

Formulation and Evaluation of Lip Balm Using Different Herbal Pigments

Sharad Visht, Sana Sirwan Salih, Darya Aziz Mohammed, Areej Ammar Abduljabbar, Sarmad Jabbar Hama, Ibrahim Ahmed Khudhair

Department of Pharmacy, Faculty of Pharmacy, Tishk International University, Erbil, Kurdistan Region, IRAQ.

ABSTRACT

Background: Lip balm is one popular formulation in cosmetic field. The primary role of lip balm is to treat dry lips and prevent their dehydration. Some lip balm utilized chemical-based synthetic dyes causes side effects and has short moisturizing effect compared to the natural formulation. **Aim:** In current research study, the lip balm batches were prepared with natural pigments to minimize side effects and to maintain the moisturizing effects for long duration. **Materials and Methods:** The 10 batches of lip balm were formulated using extracted pigment from pigment of *Opuntia* fruit, pigment of *Curcuma longa*, pigment of *Nyctanthes arbortristis* flowers, pigment of *Centaurea orientalis* flowers and carotene by using fusion method. The ingredients of lip balm include a moisturizer, an emollient, and opacifying agent, antioxidant, antiseptic, SPF (UV-protection). All batches of lip balm were evaluated for pH, softening point, spreading aging stability, texture, color melting point, surface abnormality, perfume stability and skin irritability. **Results:** All 10 batches of lip balm showed smooth texture and no surface abnormalities. All formulations were stable, convenient, and effective to apply. The perfume was retained during and after aging stability study. **Conclusion:** It was concluded that the lip balm prepared using herbal pigments also bears ideal characteristic of lip balm.

Keywords: Lip balm, Cosmeceuticals, Phytotherapy, Moisturizing, Herbal pigments.

Correspondence:

Dr. Sharad Visht

Assistant Professor, Department of Pharmacy, Tishk International University, Erbil, Kurdistan Region, IRAQ.
Email: sharad.visht@tiu.edu.iq

Received: 08-09-2023;

Revised: 25-10-2023;

Accepted: 09-11-2023.

INTRODUCTION

Herbs, Phyto-constituents, and extracts have been used since ancient time as traditional medicines for thousands of years all over the world. Cosmetics are chemicals or substances applied to the body to improve appearance. Today, the use of cosmetics has become more widespread worldwide and is constantly evolving, especially facial cosmetics (lip balm) from herbs/ natural sources.^[1,2] The herbal cosmetics like lip balm do not contain other potentially dangerous ingredients (synthetic chemicals preservatives) that are found in synthetic products, such as petrochemicals, artificial fragrances, spices, dyes and preferred over regular lip balms prepared using synthetic material.^[3,4]

So, the world is returning to herbal products. Herbal cosmetic products are an irreplaceable gift of nature to humans as a wide range of herbal cosmeceuticals that complete beauty treatment. Lips are particularly sensitive due thin skin and are often the first sign of dryness. Lip balm is the most common cosmetic product that most people (men and women) use to moisturize and protect

lips from cracking and drying as it form an occlusive coating on the surface of the lips, lock in moisture and protect the lips from external exposure, such as sunlight, in the winter season, with less humid temperatures, winds also dry the thin skin on the lips that away the moisture from the body.^[5]

Primarily for protection, the top layer of the skin (corneum) has around 15 layers in general while at the top the layer of the lips (corneum) has around 4 layers and is quite thin as compared to formal facial skin. Due to thin layer, lips dry and crack/ chapped easily and so lip balm are the best choice as it contains a waxy material to cover the lips protects damaged lips from ulcers and cold sores. There are few melanin cells in the lip skin.^[6,7]

Different types of Lip balms are literature classified according to the ingredients, for example, moisturizing lip balm, UV (Ultraviolet) filtering lip balm, healing lip balm, tinted lip balm, nourishing lip balm. Using an herbal lip balm to nourish and protect lips from the elements is a healthy and effective way to care for lips.^[1]

Lip balms are also classified into different types, such as natural components. Herbal lip balm is made from herbs, plant extracts and essential oils. These ingredients are often organic, non-toxic, and free of artificial flavors, colors, and preservatives. Nourishing and Soothing: Herbal lip balm contains herbs to repair and soothe



