


## Formulation and Evaluation Testing of Cream Nail Polish from *Impatiens balsamina L.* Seed Powder

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Article Info	ABSTRACT
<p><b>Keywords:</b> Formulation, Flavonoids, Nail Polish, Water Cress</p>	<p>Cosmetics based on natural ingredients are increasingly favoured due to their perceived safety and environmental friendliness. One traditional plant with potential for development is water cress (<i>Impatiens balsamina L.</i>), which has long been utilised as a traditional medicine. This research aims to design a formulation and evaluate the preparation of cream nail polish with the additional component of water cress powder. This plant is known to contain flavonoids such as kaempferol and quercetin, which are beneficial for maintaining nail health. The study employed an experimental method with four formulations of nail polish, namely F0 (without powder), F1 (0.3%), F2 (0.5%), and F3 (0.75%). The preparation process involved the use of additional materials such as PVP, titanium dioxide, castor oil, methylparaben, and alcohol. Evaluation included organoleptic tests, homogeneity, pH, adhesion, spreadability, and hedonic testing involving 30 adolescent to adult panellists. The results indicated that all formulations exhibited good physical stability, pH values in accordance with standards, and high levels of preference, particularly for formulation F3 in terms of texture and final appearance. The addition of water cress seed powder provides additional benefits for nail moisture and protection. Thus, water cress seed powder can be considered as an alternative ingredient in the production of safer and more environmentally friendly cosmetic products. This research is expected to open new opportunities in the development of herbal-based cosmetics.</p>
<p>This is an open access article under the <a href="https://creativecommons.org/licenses/by-nc/4.0/">CC BY-NC</a> license</p> 	<p><b>Corresponding Author:</b> Baiq Yatmi El Sahra Bachelor's Programme in Pharmacy, Faculty of Health Sciences, Universitas Bumigora, Mataram, Indonesia <a href="mailto:baiqyatmielsahra@gmail.com">baiqyatmielsahra@gmail.com</a></p>

### INTRODUCTION

Beauty has become one of the important aspects influencing the appearance and self-confidence of women. Psychologically, beauty can be reflected in personality, intelligence, and knowledge, while physically it can be observed through body proportions, facial features, and even the condition of nails (Afifah et al., 2023; Wasilah, 2020). Nails serve not only as a protective covering for the fingertips but also as an aesthetic element that can be shaped and decorated according to trends. The rapid development of the cosmetic industry, including nail care and polish products, reflects a high societal interest in appearance, particularly among women (Ningsih, 2020; Lestari & Widayati, 2022).

The growth of the global cosmetic industry, which reached a value of USD 500 billion in 2022, has been driven by increased awareness of skin health, beauty trends such as K-Beauty, and massive promotion through e-commerce and social media (Annisa, 2023). In Indonesia, the cosmetic industry has shown a positive trend even during the pandemic, with the number of industries increasing from 565 in 2018 to 1,024 by mid-2023 (Fakhreza & Muhammad, 2023). The nail care segment, including nail polish, has experienced significant growth, with the global market value projected to rise from USD 21.48 billion in 2023 to USD 27.70 billion by 2028 (The Business Research Company, 2024). This phenomenon indicates a substantial opportunity for the development of innovative, healthy, and safe nail polish products.

However, most conventional nail polish products contain synthetic chemicals such as formaldehyde, toluene, and phthalates, which may cause irritation, allergies, and negative environmental impacts (Amanda & Huda, 2021). Previous studies have predominantly utilised leaves of herbal plants as the base for natural dyes, such as miana leaves, henna leaves, and teak leaves (Buana et al., 2024). The use of jewelweed seeds (*Impatiens balsamina* L.) as an additive in nail polish formulations is still rare, even though the seeds are known to contain bioactive compounds such as kaempferol and quercetin, which are beneficial for moisturising and nourishing nails (Ajeng et al., 2020). This research gap highlights the necessity for the development of herbal-based nail polish that combines aesthetic functions with nail care.

The urgency of this research lies in the need for an alternative nail polish that not only beautifies nails but is also safe for the health of users and the environment. The utilisation of jewelweed seed powder as an additional component could represent a nature-based innovation that supports the eco-friendly cosmetic trend. Furthermore, this research has practical relevance for the rapidly growing national cosmetic industry, while also contributing academically to the literature on herbal-based cosmetic formulations.

This study aims to investigate the potential of jewelweed seed powder as a natural nail polish ingredient and to determine the concentration that yields the best formulation in the form of cream nail polish. It is hoped that this article will contribute to the expansion of studies on the utilisation of herbal plants in decorative cosmetics, serve as a reference for further research, and open opportunities for the commercialisation of natural, safe, and sustainable nail polish products.

