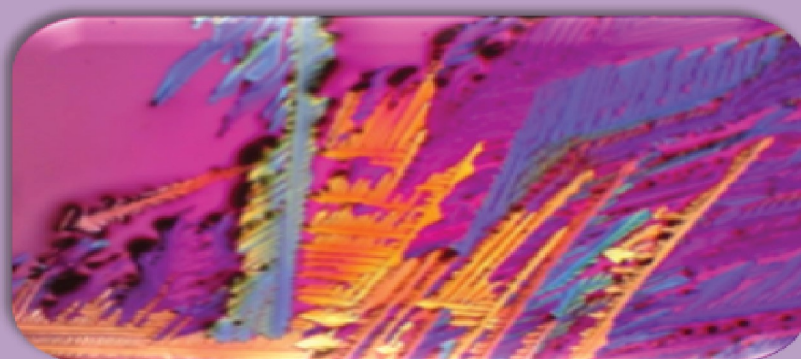




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## **Formulation Nails Color Gel Peel-Off Using Pacar Air (*Impatiens balsamina* L.) Leaf Extract and Sodium Carboxy Methyl Cellulose**

### **(Formulasi Gel *Peel Off* Pewarna Kuku yang Mengandung Ekstrak Daun Pacar Air (*Impatiens balsamina* L.) dan Sodium Carboxy Methyl Cellulose)**

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Submitted 23 January 2020, Accepted 4 October 2020

**Abstract:** Leaves of Pacar air or *Impatiens balsamina* L. (IB) are directly pounded and then placed on the surface of the nail to color the nails traditionally. It's preferred by Moslem because wudu water can penetrate to the nail. The traditional way of using the leaves is unpleasant and these leaves should be used in the fresh form. The IB leaves contain flavonoids, quinones and tannins that provide a natural orange color. A formulation of a nail polish containing the leaf's extract is needed so it's easy to use and stable during storage. The aim of this research is to make nail color gel peel off from IB extract which is easy to use and stable. Nail color gel peel off is made using Sodium Carboxy Methyl Cellulose (Na-CMC) as a gel base. This research was carried out by making six formula of gel peel off using swelling and mixing methods at various IB extract concentrations of 5%, 10% and 15% using 1% and 3 % of Na-CMC as the base respectively and the prepared product was evaluated. The IB leaves can be made into cosmetic preparations that have a good quality. All preparations have a yellow to orange red, odorous and homogeneous, pH 4.7-5.4, viscosities 630-3600 cps, has a pseudo plastic thixotropic flow properties. When nail color gel peel off used in nails, the base can remove from nail and only the coloring agent attached to the nail.

**Keywords:** Extract, Gel peel off, *Impatiens balsamina* L, Nail cosmetic, Sodium Carboxyl Methyl Cellulose.

**Abstrak:** Daun Pacar air atau *Impatiens balsamina* L. (IB) secara langsung dihancurkan dan diletakkan di permukaan kuku untuk mewarnai kuku secara tradisional. Hal itu lebih dipilih oleh kaum Muslim karena air wudhu dapat penetrasi melalui kuku. Cara tradisional menggunakan daun tidak menyenangkan dan daun tersebut harus digunakan dalam bentuk segar. Daun IB mengandung flavonoid, kuinon, dan tanin yang menyediakan warna jingga alami. Sebuah formulasi pewarna kuku mengandung ekstrak daun diperlukan agar memudahkan penggunaan dan stabil selama penyimpanan. Tujuan penelitian ini untuk membuah gel *peel off* pewarna kuku dari ekstrak IB yang mudah digunakan dan stabil. Gel *peel off* pewarna kuku menggunakan Sodium Carboxy Methyl Cellulose (Na-CMC) sebagai basis gel. Penelitian tersebut dilakukan dengan membuat enam formula gel *peel off* yaitu metode *swelling and mixing* pada ekstrak IB dengan konsentrasi 5%, 10% dan 15% menggunakan Na-CMC 1% dan 3 % sebagai basis gel, lalu sediaan dievaluasi. Daun IB dapat dibuat menjadi sediaan kosmetik yang memiliki kualitas yang bagus. Semua sediaan memiliki warna kuning hingga jingga kemerahan, beraroma, homogen, pH 4.7-5.4, viskositas 630-3600 cps, memiliki tingkat alir *pseudo plastic thixotropic*. Ketika gel *peel off* pewarna kuku digunakan pada kuku, basis gel dapat dilepas dari kuku dan hanya tertinggal pewarna kukunya saja yang menempel pada kuku.