DOI: 10.5530/pres.16.2.46

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dry, chapped lips. For example, beeswax, shea butter and cocoa butter form a barrier that locks in moisture and protects the lips from further damage. Beeswax is a natural compound secreted by bees that is often used in cosmetics, especially lip balms. This substance is very moisturizing and helps in lips protection from the harmful rays of the sun and possesses a pleasant smell. Beeswax acts as a natural emulsifier. Nourishment: The nourishing ingredients of the lip balm restore the natural oils and moisture of the lips. Coconut oil, jojoba oil and vitamin E oil are examples of ingredients that provide hydration and nutrients that support healthy lips. Multipurpose: In addition to treating viral infections and colds, herbal lip balm can also protect lips from the harmful sunrays. Thanks to the use of essential oils, herbal lip balms can also create a calming and soothing aroma.

However, there are some differences between lipstick and lip balm, particularly in terms of aim of use and functionality, because mainly lipstick is used for coloring of lips, but lip balm protects the lips from drying. The preparation of lip balms requires balancing the concentrations of the chief component's (butter, waxes and oils) to attain the adequate melting temperature (65-75°C) of the final product. Thus the contact of the lip balm with the lips does not results in a feeling of friction or dryness and allows homogeneous layer formation on the lips to protect the membranes of the lips that are sensitive to environmental factors (UV radiation, pollution, drought)^[8,9] Creating lip balms requires a balanced concentration of key ingredients like as butters, oils, waxes and pigments, as every ingredient has different functions and affects the characteristics of lip balm. The beeswax eases the shine and hardness, wool fat (lanolin) allow as an oil-based base, white petroleum jelly as a humectant, glycerol as a stabilizer, oleic acid as a texturizer, saccharin/aspartame as a sweetener/ flavor, zinc oxide as a sunscreen, titanium dioxide as a fogging agent, lemon oil as an antioxidant and antiseptic.^[10,11]

MATERIALS AND METHODS

Extraction of pigment

Accurately weighed 200 g of Herb (*Opuntia ficus-indica*) fruits (Family-Cactaceae) grounded, soaked with 1 L ethanol and mixed using mechanical stirrer 1 hr for high yield of pigment. Mixture was filtered using qualitative filter paper (size 102), centrifuge at 10000 rpm for 5 min to get supernatant. Supernatant was finally dried using freeze drier. The pictorial representation of the extraction procedure is given in Figure 1A.^[12-14]

The pigment from *Nyctanthes arbor-tristis* flowers (Family-Oleaceae) was extracted using Soxhlet apparatus and ethanol as a solvent. Extract was concentrated using freeze drier. The pictorial representation of the extraction procedure is given in Figure 1B.^[12-14]

The pigment from *Centaurea orientalis* flowers (Family-Asteraceae) was placed in a thimble and packed in Soxhlet

apparatus. The ethanol was used for extraction of solvent. Mixture was placed in freeze drier. The pictorial representation of the extraction procedure is given in Figure 1C.^[15-18]

Characterization of pigments

Yield: The yield of pigments extracted from the fruits of *Opuntia ficus-indica*, flowers of *Nyctanthes arbor-tristis* flowers and flowers of *Centaurea orientalis* were determined.^[19]

FTIR study: The FTIR study was performed using Fourier transform infrared spectrophotometry (Shimadzu IRAffinity-1S). FTIR is used to identify various types of bonds and functional groups of the molecule or a mixture.^[20]

Development of Lip Balm

The ten batches of lip balm were prepared by fusion method. All components were heated at 70°C in beaker in controlled manner in sequence of solid, semisolid and liquid excipients. On complete melting mixture was mixed with remain excipients. The sequence of addition of excipient was as showed in Table 1 and Figure 1D. The lip balm batches were kept in a dry and cool place.

Evaluation and characterization of lip balm

Organoleptic properties: The visual inspection was performed to confirm any change in color, odor, or shape during storage environment.^[21,22]

Texture: The texture of 5 lip balm from all 10 batches was evaluated to confirm the presence/ absence of any grittiness /or separation of any solid particles on applying or during storage.^[23]

pH: The pH tests were performed by immersing probe of digital pH meter into a lip balm mixture to confirm acidic pH or alkaline pH.^[24]

Melting point: Total 10 batches lip balm was placed in individual capillary tube. The temperature was increased linearly, and capillary was observed for melting of lip balm using thermometer. The experiment was performed in triplicate and mean melting point was considered as the melting point of lip balm.^[25,9]

FTIR: The FTIR (Shimadzu, IRAffinity-1S) was used to figure out various type of functional groups and bonds present in molecules or a mixture by scanning sample from 500 to 4000 cm⁻¹ wavelength.

