Sensory Evaluation of Performance in Pet Products (for Dogs and Cats) using the animal's synthetic stink and dog hair strands

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Abstract (Maximum of 200 words)

This study introduces a novel sensory methodology for evaluating the performance of fragranced products designed for pets (dogs and cats), including shampoos, conditioners, dry shampoos, and colognes.

Departing from traditional methods involving live animals, this approach uses synthetic pet odor simulations and repurposed dog hair clippings obtained from pet grooming salons, therefore promoting sustainability and ethical considerations. This methodology adapts and refines existing internal sensory evaluation protocols used within the company.

The primary objective of this project was to determine, through sensory analysis, whether the tested fragrance samples effectively masked the inherent odor of pets while

simultaneously delivering a pleasant and desirable fragrance profile. The evaluation focused on odor coverage performance and fragrance intensity when compared to a predetermined benchmark fragrance.

The results obtained through this methodology were promising and proved essential in guiding fragrance selection for the project. Importantly, no animals were used in any stage of this study.

Keywords: Pet Products, Sensorial Analysis, Animal's Synthetic Stink, Dog Hair Strands.

Introduction.

Sensory analysis plays a crucial role in measuring, analyzing, and interpreting reactions to the characteristics of various products, including food, cosmetics, and more. This analysis is conducted by panels of specially trained individuals with heightened perceptions in one or more senses: sight, smell, taste, touch, and hearing[1]. These evaluations are crucial tools in new product development, ensuring effective and safe products are created. This article explores the importance of sensory analysis in developing and refining cosmetic products specifically designed for pets, focusing on dogs and cats. We will deepen into different sensory evaluation methodologies and discuss how to build a unique sensory identity for brands and products within this growing market.

Pet care products have carved out a significant niche within the cosmetics industry, driven by a global shift in pet owner consumption habits and behaviors. This trend is particularly pronounced in the Brazilian market, where 72% of Brazilians own at least one pet, and a staggering 92% of pet owners consider their companion animal a family member[2].

Pet owners are increasingly seeking hygiene and grooming products with attributes traditionally found in human personal care products. There is a growing preference for clean and gentle formulas prioritizing skin and coat health, mirroring the trends observed in human cosmetics[2].

Materials and Methods.

This study employed a three-pronged sensory analysis approach to evaluate the performance of fragranced pet care products, specifically targeting malodor control, base coverage, and overall fragrance intensity.

Malodor Reduction Analysis

An in vitro methodology was implemented to assess malodor reduction. This approach mimics the conditions of in vivo testing but offers greater control over temperature, time, and product application. A synthetic malodor standard, designed to simulate the characteristic odor of dogs and cats, was utilized. Trained assessors evaluated malodor and fragrance intensity three times: immediately after product application, after 2 hours, and after 6 hours. The samples were incubated at 40°C between assessments to simulate real-world conditions. This methodology was applied to evaluate Perfume and Dry Baths, alongside a placebo control containing only the synthetic stink standard.

Base Coverage Analysis

The base coverage analysis aimed to assess the intensity of the product base and the intensity of the fragrance using dog hair strands. Shampoo and Conditioner samples were

compared with and without fragrance to evaluate the effectiveness of masking the inherent base odor.

Fragrance Impact Analysis

The final analysis focused on evaluating the intensity of the fragrance's impact on dog hair strands, using the fragrance concentration within the product packaging as the maximum intensity benchmark. Trained assessors conducted a comparative olfactory evaluation of Shampoo, Conditioner, and Perfume samples. The target fragrances selected for the project were compared against benchmark Shampoo, Conditioner, and Perfume samples representing existing market products.

Evaluation Methodology

All sensory evaluations were conducted using a 9-point categorical scale, ranging from 0 (invisible) to 8 (extremely strong), to assess the intensity or presence of the target attributes. Outliers were removed from the analysis while maintaining at least 5 data points for each assessment.

Results.

Malodor Reduction Analysis:

Malodor analysis was conducted on both Perfume and Dry Bath formulations. Results for the Perfume samples are presented in Figure 1.