**Kata kunci:** Ekstrak, Gel *peel off*, *Impatiens balsamina* L, kosmetik kuku, Sodium Carboxyl Methyl Cellulose.

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## INTRODUCTION

NAIL is the part of finger skin in the form of transparent protective plates and composed by a combination of epithelial layer germinative cells (stratum germinativum) and a unified malpighi layer<sup>(1)</sup>. Without nails, finger sensitivity can be reduced by 50% and holding ability is difficult, as there is no fingernail pressure on the finger<sup>(2)</sup>. Various ways to disguise the actual condition of the nail or the beautify appearance of the nail. There are various types of nail cosmetics, such as Nail polish or Nail enamel, Nail hardener, Nail enamel remover, Nail cuticle remover, Nail Moisturizer, Nail addition (nail plastic or press-on nail or preformed artificial nail), Nail wrap or silk nail<sup>(2,3)</sup>. Two type of nail color cosmetics which is non-water-absorbant and water-absorbant. Non-water absorbant nail polish cosmetic has some variation such as nail polish or nail polish for example shimmer, frost polish (lower glossy nail polish and is not popular at this time), luster nail polish (shiny nail polish such as metallic) and nail cosmetics that can absorb water such as nail polish and henna. Nut nail coloring is widely used mainly by Moslem, because the dye does not prevent the entry of water to the nail when they wudu<sup>(4)</sup>.

Dyes used can be synthetic compounds, semi-synthetic and compounds derived from nature. Based on resource, the dyes were divided into two groups namely synthetic dyes and natural dyes, natural dye comes from 3 groups of dyes from plants, animals and microbial activities<sup>(5)</sup>. One of the plants that can produce natural colors is Pacar air or *Impatiens balsamina* L. (IB). This plant in some areas known as a plant that used to color nails by pounding and attached to the nails. IB is a plant that easily growing without the need for special care. In the preliminary test of the secondary metabolite showed that IB leaves contain flavonoids, quinons, saponins, tannins and steroids<sup>(6)</sup>. Flavonoids are pigments found in plants and soluble in polar solvents such as water, ethanol, methanol, ethyl acetate, or mixtures of such solvents. Anthocyanin is a type of flavonoid compounds and most commonly found in nature. Anthocyanin provides colors ranging from orange to red to purple. The appearance of the color is influenced by pH value. Anthocyanin give red color in acidic pH and give blue or purple at the base pH<sup>(7,8)</sup>.

Traditionally, IB. leaves are used directly by pounding and affixed to the nail. These leaves can't be stored for a long time and in its use is less comfortable because of the smell of the typical IB leaves.

This problem can be solved by cosmetic preparation such as a colloidal, gel, or cream as a carrier. Gel is

a colloid with greater amount of gentle agent base, which has non newton flow properties, is easy to apply and can release active substances in a short time. Sodium Carboxy Methyl Cellulose (Na-CMC), gum acacia, gum tragacanth, and others. Na-CMC is a base that serves as a dye carrier which will form hydrophilic colloids when added to water<sup>(9)</sup>.

The purpose of this study was to make colloidal preparations and gel nail dyes that can be stored for a long time and the dye leaves a stain on the nail and lasts for a certain period of time. This study will prepare nail color gel peel off containing 5%, 10% and 15% IB leaf extract and gelling agent Na CMC 1% and 5% respectively.

## MATERIALS AND METHODS

**Materials.** *Impatiens balsamina* L (IB) leaves taken from the Research Institute for Medicinal and Aromatic Plants (BALITRO), Cimanggu, Bogor, West Java, CMC-Na, Glycerin, Propyl Paraben, Methyl Paraben, TEA, Oleum rosae, Aquadest, Alkokol 96%, NaOH, Ammonia, Chloroform, HCl, Dragendorff Reagent, Mayer Reagent, NaNO<sub>2</sub>, AlCl<sub>3</sub>, NaOH 1N (All materials are pharmaceutical grade and are purchased from PT Brataco).