Softening Point: The Orbital shaker has been used, to determine the softening point and the temperature was increased linearly up to 60°C.^[26]

Surface Abnormalities: Visual lip balm texture, which has been evaluated for checking orto reveal whether there is presence of any surface imperfections such as wrinkle and crystal formation, exudation of both fatty substances and solid, and contamination by microorganism like mold and fungi.^[27]

Aging stability studies: Lip balm batches were evaluated for testing and the expediting of stability experiments over a 30-day period at 25°C (room temperature), 5°C (refrigerated), and 40°C.

Perfume stability: The lip balm batches were stored at 25°C room temperature for 1 month to evaluate perfume stability of lip balm. The fragrance was also confirmed.^[28]

Skin irritability: The skin irritability test was done simply by applying the product to the skin and letting it on for 10 min.^[29]

Spread ability: Lip balm were evaluated for testing and the expediting of stability experiments over a 30-day period at room temperature (25°C), refrigerated (5°C), and oven temperature (40°C) as marked as good, intermeddle and bad as showed in Table 2.^[29]

RESULTS AND DISCUSSION

The yield of pigments extracted from *Opuntia ficus-indica* fruits, *Nyctanthes arbor-tristis* flowers and *Centaurea orientalis* flowers were found to be 1.67±0.25%, 1.83±0.36% and 1.12% as showed in Figure 2.

The FTIR of *Opuntia ficus-indica* fruits pigment showed various peaks in the functional group region, at 3640-3530 cm⁻¹ obtained OH stretch, also at 3570-3200 cm⁻¹ presence OH (broad) stretching, aromatic C-H stretch at 3130-3070 cm⁻¹, at 2850-2815 cm⁻¹ showed C-H stretch asym./sym, also C=C-C stretch of aromatic ring showed at 1615-1580 cm⁻¹/1510-1450 cm⁻¹/3130-3070 cm⁻¹, bending at 1470-1430/1380-1370 cm⁻¹, C-H several aromatic out-of-plane bend at 900-670 cm⁻¹, also around 1200 cm⁻¹ showed C-O stretching, C=O observed at 1725-1705 cm⁻¹, alkenyl C=C group stretching observed of 1680-1620 cm⁻¹, also C=C stretching at 1680-1620 cm⁻¹, aromatic C=C have been observed at 1490 cm⁻¹, also C-C at 1300-700 cm⁻¹, stretching of C-O at 1150-1050 cm⁻¹, also several aromatic C-H in-plane bend at 1225-950 cm⁻¹, stretching of C-OH at 1079 cm⁻¹, aromatic group have been observed C=C at 1490 cm⁻¹, also C-S stretch at 705-570 cm⁻¹ as showed in Figure 3.^[30,31]

The FTIR of *curcumin* showed various peaks in the functional group region such as phenolic OH stretching observed at 3640-3530 cm⁻¹, vibrations of phenolic O-H stretching hydroxyl groups at 3200-3500 cm⁻¹, also C-H stretch of (methoxy, methyl ether) O-CH₃ at 2850-2815 cm⁻¹, the of methoxy C-H stretch (CH₃-O-) at 2820-2810 cm⁻¹, also alkenyl C=C stretch 1680-1620, also showed various peaks in the finger print region such as 1490 cm⁻¹ showed aromatic C=C, stretching of phenolic C-O at around 1200 cm⁻¹, bending of C-H methyl asym./sym at 1470-1430/1380-1370 cm⁻¹, C=O at 1725-1705 cm⁻¹, phenolic C-O at 1246 cm⁻¹ as shown in Figure 3.

