

FORMULATION AND EVALUATION OF EAU DE PARFUME (EDP) FLORAL AROMA CHARACTERISTICS

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ABSTRACT

Currently, perfumes have emerged as highly sought-after cosmetic products in the Indonesian consumer market, aligning with the demands of daily life for enhanced self-assurance. Various types of perfume are categorized based on the ratio of fragrant oil content to solvent. Presently, the prevailing perfumes available in the market predominantly belong to the category with low concentrations of fragrant oils. The principal objective of this research is to formulate a product recipe for Eau de Perfume (EDP) with sweet and floral characteristics. The methodology employed in this study is experimental and consists of two phases: perfume formulation, evaluation, and final product development. The evaluation conducted in this research encompasses organoleptic and physical assessment, aroma longevity testing, spot testing, hedonic evaluation, and sensory testing. Based on the data collected from the research results, it can be concluded that the perfumes with longer aroma longevity are formulas F1 and F2. The average area of EDP spray dispersion is 74,48 mm. The most preferred hedonic test result was obtained from formula F2. Organoleptic test data for all formulas showed a clear and particle-free, the colorless solution observed after one month of storage. The solution's viscosity increased during the fourth week due to the partial evaporation of the solvent. Sensory analysis results revealed that the aroma of all three formulas was characterized as sweet with floral undertones.

Keywords: Eau de Perfume (EDP), sensory analysis, fragrance oil.

INTRODUCTION

Perfume is a cosmetic preparation formulated from a blend of essential oils or synthetic chemical compounds possessing aromatic properties, fixative for fragrance retention, and solvents (Koensoemardiyah, n.d.). This class of cosmetics is typically employed to impart fragrance to the human body, objects or enclosed spaces. Moreover, it serves as an adjunct in various cosmetic formulations to enhance an individual's self-confidence. Perfumes are categorized into different types, including perfume extract (20-30%), Eau de Perfume (8-15%), Eau de Toilette (4-8%), dan Eau de cologne (1-3%), distinguishing one from another based on the proportion of solvents blended within the preparation (Khan, 2017). The choice of solvent employed aligns with the specific characteristics of the perfume materials (Kataren, 1985.).

In the perfume formulation process, fragrance materials are categorized into three distinct components, namely the top note, constituting 15-25% of the total composition, the middle note, comprising 30-40%, and the base note, accounting for 40-55% of the final fragrance formulation (Hunter, 2009). This categorization is based on the level of evaporation speed of fragrance molecules into the atmosphere. Compounds within the

top note section are characterized by their rapid evaporation within the first 15 minutes, followed by the middle notes, and finally base note (Sell, 2019). Aromas typically associated with top notes include citrus, green, and fruit scents, middle notes encompass floral and spicy fragrances, while base notes consist of wood and animal-derived scents.

Currently, commercially available perfume products can be classified into three main categories: masculine, feminine, and unisex. Masculine fragrance are predominantly characterized by spicy and tangy notes, resulting in products designed for men featuring woody and animalistic aromatic attributes. In contrast, feminine fragrances are primarily rooted in floral and fruity categories, exhibiting sweet olfactory characteristics (Lindqvist, 2012). Generally, floral scents enjoy the highest consumer demand due to their inherent sweetness, which can bolster the self-confidence of the wearer (de March et al., 2015).

In recent years many young entrepreneurs have ventured into the cosmetics industry, specifically in the field of perfumery. Notably, public figures have also entered the world of fragrance. Additionally, several cosmetic industries have expanded their product development efforts, shifting their focus beyond body care and decorative cosmetic product to include fragrances. The utilization of perfume-type cosmetics has rapidly become a prevailing trend, further fueled by growing consumer base spanning from teenagers to adults. However, the currently available perfumery products in the market are predominantly of the Eau de Cologne type, which features a relatively low concentration percentage. Consequently, when utilized by consumers, the longevity of the fragrance is notably limited. Thus, the researchers aim to develop a formulation for Eau de Perfume (EDP) products to enhance the longevity of the fragrance experienced by consumers.

MATERIAL AND METHODS

Materials

The formulation of the liquid perfume is supported by the inclusion of various fragrance oils, namely white peach, jasmine, cherry blossom, green tea, sandalwood, and vanilla. The solvent employed in this formulation is 96% ethanol.

