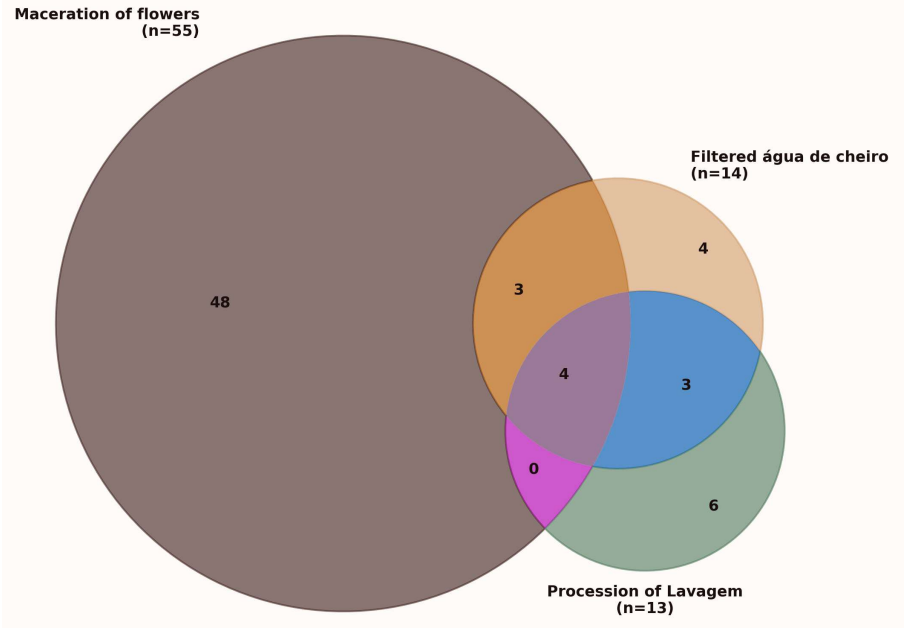


Fig. S14. Three-way Venn diagram detailing volatile intersections between Botanical Maceration of Flowers, Filtered *Água de Cheiro*, and Procession March.

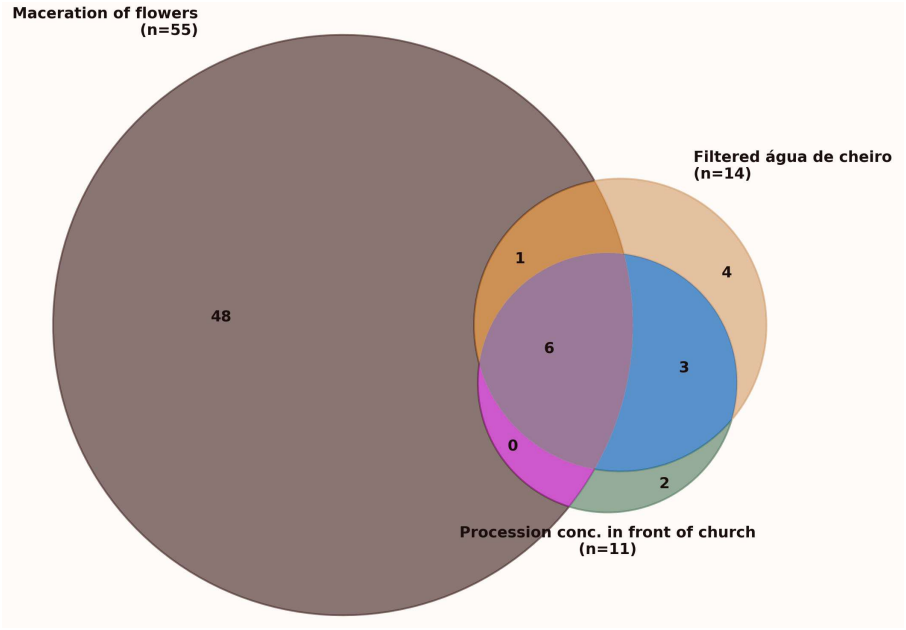


Fig. S15. Three-way Venn diagram detailing volatile intersections between Botanical Maceration of Flowers, Filtered *Água de Cheiro*, and Church Forecourt Concentration.

Table S14: Three-way Venn intersection analysis for Commercial Lavender Cologne vs. Center Stairs Washed vs. Ambient Stairs.