The FTIR of pigment obtained from *Nyctanthes arbor-tristis* flowers showed various peaks in the functional group region, at 3130-3070 cm⁻¹ showed aromatic C-H stretching, and OH at

3640-3530 cm⁻¹, OH stretch (broad) showed at 3570-3200 cm⁻¹, also at 2820-2810 cm⁻¹ showed C-H stretch, at 2850-2815 cm⁻¹ showed C-H stretch, at 1725-1705 cm⁻¹ showed at 1680-1620 cm⁻¹ presence of stretching alkenyl C=C group, also several peak observed in the finger print region at 1470-1430/1380-1370 cm⁻¹ showed bending of C-H asym./sym, C=C-C aromatic ring stretching 1615-1580 cm⁻¹/1510-1450 cm⁻¹ at 1490 cm⁻¹ aromatic C=C, C-C, C=O, aromatic C=C at 1490 cm⁻¹ several aromatic C-H in-plane bend at 1225-950 cm⁻¹, at 1246 cm⁻¹ showed C-O, C-O stretch at around 1200 cm⁻¹, and C-O stretch at 1150-1050 cm⁻¹, C-OH stretching at 1079 cm⁻¹ several aromatic C-H out-of-plane bend at 900-670 cm⁻¹, C-S stretch at 705-570 cm⁻¹ as shown in Figure 3.^[32,33]

The FTIR of *β-carotin* showed the presence of OH stretch at 3640-3530 cm⁻¹, OH stretch (broad) at 3570-3200 cm⁻¹, also C-H stretch have been reported at 3130-3070 cm⁻¹, at 2820-2810 cm⁻¹, showed C-H stretching, at 2850-2815 cm⁻¹, observed C-H stretching, C=O showed at 1725-1705 cm⁻¹, at 2850-2815 cm⁻¹, alkenyl C=C stretch 1680-1620 cm⁻¹, stretching of C=C group at 1680-1620 cm⁻¹, also aromatic C=C at 1490 cm⁻¹, C-H asym./sym, C=C-C aromatic ring stretch 1615-1580 cm⁻¹, /1510-1450 cm⁻¹/3130-3070 cm⁻¹, and aromatic C=C at 1490 cm⁻¹, bending at 1470-1430/1380-1370 cm⁻¹, at 1300-700 cm⁻¹, showed C-C, several aromatic C-H in-plane bend at 1225-950 cm⁻¹, at 1246 cm⁻¹, C-O-C have been reported, also -OH stretching at 1079 cm⁻¹, at around 1200 cm⁻¹, C-O stretch obtained, C-O stretch at 1150-1050 cm⁻¹, several aromatic C-H out-of-plane bend at 900-670 cm⁻¹, aromatic C-S stretch at 705-570 cm⁻¹ as shown in Figure 3.^[34,35]

The FTIR of pigment obtained from *Centaurea orientalis* showed the presence-OH stretch (broad) at 3570-3200 cm⁻¹, also aromatic C-H stretch at range 3130-3070 cm⁻¹, -OH stretch at 3640-3530 cm⁻¹, at the range of 2820-2810 cm⁻¹ showed C-H stretch, C-H stretch at 2850-2815 cm⁻¹, at range of 1680-1620 showed C=O, C=C stretching, at range of 1680-1620 cm⁻¹ showed alkenyl C=C stretching, also at 1490 cm⁻¹ showed aromatic C=C group, bending at 1470-1430/1380-1370 cm⁻¹, at 1490 cm⁻¹ obtained aromatic C=C group, several peaks reported in the finger print region such as, aromatic C-H in-plane bend at 1225-950 cm⁻¹, also C-O at 1246 cm⁻¹, at range of 1300-700 cm⁻¹ showed C-C group, C-O stretching showed at around 1200 cm⁻¹, also several aromatic C-H out-of-plane bend at range of 900-670 cm⁻¹, at range of 1150-1050 cm⁻¹ showed C-O stretch, C=C-C aromatic ring stretch 1615-1580 cm⁻¹/1510-1450 cm⁻¹/3130-3070 cm⁻¹, stretching at 705-570 cm⁻¹ showed C-S group, also at 1079 cm⁻¹ C-OH stretching reported, as shown in Figure 3.^[36,37]

Bees Wax: The peak range around 2900-3000 cm⁻¹ showed C-H asymmetric stretching vibration (hydrocarbons) and CH₂ symmetric, in the finger print region showed various peaks the range of 1127 cm⁻¹ showed (CH₂-C=O stretching and C-H

Table 1: Composition of lip balm.