Methods

Formulation of Eau De Perfume (EDP)

The selection of ingredients for EDP formulation represents a carefully curated blend designed to achieve olfactory harmony in alignment with the intended floral aroma characteristics. The three experimental formulations (F1, F2, and F3) exhibit variations in ingredient concentrations. The detailed composition of the EDP formula is presented in Table 1.

Table 1. Formula Eau De Perfume (EDP)

Materials	F1 (%)	F2(%)	F3(%)
White peach	20	10	20
Jasmine	10	20	10
Cherry blossom	20	20	20
Green tea	10	10	20
Sandalwood	20	20	10
Vanilla	20	20	20

The top notes components (white peach), middle notes (jasmine, cherry blossom, and green tea), and base notes (sandalwood and vanilla) were blended within a beaker glass. The solution was stirred until achieving homogeneity and subsequently applied to a scent test paper. If the fragrance formulation proved suitable, it was then prepared as a finished product. Each fragrance oil material was prepared as a finished product. Each fragrance oil material was meticulously weighed in accordance with its designated concentration and combined with the perfume solvent. The resulting solution was stirred for approximately 10 seconds before being transferred into a perfume container. In this study, the EDP concentration in the perfume product was established at 10%.

The distinctive fragrance profile of the Eau de Perfume is characterized by a sweet floral aroma. This olfactory trait is substantiated by an analysis of the chemical composition, which reveals a higher proportion of floral notes relative to other fragrance components, as illustrated in Figure 1.

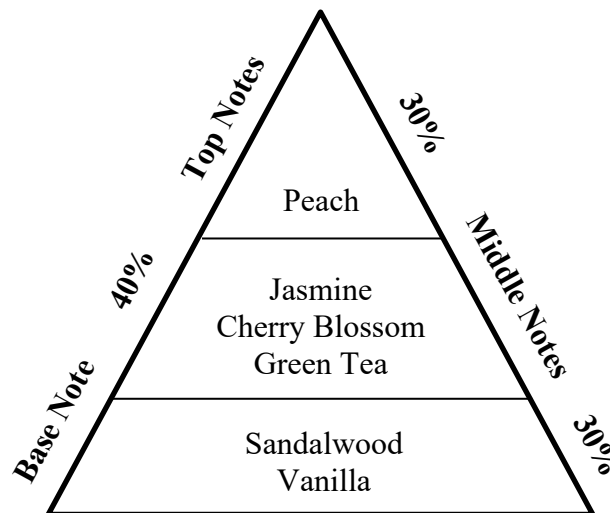


Figure 1. Olfactory System Characteristic Scent of Sweet Floral

Evaluation of Eau De Parfum (EDP)

Organoleptic test

Organoleptic assessments were performed on the EDP formulation, encompassing an evaluation of three key parameters: homogeneity, color uniformity, and formula consistency. Homogeneity assessments entailed the meticulous scrutiny of the

formulation for the presence of particulate matter. This examination involved dispensing EDP onto a glass substrate and scrutinizing it against a contrasting dark background.

On the other hand, color consistency of the EDP perfume preparation was visually appraised on a daily basis for a duration of one month under ambient room temperature conditions. Formulation consistency, in terms of its overall appearance and texture, was subjected to both sensory and visual evaluation on a weekly basis over the course of one month at room temperature.

Scent long-lasting test

The evaluation of fragrance persistence was conducted by spraying the perfume solution to smell test papers. The olfactory characteristics were evaluated through olfaction, with the perfume being smelled at a standardized distance of 10 cm from the nose over a duration spanning from the initial application until the conclusion of the fourth hour. The perfume was considered to process enduring intensity if its fragrance remained discernible throughout this four-hour period.

Spot test

Perfume spot testing entails the application of the perfume solution onto brightly colored paper, followed by the measurement of the resulting spot's diameter utilizing a precision caliper. A larger extent of perfume dispersion is indicative of superior quality.

Hedonic test

The hedonic evaluation was conducted with a cohort of 30 panelists, where each panelist assessed the EDP sample based on their sensory perception and emotional response. The panelists employed a hedonic scale featuring five levels, with corresponding descriptions: 1 = "very dislike", 2 = "dislike", 3 = "neutral", 4 = "like", and 5 = "very like".