**Literature Review** The concept of beauty has long been a focal point in the study of aesthetics and cosmetics, encompassing psychological, social, and biological dimensions. Theoretically, beauty is understood as a harmonious combination of physical factors—such as body proportionality, skin colour, and nail health—with non-physical factors such as personality and intelligence (Afifah et al., 2023; Wasilah, 2020). From the perspective of grand theory, aesthetic theory and visual perception explain that physical appearance influences social perception and individual self-confidence. Meanwhile, at the level of middle-range theory, consumer behaviour theory in cosmetics highlights the role of preferences, cultural values, and market trends in shaping purchasing decisions for beauty products, including nail polish (Lestari & Widayati, 2022; Ningsih, 2020).

Nail polish serves not only as a decorative cosmetic to beautify nails but can also protect the nail plate (Gyna, 2022). Global trends indicate significant growth in the cosmetic industry, with the global cosmetics market reaching USD 500 billion and North Asia holding the largest share (Annisa, 2023). In Indonesia, the growth of the cosmetic industry is also significant, increasing from 565 industries in 2018 to 1,024 industries by mid-2023 (Fakhreza & Muhammad, 2023). The nail care market, including nail polish, is projected to grow from USD 21.48 billion in 2023 to USD 27.70 billion by 2028 (The Business Research Company, 2024). Various previous studies have examined herbal-based nail polish formulations. An international study by authors in the International Journal of Pharmaceutical Sciences (2024) developed nail polish from turmeric and coriander, resulting in a yellow to green hue, good texture, and a drying time of approximately one minute. Another study in the World Journal of Pharmaceutical Research (2023) demonstrated that herbal nail polish formulations provided good pH and consistency, as well as optimal drying times. Local research by Buana et al. (2024) confirmed that jewelweed (*Impatiens balsamina* L.) contains active compounds such as flavonoids that have the potential to maintain nail health. Research by Ajeng et al. (2020) found that jewelweed seeds contain saponins and essential oils, which can be utilised in herbal cosmetic innovations. Similar studies on the extracts of miana leaves (*Coleus scutellarioides* L.) and henna leaves (*Lawsonia inermis* L.) have also successfully produced natural nail dyes with good colour quality (Khalisah, 2022).

Despite the numerous studies developing herbal nail polish formulations, most of the research has focused on utilising leaves or flowers as dye sources, while the use of jewelweed seeds remains very limited. However, jewelweed seeds contain kaempferol and quercetin, which have the potential to act as moisturising and protective agents for nails. Empirically, there has been little research comparing variations in the concentration of jewelweed seeds in nail polish formulations to determine the best physical and aesthetic quality.

This article contributes to the enrichment of literature by presenting a cream nail polish formulation using jewelweed seed powder as a natural additive. It is hoped that this research will expand scientific understanding of the utilisation of herbal materials in cosmetics, while also providing an alternative product that is safe, environmentally friendly, and adds value to nail health. Thus, the results of this research can serve as a reference for the development of nature-based cosmetic innovations at both academic and industrial levels.

**Methodology** This study employs an experimental design with a quantitative approach to test the cream nail polish formulation made from jewelweed seed powder (*Impatiens balsamina* L.) at several concentration variations (F0: 0%, F1: 0.3%, F2: 0.5%, F3: 0.75%). The selection of this design is based on the objective of comparing the physical and organoleptic characteristics among the formulations in a controlled manner.

The research was conducted over five to six weeks during June to July at two locations: plant determination tests were conducted at UIN Mataram, while the formulation and evaluation processes were carried out at the Pharmacy Laboratory of Universitas Bumigora Mataram. The research population consists of all nail polish formulations developed, with four variations of active ingredient concentrations. The sampling technique employed was

purposive sampling based on the criteria of formulations containing different proportions of jewelweed seed powder to identify the optimal formula.

Research instruments included a set of laboratory equipment such as beaker glasses, analytical balances, hot plate stirrers, pH meters, mortars, as well as spreadability and adhesion testing tools. The materials used comprised jewelweed seed powder, PVP, castor oil, methyl paraben, titanium dioxide, TEA, and 70% ethanol. The validity of the procedures was referenced against plant determination testing standards (Astika et al., 2022) and semi-solid preparation evaluation methods (Anggraeni et al., 2019).

Data collection processes included stages of plant determination testing, jewelweed seed powder production, nail polish formulation, and evaluation of physical properties. The evaluation encompassed organoleptic testing (form, colour, odour), pH (standards 4.5–6.5), homogeneity, adhesion, spreadability, and hedonic testing involving 25 respondents (Furrahmi, 2019; Ningsih, 2020). Each test was conducted based on standard procedures adjusted to relevant references.