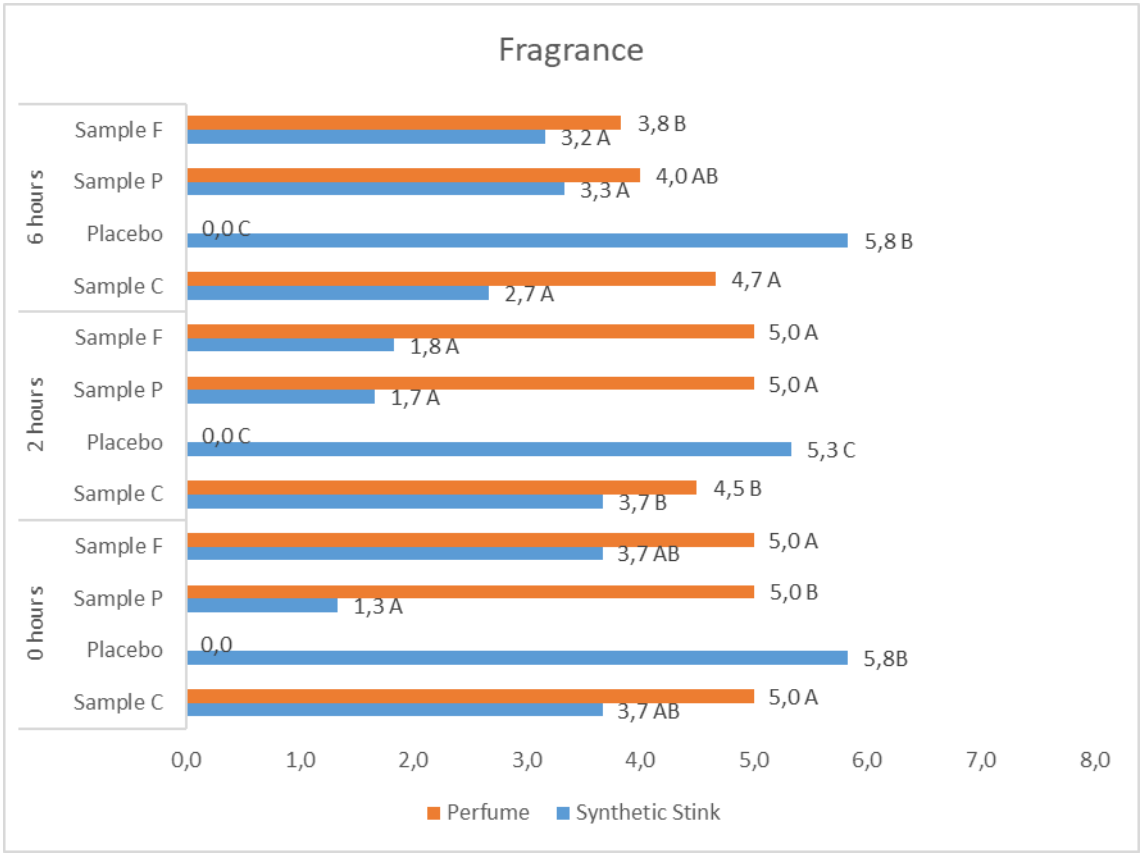

Figure 1: Malodor analysis results for perfume samples. Analyzed using XLSTAT software with Analysis of Variance (ANOVA). The significance level for this study was set at 5% (p-value less than 0.05 to indicate a significant difference at a 95% confidence level).

All perfumes formulations demonstrated strong performance, exhibiting a "moderate" to "strong" fragrance intensity rating on the 9-point scale. Malodor intensity was significantly reduced immediately following application compared to the placebo control.

Figure 2 presents the malodor analysis results for the Dry Bath samples.