**Methods. Preparation of IB Leaf Extract.** The leaves of IB as much as 1 kg are cleaned and sorted, then are mashed using a blender, and macerated with 5 L 96% ethanol for 5 days while occasionally stirring, after 5 days the sample is filtered then concentrated using a rotary evaporator at a temperature of 45°C<sup>(10)</sup>. The liquid extract obtained from the rotary evaporator is then concentrated into a thick extract using water bath. The extract was weighed and stored in a closed brown bottle before being used for testing.

**Organoleptic and pH evaluation.** The IB extract was subjected to evaluation procedures including organoleptic and pH.

**Phytochemical screening of the extract. Test for alkaloids.** The extract was added with 2-4 drop of acetic acid followed by Dragendrof's reagent and mixed. The alkaloid presence was indicated with a precipitate with orange-red color formed<sup>(10,11)</sup>.

**Test for flavonoid.** Experimental solution (sample) was made by means of 2 grams of simplicia powder added with 100 ml of hot water, boiled for 5 minutes, and filtered. The sample was added with 5 ml dilute solution of ammonia and concentrate solution of H<sub>2</sub>SO<sub>4</sub>. Flavonoids compound were shown by yellow color formation<sup>(10,11)</sup>.

**Test for saponins.** The sample (2g) was boiled in 20 mL distilled water and filtered. The distilled water

**Table 1. Formulation of nail color using colloids and gels**

No	Materials	The amount (%)							
		Colloid				Gel			
		Blank K	F1	F2	F3	Blank G	F4	F5	F6
1	IB. Extract	0.00	5.00	10.00	15.00	0.00	5.00	10.00	15.00
2	Na- CMC	1.00	1.00	1.00	1.00	3.00	3.00	3.00	3.00
3	Glycerin	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
4	Triethanolamine	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
5	Methylparaben	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
6	Propylparaben	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
7	Oleum Rosae	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
8	Water to	100	100	100	100	100	100	100	100

was mixed and shaken vigorously with 10 ml filtrate until its produce a persistent froth then 3 ml of olive oil was added, mixed and shaken vigorously until an emulsion was formed, that indicates there is saponins compound in the sample<sup>(10,11)</sup>.

**Test for tannins** compound, the extract (500 mg) was boiled with 20 ml water in a tube, added 2-3 drops of 0.1 % ferric chloride and observed for brownish green or a blue-black color<sup>(10,11)</sup>.

**Test for Quinon.** The experimental solution from the identification of flavonoids (5 ml) was added 1N NaOH solution a few drops in a tube. The quinone class compounds were indicated with red color formation<sup>(11,12,13)</sup>.

**Test for Steroid.** The extract (20 mg) was macerated in a tightly closed container with 20 ml for 2 hours, and then filtered. The filtrate was evaporated in a 5 ml vaporizer cup until a residue was obtained. Lieberman-Buchard reagent (Anhydrous acetic acid 2 drop and concentrated solution of sulfuric acid) were added the residu. Steroid or triterpenoid compounds were shown by green or red color formed<sup>(10,11)</sup>.

**Test for Anthocyanin.** The thick extract 20 mg was heated with 2N HCl, for 5 minutes at a temperature of 95-100°C. Positive results were obtained if the red color remains. Sodium hydroxide solution added drop by drop to the extract. Positive results were obtained when the color turns to bluish green<sup>(6,8,14)</sup>.

**Preparation of the nail color formula.** The material used is as stated in Table 1. Methyl paraben is dissolved with hot water, then the methyl paraben solution is used to soak sodium CM, stirred until homogeneous, TEA is added while stirring until gel mass is formed. Glycerin with propyl paraben is mixed in one cup, then warmed in a water bath at 60-70°C while stirring then put into a gel mass that has formed, stirred until homogeneous, then IB leaves extract was

added and mixed until homogeneous, then add oleum rosae and water little by little while stirring until it produces a homogeneous gel mass.