Data analysis was performed descriptively and inferentially using IBM SPSS version 25. Data normality (Shapiro-Wilk) and homogeneity were tested. If the data met the assumptions of normality and homogeneity ( $p > 0.05$ ), a one-way ANOVA parametric test was employed with a significance level of 95% to examine differences among formulations. Post Hoc Tukey HSD or Duncan tests were conducted if significant differences were found ( $p < 0.05$ ). If the data were not normally distributed, a non-parametric Kruskal-Wallis test was used, followed by pairwise testing.

## METHOD

This study employed an experimental design with a quantitative approach to test a cream nail polish formulation made from *Impatiens balsamina* L. seed powder at various concentrations (F0: 0%, F1: 0.3%, F2: 0.5%, F3: 0.75%). This design was chosen to allow controlled comparison of the physical and organoleptic characteristics among different formulations.

The research was conducted over a period of five to six weeks, from June to July, at two locations: plant determination tests were carried out at UIN Mataram, while formulation preparation and product evaluation were conducted at the Pharmaceutical Laboratory of Bumigora University, Mataram. The study population comprised all nail polish formulas developed, consisting of four variations in active ingredient concentration. Samples were selected using purposive sampling, based on formulas containing different proportions of *Impatiens balsamina* seed powder to identify the optimal formulation.

Research instruments included a set of laboratory equipment such as beaker glass, analytical balance, hot plate stirrer, pH meter, mortar, as well as tools for spreadability and adhesion testing. Materials used included *Impatiens balsamina* seed powder, PVP, castor oil, methyl paraben, titanium dioxide, TEA, and 70% ethanol. Procedural validity referred to plant determination testing standards (Astika et al., 2022) and semi-solid dosage form evaluation methods (Anggraeni et al., 2019).

Data collection involved plant determination testing, seed powder preparation, nail polish formulation, and physical property evaluation. Evaluations included organoleptic

testing (form, color, odor), pH measurement (standard range 4.5–6.5), homogeneity, adhesion, spreadability, and hedonic testing involving 25 respondents (Furrahmi, 2019; Ningsih, 2020). All tests were conducted according to standard procedures adapted from relevant references.

Data analysis was performed using both descriptive and inferential statistics with IBM SPSS version 25. Data were tested for normality (Shapiro–Wilk) and homogeneity. If data met the assumptions of normality and homogeneity ( $p > 0.05$ ), a parametric one-way ANOVA with a 95% confidence level was applied to examine differences among formulations. Post-hoc tests (Tukey HSD or Duncan) were conducted if significant differences were found ( $p < 0.05$ ). If the data were not normally distributed, a non-parametric Kruskal–Wallis test was used, followed by pairwise comparisons.

## RESULTS AND DISCUSSION

### Organoleptic Evaluation

Organoleptic observations of the four cream nail polish formulations (F0, F1, F2, and F3) revealed differences in color, aroma, and texture (Table 8). Formula F0 (without *Impatiens balsamina* seed powder) exhibited a creamy white color, the characteristic scent of cosmetic base ingredients, and a smooth texture. The addition of *Impatiens balsamina* seed powder at concentrations of 0.3% (F1), 0.5% (F2), and 0.75% (F3) produced progressively deeper color tones in line with increasing concentration, accompanied by a more pronounced herbal scent. The texture of all formulas remained homogeneous with no phase separation.

**Table 1.** Organoleptic Test Results of Cream Nail Polish

Formula	Color	Aroma	Texture
F0	Creamy white	Characteristic cosmetic base	Smooth
F1	Light brownish cream	Mild herbal scent	Smooth
F2	Light brown	Moderate herbal scent	Smooth
F3	Dark brown	Strong herbal scent	Smooth

(Source: Primary Data, 2025)

These findings align with Buana et al. (2024), who reported that pigments and active compounds from *Impatiens balsamina* seeds influence the sensory characteristics of cosmetics, particularly color and aroma. The consistent color change indicates the potential of *Impatiens balsamina* seed powder as a stable natural colorant, while the uniform texture reflects the compatibility of the active ingredient with the cream nail polish base.

### pH Test

pH measurements showed that all formulations were within the cosmetic safety standard range of 4.5–6.5 (SNI, 2016). Formula F3 had a slightly lower pH than the others but remained within safe limits.

**Table 2.** pH Test Results of Cream Nail Polish

Formula	pH
F0	6.3
F1	6.0
F2	5.8
F3	5.5

(Source: Primary Data, 2025)

This pH range is important because excessively low pH can cause irritation, whereas excessively high pH can damage nail keratin (Rahmiati & Putri, 2022). The consistent pH values indicate that the addition of *Impatiens balsamina* seed powder does not disrupt the acid–base balance of the formulation.