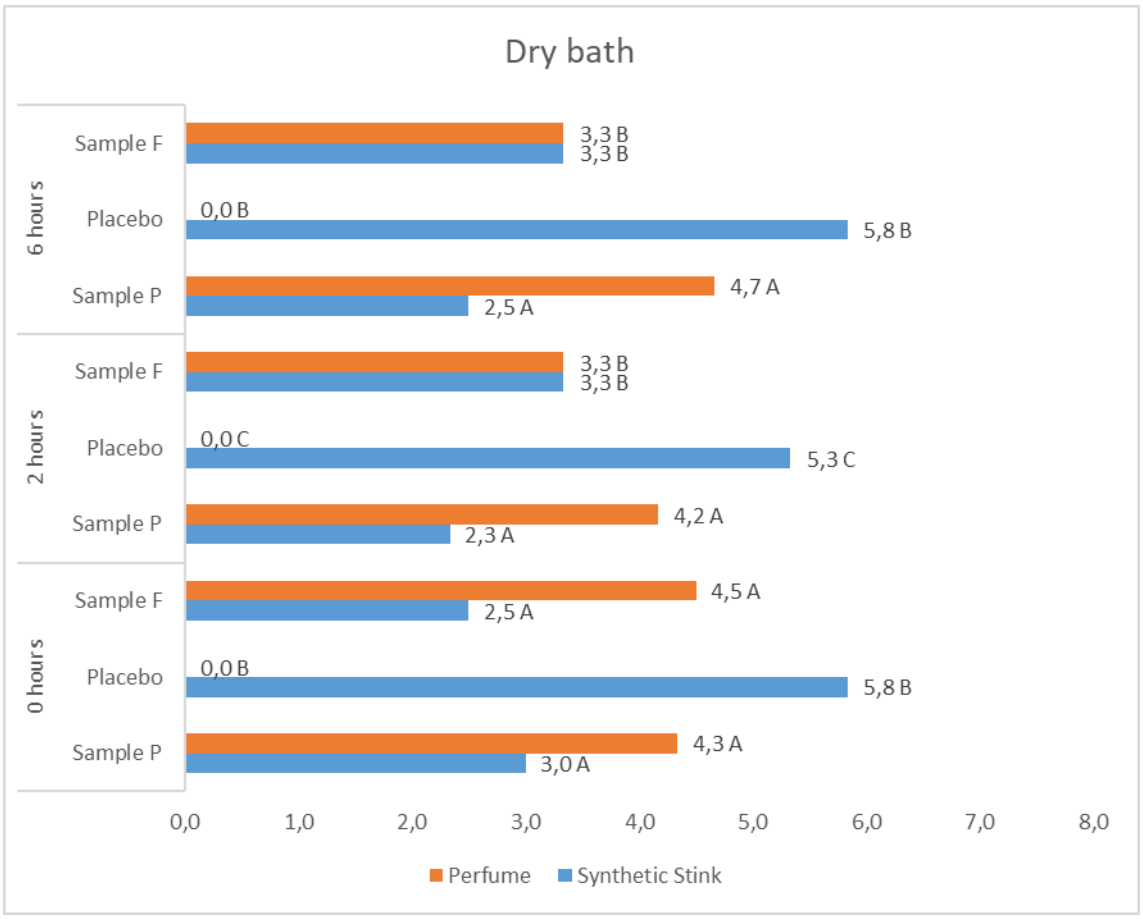

Figure 2: Malodor analysis results for Dry Bath samples. Analysis were carried out using XLSTAT software with Analysis of Variance (ANOVA). The significance level for this study was set at 5% (p-value less than 0.05 to indicate a significant difference at a 95% confidence level).

Similar to the Perfume samples, the Dry Shampoo formulations exhibited consistent performance. Fragrance intensity was perceived as "moderate" to "strong" on the 9-point scale. Malodor intensity was significantly reduced immediately following application compared to the placebo control.

Base Coverage Analysis:

The base coverage analysis focused on evaluating the effectiveness of fragrance masking the inherent base odor in Shampoo and Conditioner formulations. The results are presented in Figure 3.