**The physicochemical evaluation of the nail color formulation.** The evaluation procedures include an organoleptic examination of the physical attributes, color, odor, homogeneity and pH tests, viscosity and rheology test, irritation test, and color adhesion test. The viscosity and rheology of the formulation were performed using a Brookfield Viscometer type LV. The tool is mounted with various rpm starting from 1.5; 3; 6; 12; 30; 60. Results showed that the extract had a viscous form, with a specific of pacar air leaves odour and brownish red colour. The results of the phytochemical screening test can be seen in Table 2.

**Test color or color sticking.** A topical test was performed to determine the adhesion of the color to the nail. The topical test was performed visually on 54 panelists with 108 thumb nails. Each panelist was asked to apply the gel with variations in concentration of IB extract on the treatment 1 time and twice applying then left for 5 minutes, 10 minutes and 15 minutes respectively, then the base attached on the nail is removed, and visually observed whether the color stain remains on the nail which was observed until its fades. The parameters observed in the color adhesion test on the nail are observed from the amount of spread, the average weight attached to the nail and the length of time of application<sup>(3,4)</sup>.

**Table 2. Organoleptic and pH of the IB extract**

Evaluation	Extract
Form	Viscous liquid
Odor	specific of IB leaf
Color	brownish red color
pH	4.87

## RESULT AND DISCUSSION

The extract of IB as much as 7.83 g was obtained from the fresh leaves using maceration method in ethanol 96% for 5 days with a recovery factor 7.83%. The organoleptic test results of IB leaf extract are in Table 3, the extract visually is in a brownish red, viscous liquid form, with a pH of 4.87.

The phytochemical screening showed the IB extract contains flavonoid, quinones, tannins, and anthocyanin compounds. The active compounds contained in the IB leaf such as anthocyanin, flavonoids and quinones are natural pigments that can be used as dyes<sup>(15,16,17)</sup>.

The result of organoleptic, homogeneity and pH test of nail dye colloid and gel made on formulas 1, 2, 3, 4, 5 and 6 and blanks are described in Table 4.

Based on observations on all gel formulas obtained have rose odorous, homogeneity, yellow orange until brownish-red color, except for a blank formula transparent because didn't contain extract. Formula that contains 1% Sodium Carboxy methylcellulose (F1, F2 and F3) has viscous liquid gel form but F4, F5 and F6 have semisolid form, with pH between  $4.7 \pm 0.05$  until  $5.4 \pm 0.010$  and  $5.54 \pm 0.01$  until  $5.87 \pm 0.01$ . Gel formula F4 until F6 have soft until dark brownish-red color with semisolid form. The difference in pH

is due to the mixing of different extracts (pH 4.87) with the base gel F1-F3 (pH 4.5) and F4-F6 (pH 6.3). This pH difference will result in different colors for each formula<sup>(18)</sup>.

The results of the viscosity and rheology evaluation using the Brookfield LV type viscometer in Figure 1. It saw that the blank A, F1, F2 and F3 formulas have a viscosity of 840-2400 cps blank B, F4, F5 and F6 660-11200 cps. The results of the adhesive evaluation of the color of the gel nail color extract IB can be seen Figure 2. All formulas have yellow- orange, orange, red-orange, soft brownish red, brownish red, dark brownish red. After 1 F1, F2 and F3 as much as 1 and 2 applied top for 5 minutes, 10 minutes and 15 minutes on the thumbnails, the colors attached to the nails are orange-yellow to orange, the color attached to the nails is yellow-orange to orange-red.

The applied F4, F5 and F6 as much as 1 applied and 2 applied top for 5 minutes, 10 minutes and 15 minutes on the thumbnails, the colors attached to the nails are soft brownish red, brownish red and dark brownish red.

Increasing the amount of extract used affects the color and pH of colloidal nail dye. The amount of extract (pH 4.87) used was 5%, 10% and 15% when put into a colloid base (Na CMC 1%) with a liquid gel (colloid) pH of 4.5 so that the pH of the colloidal nail polish became 5.2 to 4.4. Changes in pH also affect the colloidal color that is getting red orange. Likewise on the use of 3% Na CMC gel base (pH 6.3) the pH of the gel dropped to 5.87 to 5.54 with the color of the gel getting toward from soft brownish red in to dark brownish red. All formula nail dye have pH in normal range of skin pH (4.5-6.5), so skin and nail irritation is not expected to occur when it used<sup>(19,20)</sup>.