Unique to Lavender Cologne (n=33)	**Unique to Center Stairs Washed (n=13)**	**Unique to Ambient Stairs (n=4)**	**Shared Lavender & Stairs Washed (n=6)**	**Shared Stairs Washed & Ambient Stairs (n=8)**	**Shared Lavender & Ambient Stairs (n=0)**	**Shared by ALL 3 (n=0)**
(-)-β-Pinene	2-Ethyl-Hexanal	2-Methyl-Butane	Benzyl Acetate	2-Ethyl-Hexanol	–	–
3-Carene	A,3-Dimethylstyrene	P-Xylene	Camphor	4-Chlorobutyrophenone	–	–
4-Terpineol	A-Pinene	Pentene	Eucalyptol	Acetic Acid	–	–
α-Guaiene	A-Terpineol	Tetrahydro-Furan	Eugenol	Benzaldehyde	–	–
α-Pinene	A-Terpinyl Acaetate	–	Linalool	Benzene	–	–
α-Terpieol	β-Pinene	–	Phenylethyl Alcohol	Ethyl Acetate	–	–
α-Terpinen	D-Sylvestrene	–	–	Sulfur Dioxide	–	–
α-Terpineol Acetate	Endo-Isobornyl Acetate	–	–	Toluene	–	–
Bergamiol	Isoterpinolene	–	–	–	–	–
β-Guaiene	Longifolene	–	–	–	–	–
β-Terpineol	P-Cymene	–	–	–	–	–
β-Terpinylacetate	Vinyl Acetate	–	–	–	–	–
Camphene	–	–	–	–	–	–
Caryophyllene	–	–	–	–	–	–
D-Limonene	–	–	–	–	–	–
Dichlorobenzene	–	–	–	–	–	–
Dipropylene Glycol	–	–	–	–	–	–
Endo-Isobornylacetate	–	–	–	–	–	–
Isohomogenol	–	–	–	–	–	–
Isopulegylacetate	–	–	–	–	–	–
Neoisothujylalcohol	–	–	–	–	–	–
Nonyl-2-Methylpropanoate	–	–	–	–	–	–
Nopylacetate	–	–	–	–	–	–
O-Cymene	–	–	–	–	–	–
Patchoulene	–	–	–	–	–	–
Patchouli Alcohol	–	–	–	–	–	–
Pi-Terpineol	–	–	–	–	–	–
Pseudolimonene	–	–	–	–	–	–
S-1,2-Propanediol	–	–	–	–	–	–
Terpinolen	–	–	–	–	–	–
Thujopsene	–	–	–	–	–	–
Toluene Derivative	–	–	–	–	–	–
Unidentified	–	–	–	–	–	–

Table S15: Three-way Venn intersection analysis for Commercial Lavender Cologne vs. Center Stairs Washed vs. Botanical Maceration of Flowers.

Unique to Lavender Cologne (n=30)	**Unique to Center Stairs Washed (n=12)**	**Unique to Botanical Maceration (n=34)**	**Shared Lavender & Stairs Washed (n=3)**	**Shared Stairs Washed & Botanical Maceration (n=9)**	**Shared Lavender & Botanical Maceration (n=3)**	**Shared by ALL 3 (n=3)**
4-Terpineol	2-Ethyl-Hexanal	1,3-Dichlorobenzene	Benzyl Acetate	A-Pinene	(-)-β-Pinene	Camphor
α-Guaiene	2-Ethyl-Hexanol	2-Butoxy-Ethanol	Eugenol	Acetic Acid	3-Carene	Eucalyptol
α-Pinene	4-Chlorobutyrophenone	2-Hexenal	Phenylethyl Alcohol	Benzaldehyde	D-Limonene	Linalool
α-Terpieol	A,3-Dimethylstyrene	3-Hexen-1-Ol	–	Benzene	–	–
α-Terpinen	A-Terpineol	4-Methoxz-Benzaldeyde	–	Isoterpinolene	–	–
α-Terpineol Acetate	A-Terpinyl Acaetate	B-Myrcene	–	Longifolene	–	–
Bergamiol	β-Pinene	B-Phellandrene	–	P-Cymene	–	–
β-Guaiene	D-Sylvestrene	B-Thujone	–	Sulfur Dioxide	–	–
β-Terpineol	Endo-Isobornyl Acetate	Czclopentadiene	–	Toluene	–	–
β-Terpinylacetate	Vinyl Acetate	Dehydropipernonaline	–	–	–	–
Camphene	–	Estragole	–	–	–	–
Caryophyllene	–	Geraniol	–	–	–	–
Dichlorobenzene	–	Geranyl Oleate	–	–	–	–
Dipropylene Glycol	–	Ingenol	–	–	–	–
Endo-Isobornylacetate	–	Isoborneol	–	–	–	–
Isohomogenol	–	Isobornyl Acetate	–	–	–	–
Isopulegylacetate	–	L-Fenchone	–	–	–	–
Neoisothujylalcohol	–	L-Menthone	–	–	–	–
Nonyl-2-Methylpropanoate	–	Linalzl Acetate	–	–	–	–
Nopylacetate	–	Menthol	–	–	–	–
O-Cymene	–	Menthone	–	–	–	–
Patchoulene	–	P-Methoxzacrzlophenone	–	–	–	–
Patchouli Alcohol	–	Piperitenone	–	–	–	–
Pi-Terpineol	–	Pulegone	–	–	–	–
Pseudolimonene	–	Safrole	–	–	–	–
S-1,2-Propanediol	–	Tms Derivative	–	–	–	–
Terpinolen	–	Trans Anethole	–	–	–	–
Thujopsene	–	Trans-3-Pinanone	–	–	–	–
Toluene Derivative	–	Trichloromethane	–	–	–	–
Unidentified	–	Verbenone	–	–	–	–
–	–	Y-Cadinene	–	–	–	–