Sl.No	Ingredients (%)	Function	Opuntia ficus-indica A1	Curcumin A2	Nyctanthes arbor-tristis A3	Carotene A4	Centaurea orientalis A5	Opuntia ficus-indica B1	Curcumin B2	Nyctanthes arbor-tristis B3	Carotene B4	Centaurea orientalis B5
1	Bees wax (s)	Impart glossiness and hardness	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
2	Wool fat (Lanolin)	Oleaginous base	0	0	0	0	0	6	6	6	6	6
3	White Petroleum jelly	Moisturizing agent	6	6	6	6	6	0	0	0	0	0
4	Glycerol	Stabilizer	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
5	Oleic acid	Texture enhancer	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
6	Saccharine/Aspartam	Sweeting agent Flavoring agent	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
7	Zinc oxide (ZnO)	Sun protection	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
8	Titanium dioxide (TiO ₂)	Opacifying agent	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
9	Lemon oil	antioxidant and antiseptic	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
10	Peppermint oil	antioxidant and antiseptic	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
11	Pigment	Coloring agent	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19

Table 2: Spread ability criteria.

Symbol	Indication	Feature
G	Good	Smooth, consistent, flawless application, no fragmentation, and no lip balm distortion.
I	Intermediate	Consistent, few leaves that are fragmented, proper application, and minimal lip balm deformation.
B	Bad	Not uniform, leaves a lot of pieces, is applied improperly, and causes lip balm to distort.

bending vibrations (esters), peaks around 1500 showed CH₂ (Hydrocarbon) also at 1739 representing of C=O stretching vibration (ester and free fatty acid), also below 1000 shows CH₂ group as shown in Figure 4.

Wool Fat: The peak at 1737 cm⁻¹ for (C=O) corresponds to sulfoester covalent bond, bands near 1600 cm⁻¹ assigned to C=O and N-H (amide I and II combination of amide), peaks of H-O-H bending mode at 1635 cm⁻¹ 1076 cm⁻¹ as shown in Figure 4.

Saccharin sodium: The saccharin sodium showed C-C benzene ring *st* at 1585 cm⁻¹ and 1458 cm⁻¹, C=O absorption at 1643 cm⁻¹, -SO₂-N *st* at 1336 cm⁻¹, 1257 cm⁻¹, 1149 cm⁻¹ including *asy/sy* -SO₂- stretching vibrations. The negative saccharinate ion with *asy* absorption and carbonyl bending at 968 cm⁻¹, 748 cm⁻¹ respectively, as shown in Figure 4.

Aspartame: The FTIR of aspartame showed the peaks around 3005 cm⁻¹ showed C-H stretching in C=C-H, at range of 2926 cm⁻¹ showed CH₂ asymmetric stretching, peaks around 3500-2500 cm⁻¹ representing of (O-H) stretching, at 1285 (C-O) stretching, 1710 cm⁻¹ shows (C=O) starching, 2855 cm⁻¹ (CH₂ symmetric