The differences of coloring nail showed that the surface area of the nail and the length of time for the diffusion of the coloring agent from gel to nail affected the sticking and the nail color. Results of a visual evaluation of the color of the nails disappear 7-14 days. The strongest color was produced by the

**Table 3. Phytochemical Screening IB Extract**

No	Compounds	Result	
1	Alkaloid : - Dragendorff . Meyer	- a clear yellow precipitate - No color	(-)
2	Flavonoid	the formation of a red ring layer	(+)
3	Saponins	foam formed	(-)
4	Quinone	red color	(+)
5	Tannin	blackish green color	(+)
6	Steroid/ triterpenoid	No ring layer formed red or green	(-)
7	Anthocyanin	bluish green	(+)

**Table 4. The Evaluation of Nail color Gel**

Formula	Form	Color	odor	homogeneity	pH
Blank A	viscous liquid	transparance	rose	homogeneity	$4.5 \pm 0.005$
F1	viscous liquid	Yellow orange	rose	homogeneity	$4.7 \pm 0.05$
F2	viscous liquid	orange	rose	homogeneity	$5.2 \pm 0.005$
F3	viscous liquid	red orange	rose	homogeneity	$5.4 \pm 0.010$
Blank B	semisolid	transparance	rose	homogeneity	$6.03 \pm 0.005$
F4	semisolid	soft brownish red	rose	homogeneity	$5.87 \pm 0.010$
F5	semisolid	brownish red	rose	homogeneity	$5.68 \pm 0.006$
F5	semisolid	dark brownish red	rose	homogeneity	$5.54 \pm 0.006$