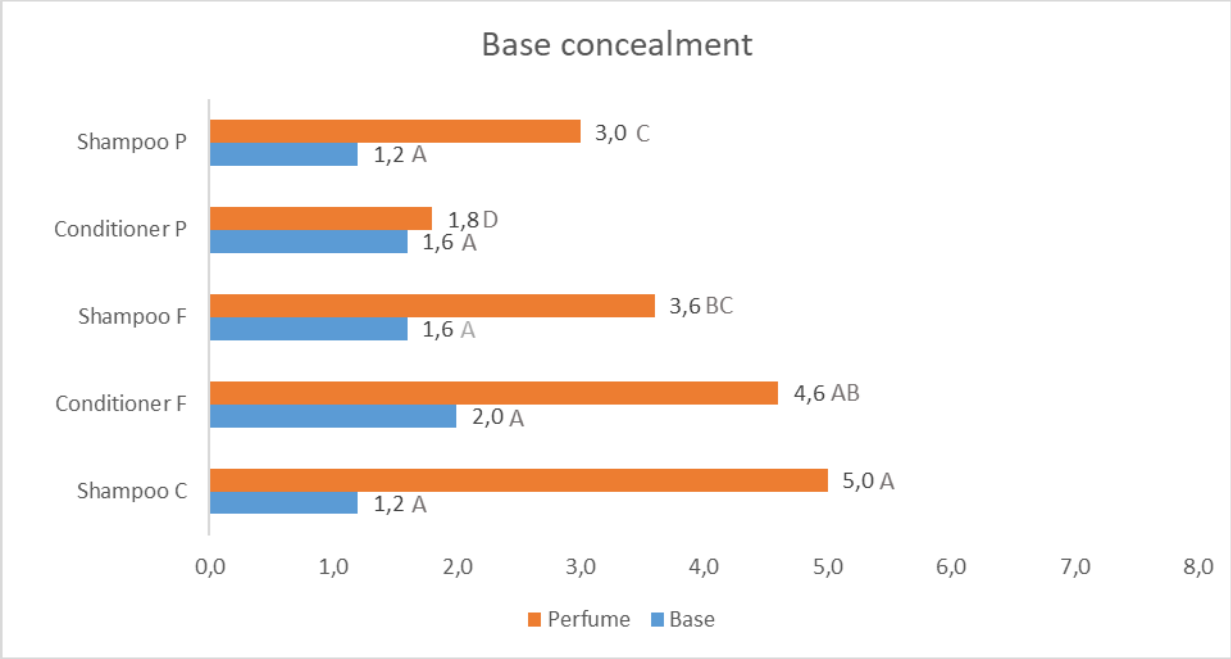

Figure 3: Base coverage analysis results for Shampoo and Conditioner samples. Analysis were carried out using XLSTAT software with Analysis of Variance (ANOVA). The significance level for this study was set at 5% (p-value less than 0.05 to indicate a significant difference at a 95% confidence level).

Evaluating base coverage required comparing fragrance-free and active-free base formulations to samples containing both fragrance and active ingredients. Shampoo C exhibited the highest fragrance intensity alongside a low base odor intensity. However, Shampoo and Conditioner F demonstrated the best overall performance, achieving a "moderate" to "strong" fragrance intensity rating on the 9-point scale while effectively minimizing base odor perception. While Shampoo and Conditioner P also masked the base

odor, the fragrance intensity was rated lower, falling within the "very weak" to "weak" range.

Fragrance Impact Analysis:

This analysis evaluated the fragrance impact of Shampoo, Conditioner, and Cologne formulations through comparison with benchmark products representing existing market offerings.

- *Shampoo Impact Performance*

Figure 4 presents the results of the fragrance impact analysis for the Shampoo samples.

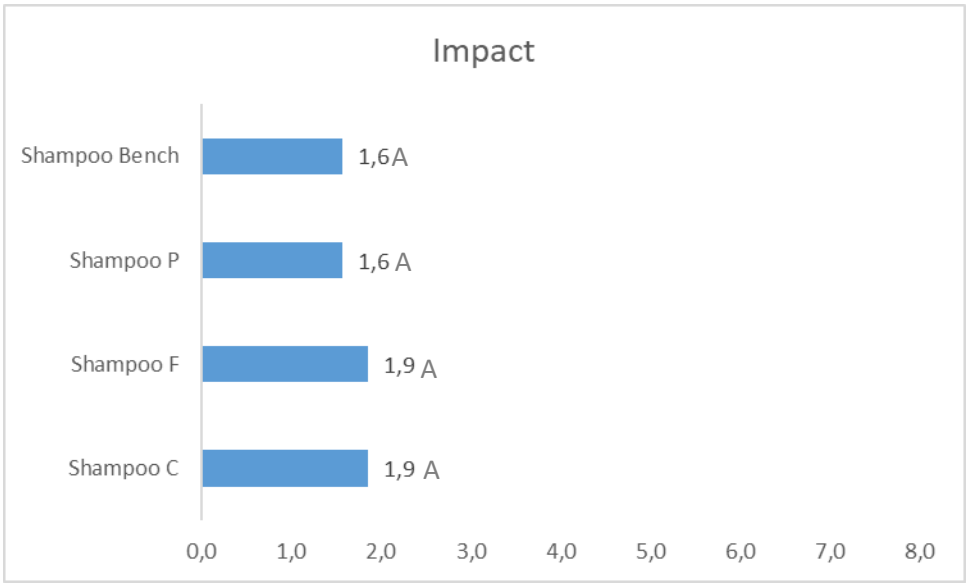

Figure 4: Fragrance impact analysis results for Shampoo samples. Analysis were carried out using XLSTAT software with Analysis of Variance (ANOVA). The significance level for this study was set at 5% (p-value less than 0.05 to indicate a significant difference at a 95% confidence level).