Table S16: Three-way Venn intersection analysis for Commercial Lavender Cologne vs. Center Stairs Washed vs. Procession March.

Unique to Lavender Cologne (n=33)	**Unique to Center Stairs Washed (n=17)**	**Unique to Procession March (n=6)**	**Shared Lavender & Stairs Washed (n=6)**	**Shared Stairs Washed & Procession March (n=4)**	**Shared Lavender & Procession March (n=0)**	**Shared by ALL 3 (n=0)**
(-)-β-Pinene	2-Ethyl-Hexanal	1,2,4-Trimethylbenzene	Benzyl Acetate	Benzaldehyde	–	–
3-Carene	2-Ethyl-Hexanol	–	Camphor	Benzene	–	–
4-Terpineol	4-Chlorobutyrophenone	Heptane	Eucalyptol	Sulfur Dioxide	–	–
α-Guaiene	A,3-Dimethylstyrene	Methanesulfonyl Chloride	Eugenol	Toluene	–	–
α-Pinene	A-Pinene	Octane	Linalool	–	–	–
α-Terpieol	A-Terpineol	P-Xylene	Phenylethyl Alcohol	–	–	–
α-Terpinen	A-Terpinyl Acaetate	–	–	–	–	–
α-Terpineol Acetate	Acetic Acid	–	–	–	–	–
Bergamiol	β-Pinene	–	–	–	–	–
β-Guaiene	D-Sylvestrene	–	–	–	–	–
β-Terpineol	Endo-Isobornyl Acetate	–	–	–	–	–
β-Terpinylacetate	Ethyl Acetate	–	–	–	–	–
Camphene	Isoterpinolene	–	–	–	–	–
Caryophyllene	Longifolene	–	–	–	–	–
D-Limonene	P-Cymene	–	–	–	–	–
Dichlorobenzene	Vinyl Acetate	–	–	–	–	–
Dipropylene Glycol	–	–	–	–	–	–
Endo-Isobornylacetate	–	–	–	–	–	–
Isohomogenol	–	–	–	–	–	–
Isopulegylacetate	–	–	–	–	–	–
Neoisothujylalcohol	–	–	–	–	–	–
Nonyl-2-Methylpropanoate	–	–	–	–	–	–
Nopylacetate	–	–	–	–	–	–
O-Cymene	–	–	–	–	–	–
Patchoulene	–	–	–	–	–	–
Patchouli Alcohol	–	–	–	–	–	–
Pi-Terpineol	–	–	–	–	–	–
Pseudolimonene	–	–	–	–	–	–
S-1,2-Propanediol	–	–	–	–	–	–
Terpinolen	–	–	–	–	–	–
Thujopsene	–	–	–	–	–	–
Toluene Derivative	–	–	–	–	–	–
Unidentified	–	–	–	–	–	–