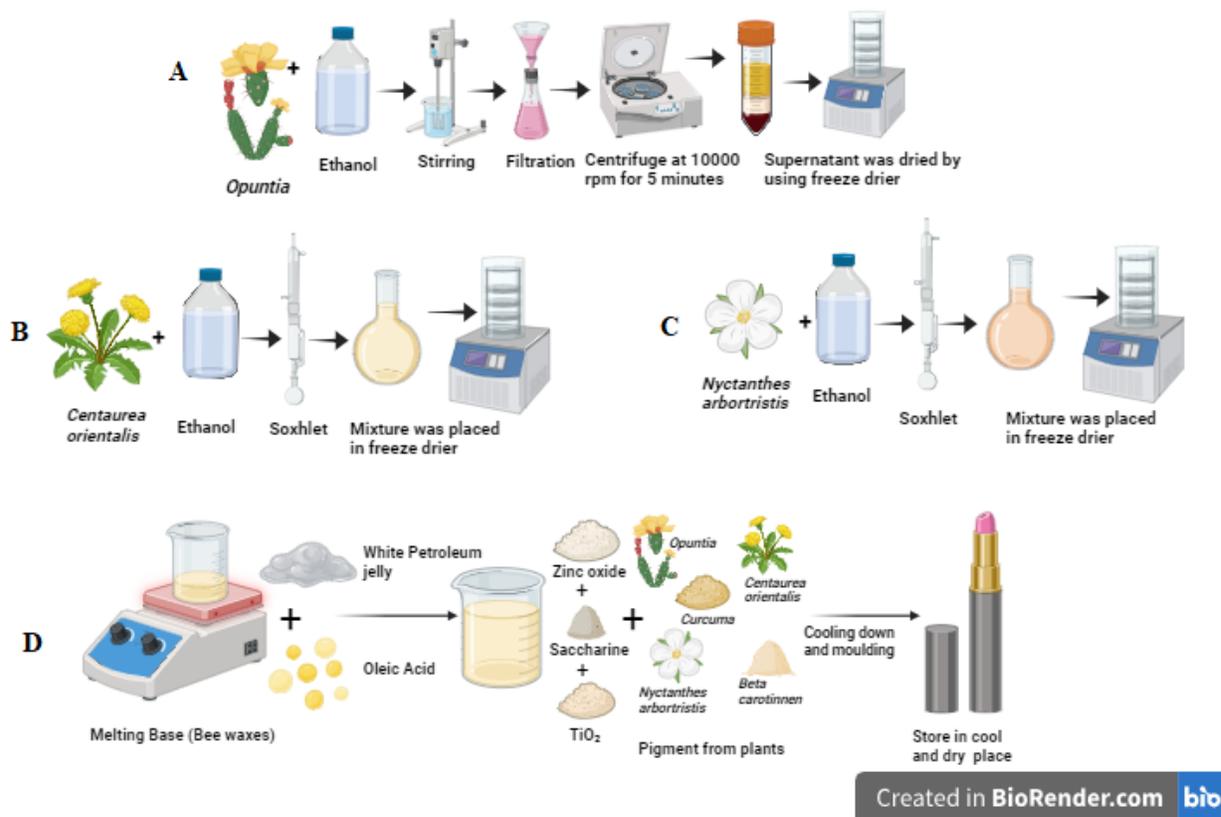


Figure 1: (A) Pigment Extraction from *Opuntia ficus*. (B) Pigment Extraction from *Nyctanthes arbor-tristis* flowers. (C) Pigment Extraction from *Centaurea orientalis*. (D) Development of lip balm.

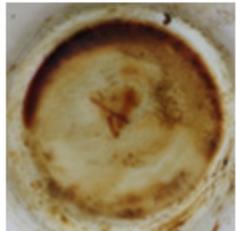
<i>Opuntia</i>	<i>Curcuma</i>	<i>Nyctanthes arbortristis</i>	β -carotene	<i>Centaurea orientalis</i>
A1	A2	A3	A4	A5
B1	B2	B3	B4	B5
				

Figure 2: (A) Pigment of *Opuntia ficus-indica* fruits, (B) *Curcumin*, (C) Pigment of *Nyctanthes arbor-tristis* flowers, (D) β -carotene, (E) Pigment of *Centaurea orientalis* flowers.

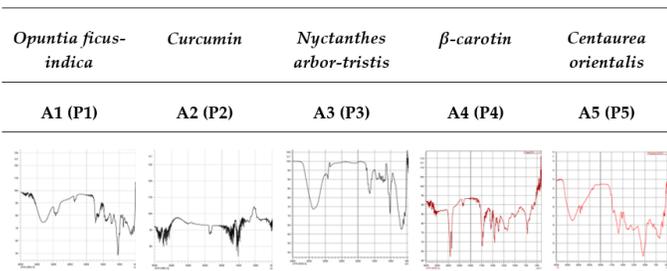


Figure 3: FTIR of Pigments.