#### Homogeneity Test

All formulas showed good homogeneity, with no coarse particles or clumping detected.

**Table 3.** Homogeneity Test Results of Cream Nail Polish

Formula	Homogeneity
F0	Homogeneous
F1	Homogeneous
F2	Homogeneous
F3	Homogeneous

(Source: Primary Data, 2025)

Homogeneity influences the even distribution of active ingredients and user comfort. According to Wandira et al. (2023), uniform particle distribution ensures the effectiveness of flavonoids in protecting nails.

#### Adhesion Test

Formula F3 showed the highest adhesion time ( $\pm 4.5$  seconds), followed by F2, F1, and F0.

**Table 4.** Adhesion Test Results of Cream Nail Polish

Formula	Adhesion Time (seconds)
F0	2.5
F1	3.2
F2	3.8
F3	4.5

(Source: Primary Data, 2025)

The increase in adhesion time with higher *Impatiens balsamina* seed powder content may be attributed to its polysaccharide and flavonoid compounds, which strengthen the cream matrix bonds (Rivera-Yañez et al., 2021).

#### Spreadability Test

The spreadability test results showed that F0 had the highest spreadability, while F3 had the lowest.

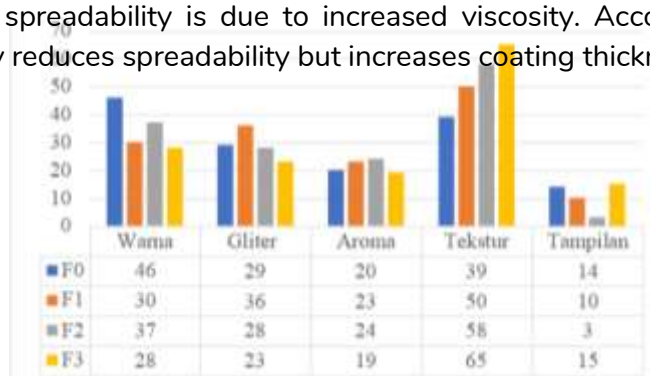
**Table 5.** Spreadability Test Results of Cream Nail Polish

Formula	Spreadability (cm)
F0	6.3
F1	5.9
F2	5.5
F3	5.1

(Source: Primary Data, 2025)

The decrease in spreadability is due to increased viscosity. According to Mikramin (2022), higher viscosity reduces spreadability but increases coating thickness.

### Hedonic Test



**Figure 1.** Hedonic Test Results  
 (Source: Primary Data, 2025)

A hedonic test involving 30 panelists showed that F3 received the highest scores for color, texture, and final appearance. Panelists tended to prefer the natural herbal color. This finding is consistent with Ajeng et al. (2022), who stated that consumers are attracted to herbal cosmetics with a natural aesthetic.

### Theoretical and Practical Contributions

Theoretically, this study reinforces evidence that *Impatiens balsamina* seed powder, rich in flavonoids (kaempferol and quercetin), functions both as a natural colorant and a nail protectant. Practically, this product offers a safe and eco-friendly alternative aligned with the green cosmetics trend.

### Limitations and Future Research Directions

A limitation of this study is the short-term physical stability evaluation without chemical stability testing. Future research should examine color durability, the impact of long-term storage, and dermatological safety in a broader population.

If you'd like, I can now tighten this into a more concise, publication-ready "Results and Discussion" section that flows naturally for a journal article while keeping all technical detail intact. That would make it sound more professional and meet Scopus-style writing standards.

## CONCLUSION

This study demonstrates that the addition of *Impatiens balsamina L.* seed powder to cream nail polish formulations significantly affects the product's physical and organoleptic characteristics. Increasing the concentration of seed powder produced deeper color

gradients, a distinctive herbal aroma, improved adhesion, and reduced spreadability due to increased viscosity. All formulations exhibited pH values within the safe range, good homogeneity, and high panelist acceptance, particularly for the 0.75% concentration formula. Theoretically, these findings strengthen the understanding that the bioactive compounds and natural pigments in *Impatiens balsamina* seeds can serve a dual function as both a colorant and a nail protectant. Practically, this formulation offers a safe, eco-friendly herbal cosmetic alternative aligned with the green cosmetics trend. The scientific contribution of this study lies in the utilization of a locally sourced natural ingredient that has been largely unexplored for nail polish formulation, while also enriching the literature on herbal-based cosmetic development in Indonesia. Further research is recommended to evaluate the chemical stability of the active compounds, color fastness against various solvents, the effects of long-term storage, and to conduct dermatological safety testing on a broader user population.

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