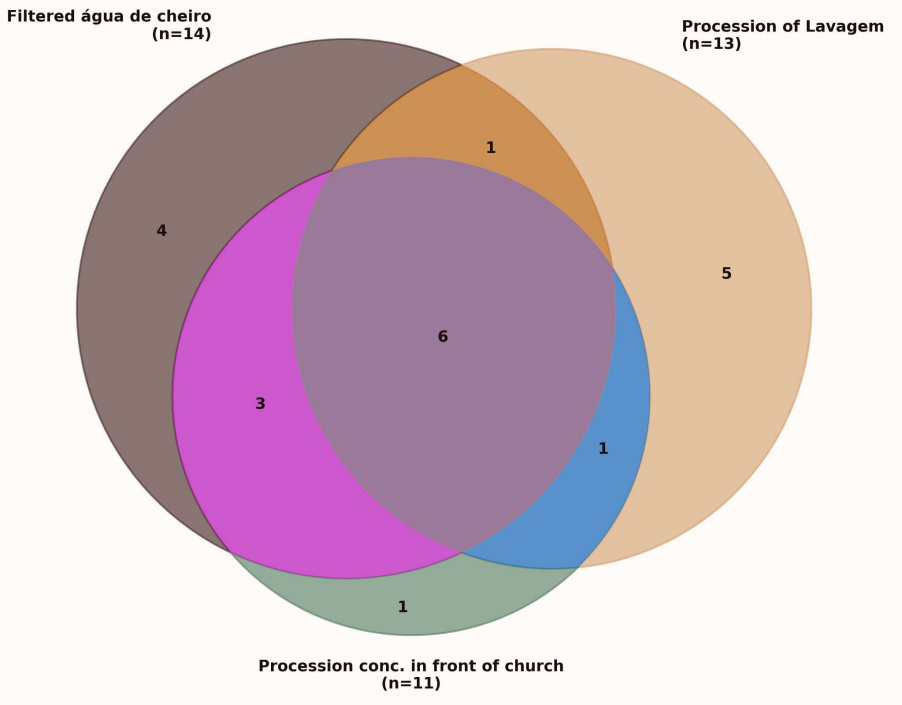


Fig. S16. Three-way Venn diagram detailing volatile intersections between Filtered *Água de Cheiro*, Procession March, and Church Forecourt Concentration.

Table S17: Three-way Venn intersection analysis for Commercial Lavender Cologne vs. Center Stairs Washed vs. Church Forecourt Concentration.

Unique to Lavender Cologne (n=34)	**Unique to Center Stairs Washed (n=15)**	**Unique to Church Forecourt Concentration (n=1)**	**Shared Lavender & Stairs Washed (n=6)**	**Shared Stairs Washed & Church Concentration (n=4)**	**Shared Lavender & Church Concentration (n=0)**	**Shared by ALL 3 (n=0)**
(-)-β-Pinene	2-Ethyl-Hexanal	Ocimene	Benzyl Acetate	4-Chlorobutyrophenone	–	–
3-Carene	2-Ethyl-Hexanol	–	Camphor	Acetic Acid	–	–
4-Terpineol	A,3-Dimethylstyrene	–	Eucalyptol	Benzaldehyde	–	–
α-Guaiene	A-Pinene	–	Eugenol	Benzene	–	–
α-Pinene	A-Terpineol	–	Linalool	–	–	–
α-Terpieol	A-Terpinyl Acaetate	–	Phenylethyl Alcohol	–	–	–
α-Terpinen	β-Pinene	–	–	–	–	–
α-Terpineol Acetate	D-Sylvestrene	–	–	–	–	–
Bergamiol	Endo-Isobornyl Acetate	–	–	–	–	–
β-Guaiene	Ethyl Acetate	–	–	–	–	–
β-Terpineol	Isoterpinolene	–	–	–	–	–
β-Terpinylacetate	Longifolene	–	–	–	–	–
Camphene	P-Cymene	–	–	–	–	–
Caryophyllene	Sulfur Dioxide	–	–	–	–	–
D-Limonene	Vinyl Acetate	–	–	–	–	–

Table S18: Three-way Venn intersection analysis for Center Stairs Washed vs. Ambient Stairs vs. Botanical Maceration of Flowers.