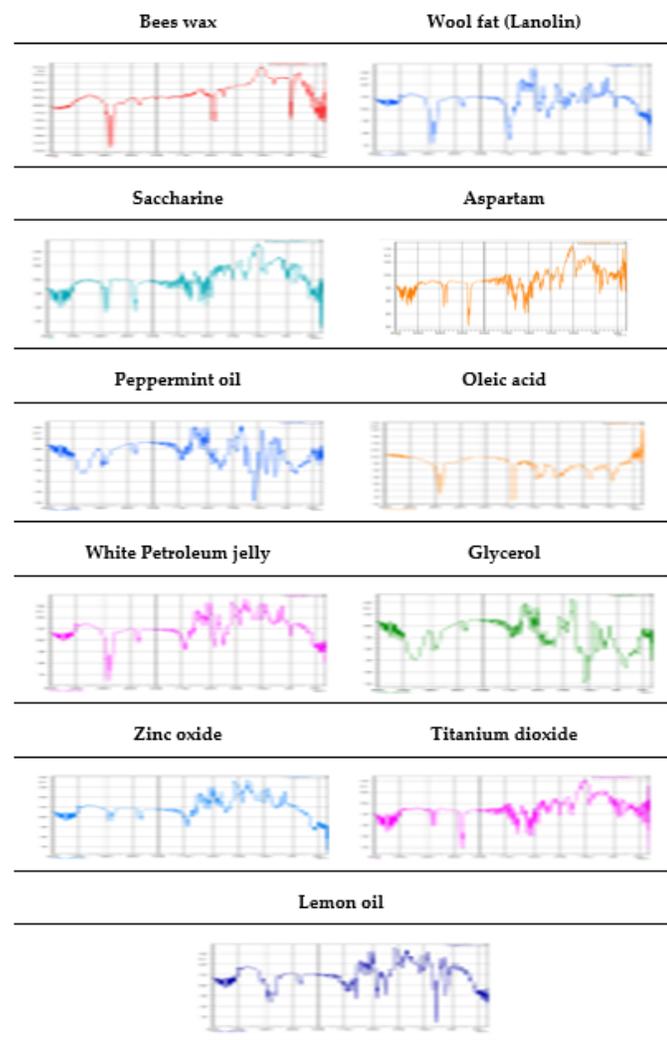


Figure 4: FTIR of excipients.

starching), in the finger print region showed several peaks like 1462 cm^{-1} (O-H) and 937 cm^{-1} O-H stretching as shown in Figure 4.

Peppermint oil: The FTIR showed the peaks at 1439 cm^{-1} , 1245 cm^{-1} , O-C-O band (primary alcohols) at 1090 and 1020 cm^{-1} , secondary alcohols peaks at 1100 cm^{-1} about 1109 cm^{-1} as shown in Figure 4.

Oleic acid: The FTIR showed the in-phase methylene (CH_2) twisting motion at 1318 and 1450 cm^{-1} , symmetric $-\text{CH}_2$

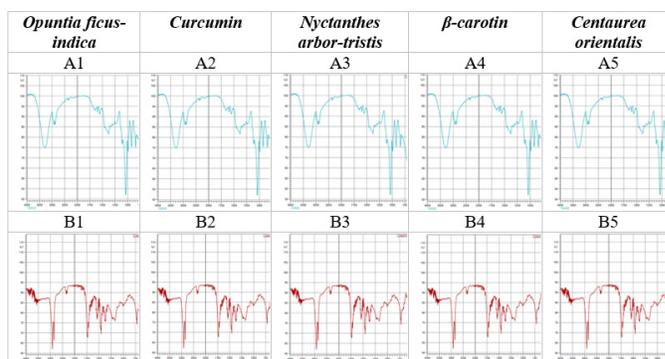


Figure 5: FTIR of lip balm batches.

stretch and the asymmetric $-\text{CH}_2$ stretch at 2854 and 2923 cm^{-1} respectively, $-\text{C}=\text{O}$ stretch at 1708 cm^{-1} , C-O stretching at 1285 cm^{-1} as shown in Figure 4.

White Petroleum Jelly: The FTIR showed the presence of various peaks, 3000 cm^{-1} showed C-H sp^2 stretching band, also at peak of 2900 cm^{-1} determined as strong C-H stretching sp^3 , at 1300-1400 cm^{-1} showed C=C aromatic band 1100 cm^{-1} obtained C-H bending, and at 745 cm^{-1} showed C-H out of plane aromatic at fingerprint region as shown in Figure 4.

Glycerol: The FTIR peaks at 3321.78 cm^{-1} (O-H) stretching, O-H bending at 910.22 cm^{-1} , C=C at 3009.99 cm^{-1} , C=O stretching of esters present in the glycerol at 1739.61 cm^{-1} , O-H stretching at 3321.78 cm^{-1} while, C=O stretching at 1739.61 cm^{-1} , O-H bending at 910 cm^{-1} , C=C at 3009.99 cm^{-1} , O-H stretching at 3265 cm^{-1} , C-H stretching at 2810-2950 cm^{-1} , C=O stretching at 1560 cm^{-1} , bending of C-O-H group in the region of 1400 to 1420 cm^{-1} (C-O st of the primary alcohol) as shown in Figure 4.

Zinc oxide: The FTIR showed the presence of peak at 440 cm^{-1} showed the Zn-O stretching vibration as shown in Figure 4.