Sensory Evaluation

The sensory evaluation involved 30 panelists tasked with evaluating three distinct samples, denoted as F1, F2, and F3. Subsequently, the panelists were required to assess the olfactory attributes of each sample based on their sensory acuity. The sensory evaluation entailed rating the aroma of each of the three variants on descriptive method (Koswara, 2006.). Prior to participating in the sensory assessment, each panelist underwent a sensitivity training session for various aroma types in order enhance their olfactory acumen.

RESULT AND DISCUSSION

Formulation Eau De Perfume

The formulation was meticulously developed through a month-long iterative process, aimed at optimizing the physical attributes of the perfume preparation. The key physical quality parameters under consideration encompassed clarity, uniformity, absence of particulate matter, and fragrance aroma. The perfume products in this study successfully met the quality standards specified in SNI 16-4949-1998.

In general, it happened because the solvent could dissolve all the fragrance oil ingredients. On the other hand, the quality product was also determined by mixture olfactory system (top, middle, and base notes). The technique of mixing fragrance oil ingredients in Eau De Perfume could produce new floral-themed odors that are detected

by nerve cells in the olfactory cortex (Zou & Buck, 2006). In the mixing process, the resulting EDP perfume aroma can be detected well by respondents.

Evaluation of Eau De Perfume

Organoleptic test

The EDP fragrance ingredients in this study were completely mixed form one homogeneous phase. In organoleptic testing, the results for homogeneity parameters fulfilled requirement of SNI 16-4949-1998, visually the mixture was no particle after stored one month at room temperature. Homogeneity test data are listed in Table 2.

Table 2. The evaluation of homogeneity

Formula	Week			
	1	2	3	4
1	+	+	+	+
2	+	+	+	+
3	+	+	+	+

*+ no particle

++ particle

Previously, Homogeneity was conducted (Mustakim et al., 2019), the formula of liquid perfume from coffee produced a muddy solution, because the coffee's particle did not mixed well. But, the evaluation result of Eau de Toilette (EDT) showed that organoleptic test for EDT formula were clear and perfectly mixed with no particle. it is because used raw materials that were certified by the Certificate of Analysis (CoA) and added a solubilizer (Gunawan & Rahayu, 2021).

The color of formula every week showed good consistency. The color indicated colorless solution. It could happen because the solution was stored in an airtight container, so that the sample is not indirect contact with oxygen which could cause an oxidation reaction to fragrance oils. It was happen because all formula contained vanilla fragrance oil. Previous research (Hardiyati et al., 2020), the evaluation stability testing results of solid perfume indicated that the least stable solid perfume was containing vanilla essential oil.

The color of perfume solution can be seen in Table 3. The evaluation dosage form of all samples showed very good consistency a liquid solution during the first three weeks, but in the fourth week the solution became slightly thicker. It could possibly occur because the solvent was evaporation. Table 4 shows consistency dosage form of perfume.

Table 3. The evaluation of colour

Formula	Week			
	1	2	3	4
1	+	+	+	+
2	+	+	+	+
3	+	+	+	+

* + Colorless

++ Yellow

Table 4. The evaluation of dosage form

Formula	Week			
	1	2	3	4
1	+	+	+	++
2	+	+	+	++
3	+	+	+	++

*+ liquid

++ thickness

Scent long-lasting test

The evaluation long lasting scent of perfume fulfilled standard SNI 16-4949-1998 if the scent still detected minimum for 4 hours after it sprayed on paper smell (Mustakim et al., 2019). The durability smell test was tested on 30 panelists. Table 5 shown the result of evaluation.

Table 3 showed durability test data that formula F1 and F2 have long-lasting scents than F3. It is because F1 and F2 contain a higher percentage of fragrance oil at the base note level than F3. This research used vanilla not only as base note formula ingredients but also as fixative. The longevity of fragrance is also influenced by quality of the volatile component mixture and fixative substances within the formulation of the EDP itself.

Table 5. Long-lasting scents of perfume

Criteria Scent	%		
	F1	F2	F3
Very strong	27	13	23
Strong	40	40	20
Normal	27	27	34
Weak	6	13	23
Very weak	-	7	-

A Fixative is a perfumery material with lower volatility compared to other materials, thereby mitigating the rate of fragrance evaporation. The purpose of adding these substances is to enhance the longevity of the fragrance oil, thereby prolonging the evaporation process. Desirable characteristics of an effective fixative substance include a high boiling point and a pleasant aroma (Sitanggang et al., 2021).