Unique to Center Stairs Washed (n=12)	**Unique to Ambient Stairs (n=4)**	**Unique to Botanical Maceration (n=38)**	**Shared Stairs Washed & Ambient Stairs (n=2)**	**Shared Ambient Stairs & Botanical Maceration (n=0)**	**Shared Stairs Washed & Botanical Maceration (n=7)**	**Shared by ALL 3 (n=2)**
2-Ethyl-Hexanal	2-Methyl-Butane	(-)-β-Pinene	2-Ethyl-Hexanol	–	A-Pinene	Acetic Acid
A,3-Dimethylstyrene	P-Xylene	1,3-Dichlorobenzene	Ethyl Acetate	–	Camphor	Benzaldehyde
A-Terpineol	Pentene	2-Butoxy-Ethanol	–	–	Eucalyptol	–
A-Terpinyl Acaetate	Tetrahydro-Furan	2-Hexenal	–	–	Isoterpinolene	–
Benzyl Acetate	–	3-Carene	–	–	Linalool	–
β-Pinene	–	3-Hexen-1-Ol	–	–	Longifolene	–
D-Sylvestrene	–	4-Methoxz-Benzaldeyde	–	–	P-Cymene	–
Endo-Isobornyl Acetate	–	B-Myrcene	–	–	–	–
Eugenol	–	B-Phellandrene	–	–	–	–
Phenylethyl Alcohol	–	B-Thujone	–	–	–	–
Vinyl Acetate	–	Czclopentadiene	–	–	–	–
4-Chlorobutyrophenone	–	Dehydropipernonaline	–	–	–	–

Table S19: Three-way Venn intersection analysis for Center Stairs Washed vs. Ambient Stairs vs. Filtered Água de Cheiro.

Unique to Center Stairs Washed (n=17)	**Unique to Ambient Stairs (n=3)**	**Unique to Filtered Água de Cheiro (n=2)**	**Shared Stairs Washed & Ambient Stairs (n=2)**	**Shared Ambient Stairs & Filtered Water (n=0)**	**Shared Stairs Washed & Filtered Water (n=0)**	**Shared by ALL 3 (n=1)**
2-Ethyl-Hexanal	2-Methyl-Butane	2-Butoxy-Ethanol	2-Ethyl-Hexanol	–	–	Acetic Acid
A,3-Dimethylstyrene	Pentene	Carbitol	Ethyl Acetate	–	–	–
A-Pinene	Tetrahydro-Furan	–	–	–	–	–
A-Terpineol	–	–	–	–	–	–
A-Terpinyl Acaetate	–	–	–	–	–	–
Benzyl Acetate	–	–	–	–	–	–
β-Pinene	–	–	–	–	–	–
Camphor	–	–	–	–	–	–
D-Sylvestrene	–	–	–	–	–	–
Endo-Isobornyl Acetate	–	–	–	–	–	–
Eucalyptol	–	–	–	–	–	–
Eugenol	–	–	–	–	–	–
Isoterpinolene	–	–	–	–	–	–
Linalool	–	–	–	–	–	–
Longifolene	–	–	–	–	–	–
P-Cymene	–	–	–	–	–	–
Phenylethyl Alcohol	–	–	–	–	–	–

Table S20: Three-way Venn intersection analysis for Center Stairs Washed vs. Ambient Stairs vs. Procession March.

Unique to Center Stairs Washed (n=17)	**Unique to Ambient Stairs (n=3)**	**Unique to Procession March (n=5)**	**Shared Stairs Washed & Ambient Stairs (n=2)**	**Shared Ambient Stairs & Procession March (n=0)**	**Shared Stairs Washed & Procession March (n=0)**	**Shared by ALL 3 (n=2)**
2-Ethyl-Hexanal	2-Methyl-Butane	1,2,4-Trimethylbenzene	2-Ethyl-Hexanol	–	–	Acetic Acid
A,3-Dimethylstyrene	Pentene	–	Ethyl Acetate	–	–	Benzaldehyde
A-Pinene	Tetrahydro-Furan	Heptane	–	–	–	–
A-Terpineol	–	Methanesulfonyl Chloride	–	–	–	–
A-Terpinyl Acaetate	–	Octane	–	–	–	–
Benzyl Acetate	–	–	–	–	–	–
β-Pinene	–	–	–	–	–	–
Camphor	–	–	–	–	–	–
D-Sylvestrene	–	–	–	–	–	–
Endo-Isobornyl Acetate	–	–	–	–	–	–
Eucalyptol	–	–	–	–	–	–
Eugenol	–	–	–	–	–	–
Isoterpinolene	–	–	–	–	–	–
Linalool	–	–	–	–	–	–
Longifolene	–	–	–	–	–	–
P-Cymene	–	–	–	–	–	–
Phenylethyl Alcohol	–	–	–	–	–	–

Table S21: Three-way Venn intersection analysis for Center Stairs Washed vs. Ambient Stairs vs. Church Forecourt Concentration.