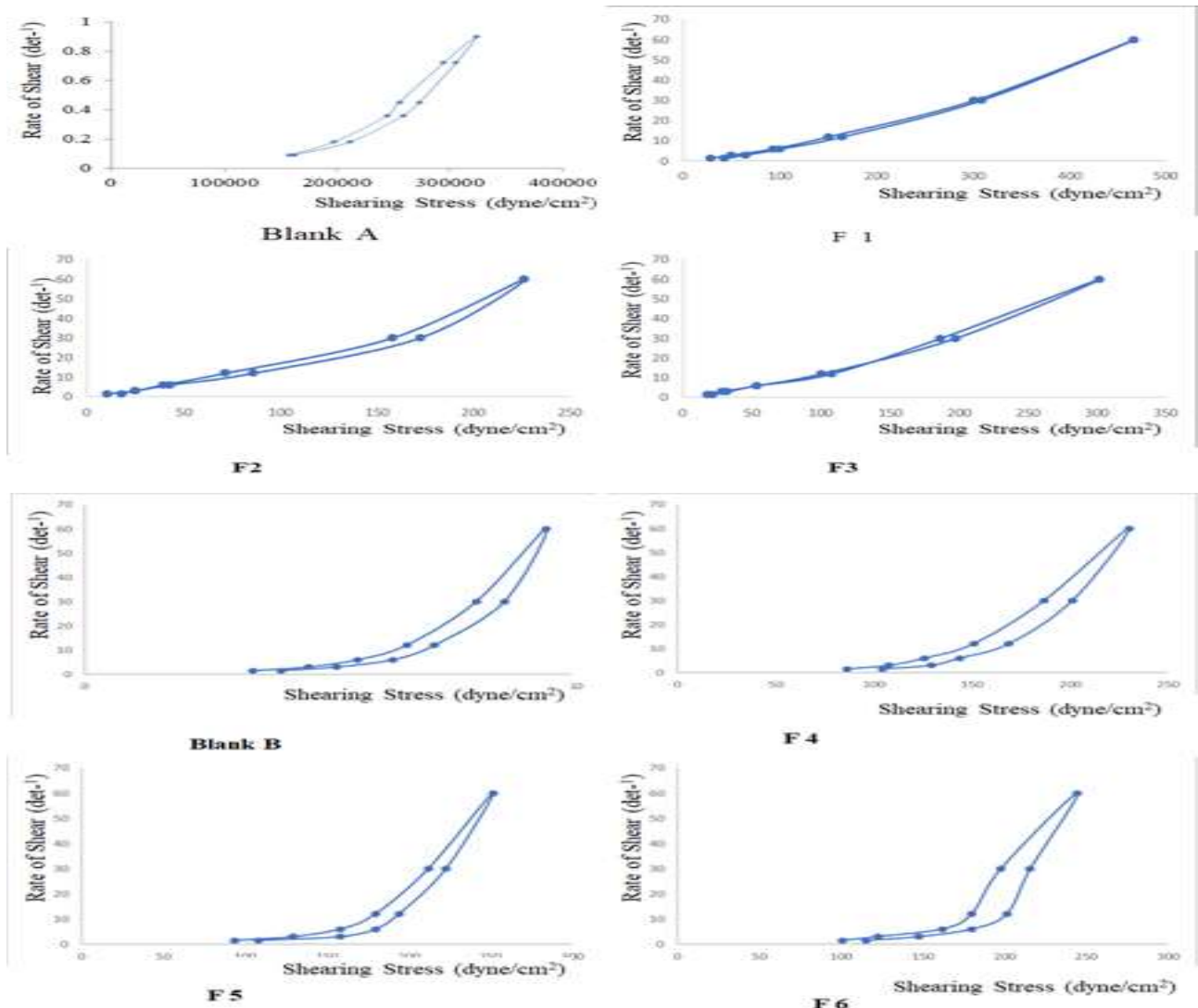


Figure 1. Profile of flow properties from all nail color formula

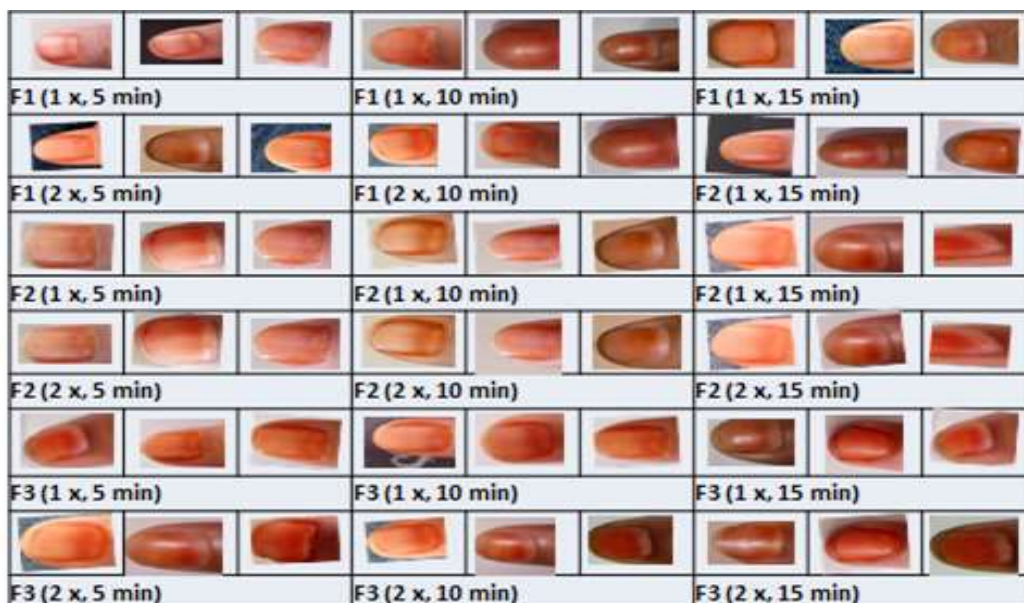


Figure 2. The thumbs (A) , middle finger (B) and pinkie nails (C) colors after applying a formula 1-6 nail gel color once and twice then allowed to stand 5 minutes, 10 minutes and 15 minutes.

formula with a concentration of 15% IB extract (F6) for 2 minutes for 15 minutes<sup>(5)</sup>. The more weight that is attached to the nail and the longer the sticking time the more concentrated the color it creates.

## CONCLUSION

The phytochemical screening showed the IB extract contains flavonoid, quinone, tannin, and anthocyanin compounds. IB leaves can be made into a good peel-off nail color with yellow orange to dark red brown. All IB-leaf gel formulas have rose odorous, homogeneity, yellow orange until brownish-red color. All formula nail dye have pH in normal range of skin pH. Due lack of the intensity of the nail color, it needs more research on formulation, so that it can fulfil the nail color product requirements and can produced for industrial scale.

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