Spot test

The evaluation data of spot test for EDP were obtained by employing an electric caliper to determine the spot diameter generated by each formula. The testing results revealed an average spot diameter of 74,48 mm for all the formulation. The data from the spot test can be observed in Table 6.

The measurement of the spot size for perfume formulations is not subject to specific requirements according to SNI 16-4949-1998. The spot size of perfume spray formulations is influenced by the shape and diameter of the perfume bottle packaging used (Gunawan & Rahayu, 2021).

Table 6. Spot test perfume

Formula	Diameter (mm)
F1	73,23
F2	75,41
F3	74,81
Average	74,48

Hedonic test

Hedonic testing is an assessment of consumer (panelist) acceptance levels regarding Eau de Parfum (EDP) products with variations in the concentration of each respective formula. The preference test results for EDP fragrances, featuring sweet and floral-themed fragrances, were administered to a sample of 30 panelists. As presented in Table 7, it is evident that panelists expressed a favorable disposition towards all three formulations of EDP fragrance. On average, formula F2 garnered the highest percentage, accounting for 42% of panelist preferences, while formula F1 and formula F3 received preferences from 37% and 20% of panelist, respectively. A graphical representation of the hedonic test data interpretation can be observed in Figure 2.

Table 7. Hedonic test perfume

Criteria Scent	%		
	F1	F2	F3
Very like	13	17	13
Like	37	43	20
Neutral	34	23	40
Dislike	13	10	20
Very dislike	3	7	7

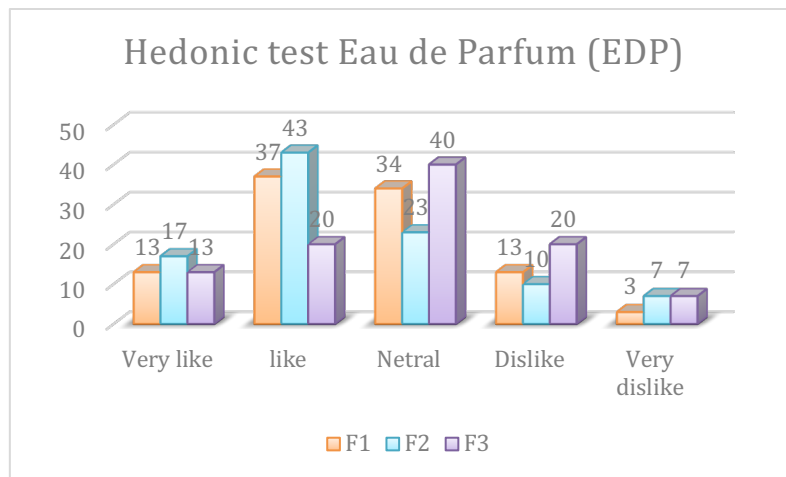


Figure 2. The result of hedonic test

Sensory Evaluation

Sensory evaluation in a cosmetic product is essential for assessing consumer acceptance. In this study, it was represented by a panel of 30 individuals. The evaluation of EDP fragrance formulation commenced with an assessment of the scent. Prior to rating the three EDP fragrance formulas, the 30 panelists underwent a 7-days training

period to familiarize themselves with the characteristics of each aroma category, including sweet, green, spicy, woody, and citric. After becoming acquainted with the various aroma types, the panelists assessed the EDP fragrance formulas based on predefined questionnaire criteria. The assessment scale was visualized in a graphical representation know as a spider web. The spider web representation of the EDP fragrance formulas can be observed in Figure 3.