Unique to Center Stairs Washed (n=17)	**Unique to Ambient Stairs (n=3)**	**Unique to Church Forecourt Concentration (n=1)**	**Shared Stairs Washed & Ambient Stairs (n=2)**	**Shared Ambient Stairs & Church Concentration (n=0)**	**Shared Stairs Washed & Church Concentration (n=0)**	**Shared by ALL 3 (n=2)**
2-Ethyl-Hexanal	2-Methyl-Butane	Ocimene	2-Ethyl-Hexanol	–	–	Acetic Acid
A,3-Dimethylstyrene	Pentene	–	Ethyl Acetate	–	–	Benzaldehyde
A-Pinene	Tetrahydro-Furan	–	–	–	–	–
A-Terpineol	–	–	–	–	–	–
A-Terpinyl Acaetate	–	–	–	–	–	–
Benzyl Acetate	–	–	–	–	–	–
β-Pinene	–	–	–	–	–	–
Camphor	–	–	–	–	–	–
D-Sylvestrene	–	–	–	–	–	–
Endo-Isobornyl Acetate	–	–	–	–	–	–
Eucalyptol	–	–	–	–	–	–
Eugenol	–	–	–	–	–	–
Isoterpinolene	–	–	–	–	–	–
Linalool	–	–	–	–	–	–
Longifolene	–	–	–	–	–	–
P-Cymene	–	–	–	–	–	–
Phenylethyl Alcohol	–	–	–	–	–	–

Table S22: Three-way Venn intersection analysis for Beginning of Mass Liturgy vs. Sanctuary Incensation vs. Ambient Stairs.

Unique to Beginning of Mass (n=1)	**Unique to Sanctuary Incensation (n=12)**	**Unique to Ambient Stairs (n=4)**	**Shared Beginning Mass & Incensation (n=1)**	**Shared Incensation & Ambient Stairs (n=0)**	**Shared Beginning Mass & Ambient Stairs (n=0)**	**Shared by ALL 3 (n=1)**
Carbitol	3-(1,3-Benzodioxol-5-Yl)-2-Propenal	2-Ethyl-Hexanol	2-Butoxy-Ethanol	–	–	Acetic Acid
–	4-Methoxycinnamaldehyde	2-Methyl-Butane	–	–	–	–
–	Isopropyl Myristate	Ethyl Acetate	–	–	–	–
–	Naphthalene	Pentene	–	–	–	–
–	Octacosanol	Tetrahydro-Furan	–	–	–	–
–	Octyl Acetate	–	–	–	–	–
–	Patchouli Alcohol	–	–	–	–	–
–	Safrole	–	–	–	–	–
–	Sulcatone	–	–	–	–	–
–	Tetraethylene Glycol Diethyl Ether	–	–	–	–	–
–	2-Phenoxy-Ethanol	–	–	–	–	–
–	Unidentified	–	–	–	–	–

Table S23: Three-way Venn intersection analysis for Sanctuary Incensation vs. Botanical Maceration of Flowers vs. Filtered Água de Cheiro.