As shown in Figure 4, all Shampoo formulations exhibited similar fragrance impact performance, with no statistically significant differences observed between them.

- *Conditioner Impact Performance*

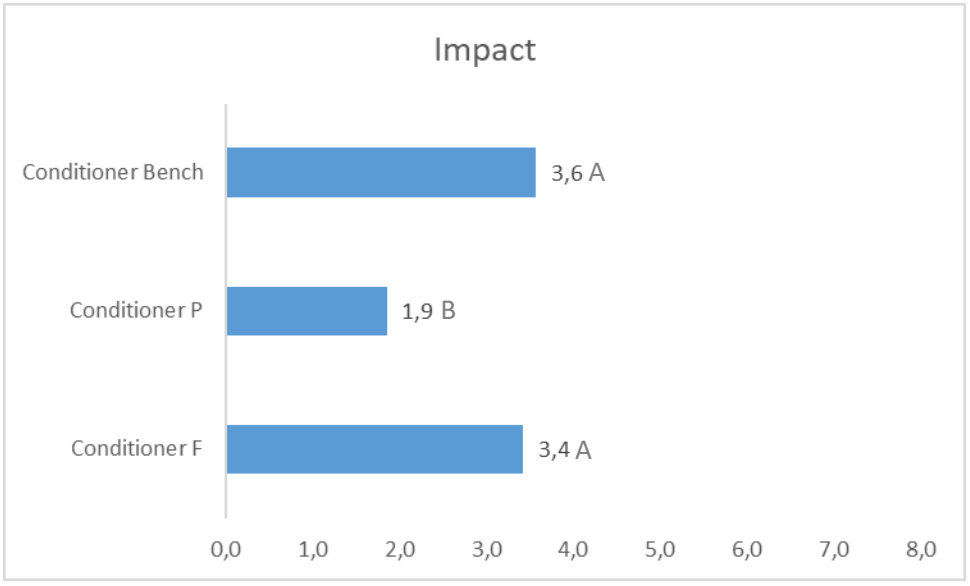

Figure 5: Fragrance impact analysis results for Conditioner samples. Analysis were carried out using XLSTAT software with Analysis of Variance (ANOVA). The significance level for this study was set at 5% (p-value less than 0.05 to indicate a significant difference at a 95% confidence level).

As depicted in Figure 5, Conditioner F and the Benchmark Conditioner demonstrated equivalent fragrance impact performance, with no statistically significant difference observed between them. However, sample P exhibited a significantly lower fragrance impact, perceived as "very weak."

- *Perfume Impact Performance*

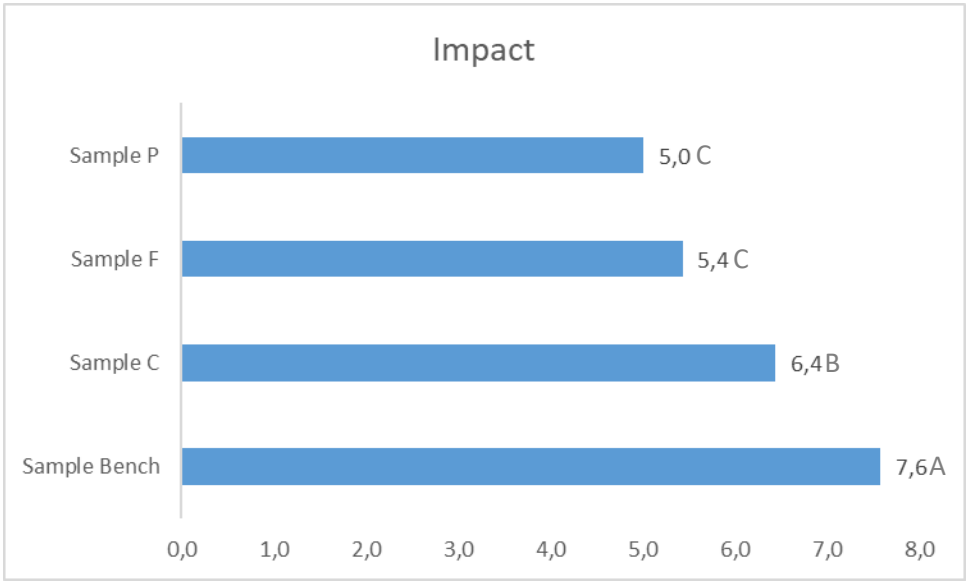

Figure 6: Fragrance impact analysis results for Cologne samples. Analysis were carried out using XLSTAT software with Analysis of Variance (ANOVA). The significance level for this study was set at 5% (p-value less than 0.05 to indicate a significant difference at a 95% confidence level).