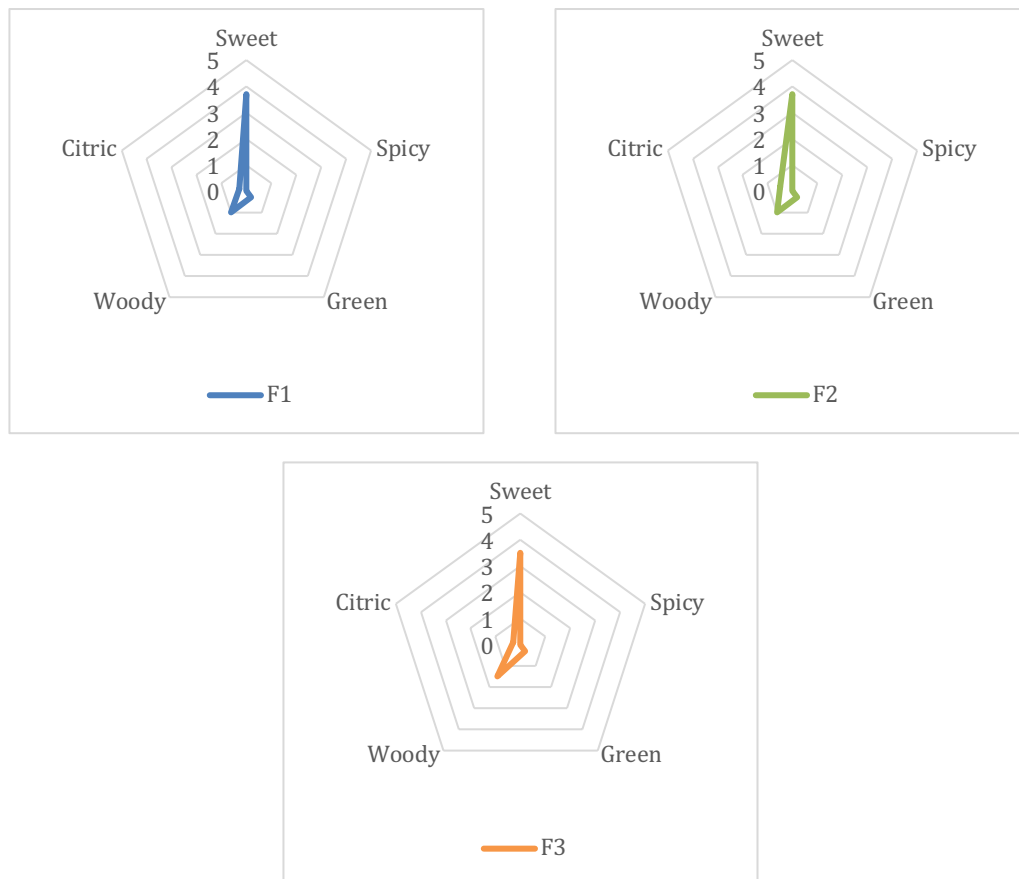


Figure 3. sensory profile obtained using volunteers questionnaires

Base on the assessments by the panelists, the attributes were rated on scale from 0 to 5 (mean \pm SD) for each formula. The results of formula 1 were with sweet-like ($3,7 \pm 2,25$) as dominant attributes, followed by woody-like ($1,0 \pm 2,03$), green-like and citrus-like ($0,3 \pm 1,27$), but spicy-like has not the score. Formula 2 were also sweet-like ($3,7 \pm 2,25$) as dominant, followed by woody-like ($1,0 \pm 2,03$), citrus-like ($0,5 \pm 1,53$), and green-like ($0,3 \pm 1,27$). Formula 3 were also sweet-like ($3,5 \pm 2,33$) as dominant attribute, followed by woody-like ($1,5 \pm 2,33$), citrus-like and green-like ($0,3 \pm 1,27$).

These results indicate that the formulations developed by the researchers align with the intended floral-themed EDP fragrance. The dominance of the sweet characteristic is attributed to the presence of sweet-smelling ingredients in the EDP formula, including jasmine, cherry blossom, and vanilla. These components contribute significantly to the overall composition. The second prominent aroma is woody, which corresponds to the second-largest percentage composition coming from sandalwood.

Citrus notes were detected by some panelist, likely stemming from white peach. All three formulas, F1, F2, dan F3, exhibited similar spider web patterns.

CONCLUSION

The fragrance product formulated in this study align with objective, which is to create an Eau de Perfume (EDP) with a floral aroma. The most preferred perfume formulation was identified as formula F2. Physically, the resulting perfume formula solutions conform to SNI 16-4949-1998, exhibiting clarity and color stability. In summary, the longevity of the fragrance in the EDP is most pronounced in formulas F1 and F2.

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