Unique to Sanctuary Incensation (n=11)	**Unique to Botanical Maceration (n=37)**	**Unique to Filtered Água de Cheiro (n=1)**	**Shared Incensation & Botanical Maceration (n=1)**	**Shared Botanical Maceration & Filtered Water (n=0)**	**Shared Incensation & Filtered Water (n=1)**	**Shared by ALL 3 (n=1)**
3-(1,3-Benzodioxol-5-Yl)-2-Propenal	(-)-β-Pinene	Carbitol	Safrole	–	2-Butoxy-Ethanol	Acetic Acid
4-Methoxycinnamaldehyde	2-Hexenal	–	–	–	–	–
Isopropyl Myristate	3-Carene	–	–	–	–	–
Naphthalene	3-Hexen-1-Ol	–	–	–	–	–
Octacosanol	4-Methoxz-Benzaldeyde	–	–	–	–	–
Octyl Acetate	A-Pinene	–	–	–	–	–
Patchouli Alcohol	B-Myrcene	–	–	–	–	–
Sulcatone	B-Phellandrene	–	–	–	–	–
Tetraethylene Glycol Diethyl Ether	B-Thujone	–	–	–	–	–
2-Phenoxy-Ethanol	Camphor	–	–	–	–	–
Unidentified	Czclopentadiene	–	–	–	–	–
–	D-Limonene	–	–	–	–	–
–	Dehydropipernonaline	–	–	–	–	–
–	Estragole	–	–	–	–	–
–	Eucalyptol	–	–	–	–	–
–	Geraniol	–	–	–	–	–
–	Geranyl Oleate	–	–	–	–	–
–	Ingenol	–	–	–	–	–
–	Isoborneol	–	–	–	–	–
–	Isobornyl Acetate	–	–	–	–	–
–	Isoterpinolene	–	–	–	–	–
–	L-Fenchone	–	–	–	–	–
–	L-Menthone	–	–	–	–	–
–	Linalool	–	–	–	–	–
–	Linalzl Acetate	–	–	–	–	–
–	Menthol	–	–	–	–	–
–	Menthone	–	–	–	–	–
–	P-Cymene	–	–	–	–	–
–	P-Methoxzacrzlophenone	–	–	–	–	–
–	Piperitenone	–	–	–	–	–
–	Pulegone	–	–	–	–	–
–	Tms Derivative	–	–	–	–	–
–	Trans Anethole	–	–	–	–	–
–	Trans-3-Pinanone	–	–	–	–	–
–	Trichloromethane	–	–	–	–	–
–	Verbenone	–	–	–	–	–
–	Y-Cadinene	–	–	–	–	–

Table S24: Three-way Venn intersection analysis for Ambient Stairs vs. Procession March vs. Church Forecourt Concentration.

Unique to Ambient Stairs (n=4)	**Unique to Procession March (n=5)**	**Unique to Church Forecourt Concentration (n=1)**	**Shared Ambient Stairs & Procession March (n=0)**	**Shared Procession March & Church Concentration (n=0)**	**Shared Ambient Stairs & Church Concentration (n=1)**	**Shared by ALL 3 (n=1)**
2-Ethyl-Hexanol	1,2,4-Trimethylbenzene	Ocimene	–	–	Benzaldehyde	Acetic Acid
2-Methyl-Butane	–	–	–	–	–	–
Ethyl Acetate	Heptane	–	–	–	–	–
Tetrahydro-Furan	Methanesulfonyl Chloride	–	–	–	–	–
–	Octane	–	–	–	–	–

Table S25: Three-way Venn intersection analysis for Botanical Maceration of Flowers vs. Filtered Água de Cheiro vs. Procession March.

Unique to Botanical Maceration (n=38)	**Unique to Filtered Água de Cheiro (n=1)**	**Unique to Procession March (n=5)**	**Shared Botanical Maceration & Filtered Water (n=1)**	**Shared Filtered Water & Procession March (n=0)**	**Shared Botanical Maceration & Procession March (n=0)**	**Shared by ALL 3 (n=0)**
(-)-β-Pinene	Carbitol	1,2,4-Trimethylbenzene	2-Butoxy-Ethanol	–	–	–
1,3-Dichlorobenzene	–	–	–	–	–	–
2-Hexenal	–	Heptane	–	–	–	–
3-Carene	–	Methanesulfonyl Chloride	–	–	–	–
3-Hexen-1-Ol	–	Octane	–	–	–	–
4-Methoxz-Benzaldeyde	–	–	–	–	–	–
A-Pinene	–	–	–	–	–	–
B-Myrcene	–	–	–	–	–	–
B-Phellandrene	–	–	–	–	–	–
B-Thujone	–	–	–	–	–	–
Camphor	–	–	–	–	–	–
Czclopentadiene	–	–	–	–	–	–
D-Limonene	–	–	–	–	–	–
Dehydropipernonaline	–	–	–	–	–	–
Estragole	–	–	–	–	–	–
Eucalyptol	–	–	–	–	–	–
Geraniol	–	–	–	–	–	–
Geranyl Oleate	–	–	–	–	–	–
Ingenol	–	–	–	–	–	–
Isoborneol	–	–	–	–	–	–
Isobornyl Acetate	–	–	–	–	–	–
Isoterpinolene	–	–	–	–	–	–
L-Fenchone	–	–	–	–	–	–
L-Menthone	–	–	–	–	–	–
Linalool	–	–	–	–	–	–
Linalzl Acetate	–	–	–	–	–	–
Menthol	–	–	–	–	–	–
Menthone	–	–	–	–	–	–
P-Cymene	–	–	–	–	–	–
P-Methoxzacrzlophenone	–	–	–	–	–	–
Piperitenone	–	–	–	–	–	–
Pulegone	–	–	–	–	–	–
Safrole	–	–	–	–	–	–
Tms Derivative	–	–	–	–	–	–
Trans Anethole	–	–	–	–	–	–
Trans-3-Pinanone	–	–	–	–	–	–
Trichloromethane	–	–	–	–	–	–
Verbenone	–	–	–	–	–	–
Y-Cadinene	–	–	–	–	–	–