The Perfume samples demonstrated the most pronounced differences in fragrance impact performance, with statistically significant variations observed between them. However, the Benchmark Cologne exhibited superior performance, achieving a "very strong" fragrance intensity rating.

Discussion.

Malodor Analysis:

Perfume: All perfume formulations demonstrated strong performance, exhibiting a "moderate" to "strong" fragrance intensity rating on the 9-point scale. Malodor intensity was significantly reduced immediately following application and remained significantly lower than the placebo control for up to 2 hours post-application. At the 6-hour mark,

Sample C emerged as the top performer, exhibiting the highest fragrance intensity and the lowest malodor intensity.

Dry Bath: Like the perfume samples, the Dry Bath formulations demonstrated consistent performance with a "moderate" to "strong" fragrance intensity rating on the 9-point scale. Malodor intensity was significantly reduced immediately following application compared to the placebo control. At the 6-hour assessment, Sample P demonstrated superior performance, exhibiting the highest fragrance intensity and the lowest malodor intensity.

Base Coverage Analysis:

Across all coat types, the Shampoo F and Conditioner F demonstrated the best performance, achieving a "moderate" to "strong" fragrance intensity rating on the 9-point scale while effectively minimizing the perception of base odor. The Shampoo P and Conditioner P also provided base odor coverage, but with a lower fragrance intensity, rated as "very weak" to "weak" on the 9-point scale.

Fragrance Impact Analysis:

All shampoo formulations exhibited similar fragrance impact performance, with no statistically significant differences observed between them. The fragrance intensity for all shampoos was rated between "very weak" and "weak."

Regarding conditioners, sample F and the Benchmark demonstrated equivalent fragrance impact performance, exhibiting no statistically significant difference. Both were

rated as having a "weak" fragrance intensity. Sample P differed significantly, exhibiting the weakest performance with a "very weak" fragrance intensity rating.

The cologne samples demonstrated the most pronounced differences in fragrance impact performance, with statistically significant variations observed between them. The Benchmark cologne exhibited superior performance, achieving a "very strong" fragrance intensity rating. Sample C followed as the second-highest performer, with a "strong" fragrance intensity rating. Samples F and P exhibited statistically similar performance, both achieving a "moderate" fragrance intensity rating.

Conclusion.

Sensory analysis is an essential tool for gaining a comprehensive understanding of consumer perception, enabling the measurement, analysis, and interpretation of responses to the sensory attributes of products, particularly in the cosmetics industry.

Employing trained panelists with heightened sensory acuity provides crucial insights for developing effective and safe products. This study sought to explore the significance of sensory analysis in the development and refinement of cosmetic products specifically designed for pets, focusing on dogs and cats. We deepened into different sensory evaluation methodologies, including the new form with the dog hair strands, and discovered desirable sensory profiles for pet care brands and products.

Our findings underscore the value of sensory analysis in developing pet-friendly cosmetic products. The malodor analysis revealed that both Perfume and Dry Bath formulations effectively neutralized unpleasant odors while delivering a pleasant fragrance experience. Notably, Sample C (Perfume) and Sample P (Dry Bath) emerged as top

performers in their respective categories, exhibiting superior long-lasting odor control and desirable fragrance intensity.

The base coverage analysis highlighted the importance of balancing base odor masking with fragrance strength. While Shampoo C exhibited the highest fragrance intensity, Shampoo F and Conditioner F achieved the optimal balance, effectively masking base odor while delivering a pleasant and appropriately strong fragrance.

The fragrance impact analysis revealed distinct performance patterns across product categories. While shampoos demonstrated a similar, while weak, fragrance impact, conditioners showed greater variability, with Sample F and the Benchmark achieving a desirable "weak" intensity level, while Sample P fell short with a "very weak" rating. The perfume samples presented the most diverse fragrance impact profiles, with the Benchmark achieving the strongest impact, followed by Sample C. Samples F and sample P exhibited a desirable "moderate" intensity level.

Conflict of Interest Statement.

All authors are employees of Grupo Boticário. However, the authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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