Table S26: Three-way Venn intersection analysis for Botanical Maceration of Flowers vs. Filtered Água de Cheiro vs. Church Forecourt Concentration.

Unique to Botanical Maceration (n=38)	**Unique to Filtered Água de Cheiro (n=1)**	**Unique to Church Forecourt Concentration (n=1)**	**Shared Botanical Maceration & Filtered Water (n=1)**	**Shared Filtered Water & Church Concentration (n=0)**	**Shared Botanical Maceration & Church Concentration (n=0)**	**Shared by ALL 3 (n=1)**
(-)-β-Pinene	Carbitol	Ocimene	2-Butoxy-Ethanol	–	–	Acetic Acid
1,3-Dichlorobenzene	–	–	–	–	–	–
2-Hexenal	–	–	–	–	–	–
3-Carene	–	–	–	–	–	–
3-Hexen-1-Ol	–	–	–	–	–	–
4-Methoxz-Benzaldeyde	–	–	–	–	–	–
A-Pinene	–	–	–	–	–	–
B-Myrcene	–	–	–	–	–	–
B-Phellandrene	–	–	–	–	–	–
B-Thujone	–	–	–	–	–	–
Camphor	–	–	–	–	–	–
Czclopentadiene	–	–	–	–	–	–
D-Limonene	–	–	–	–	–	–
Dehydropipernonaline	–	–	–	–	–	–
Estragole	–	–	–	–	–	–
Eucalyptol	–	–	–	–	–	–
Geraniol	–	–	–	–	–	–
Geranyl Oleate	–	–	–	–	–	–
Ingenol	–	–	–	–	–	–
Isoborneol	–	–	–	–	–	–
Isobornyl Acetate	–	–	–	–	–	–
Isoterpinolene	–	–	–	–	–	–
L-Fenchone	–	–	–	–	–	–
L-Menthone	–	–	–	–	–	–
Linalool	–	–	–	–	–	–
Linalzl Acetate	–	–	–	–	–	–
Menthol	–	–	–	–	–	–
Menthone	–	–	–	–	–	–
P-Cymene	–	–	–	–	–	–
P-Methoxzacrzlophenone	–	–	–	–	–	–
Piperitenone	–	–	–	–	–	–
Pulegone	–	–	–	–	–	–
Safrole	–	–	–	–	–	–
Tms Derivative	–	–	–	–	–	–
Trans Anethole	–	–	–	–	–	–
Trans-3-Pinanone	–	–	–	–	–	–
Trichloromethane	–	–	–	–	–	–
Verbenone	–	–	–	–	–	–
Y-Cadinene	–	–	–	–	–	–

Table S27: Three-way Venn intersection analysis for Filtered Água de Cheiro vs. Procession March vs. Church Forecourt Concentration.

Unique to Filtered Água de Cheiro (n=2)	Unique to Procession March (n=5)	Unique to Church Forecourt Concentration (n=1)	Shared Filtered Water & Procession March (n=0)	Shared Procession March & Church Concentration (n=0)	Shared Filtered Water & Church Concentration (n=0)	Shared by ALL 3 (n=1)
2-Butoxy-Ethanol	1,2,4-Trimethylbenzene	Ocimene	–	–	–	Acetic Acid
Carbitol	–	–	–	–	–	–
–	Heptane	–	–	–	–	–
–	Methanesulfonyl Chloride	–	–	–	–	–
–	Octane	–	–	–	–	–

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