Drug excipient interaction

The Fourier transform inferred spectroscopy of lip balm batches showed the presence of broad OH stretching, Aromatic ring stretching of C=C-C group, and aromatic C=C, also several aromatic C-H bending out-of-plane=C stretching have been reported, C-O stretch, and C-O group, C-OH and C-O stretching, aromatic C=C, also bending of several Aromatic C-H in-plane have been reported-H stretch reported, stretching of OH and Aromatic, C-H, C=O, C-S, C=C, C-H, C-C group, and C-H Asym/sym. as shown in Figure 5.

Development of Lip Balm

The 10 batches of lip balm were prepared successfully using 5 different pigments as shown in Figure 5.

Evaluation of Lip Balm

The quality of the lip balm was evaluated by using some parameters, including FTIR, organoleptic properties the pH

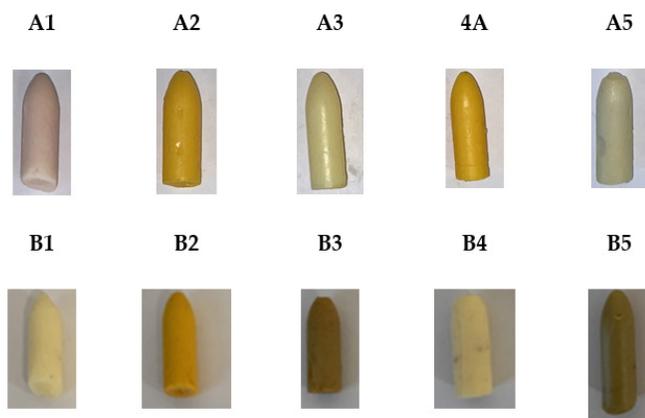


Figure 6: Various batches of lip balm batches.

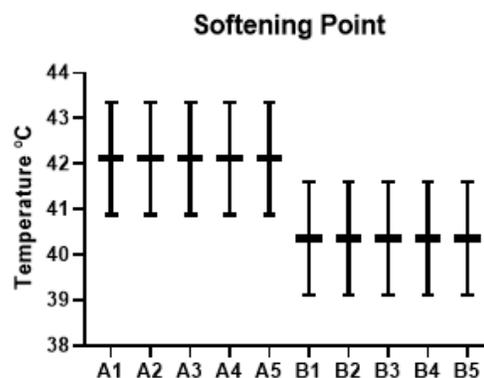


Figure 9: Softening Point of Different Lip balm batches.

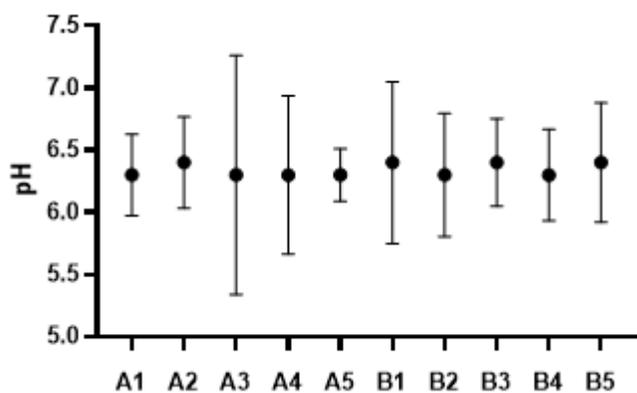


Figure 7: pH of Different Lip balm batches.

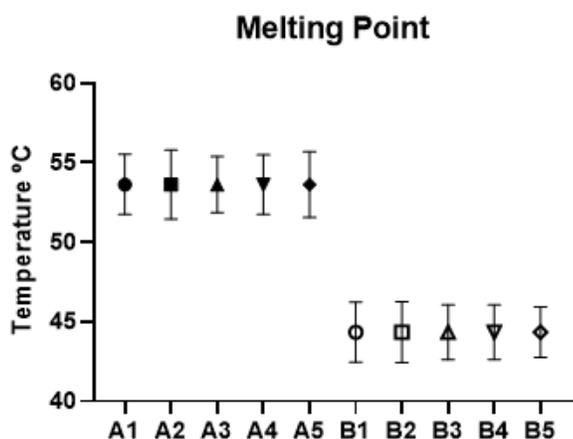


Figure 8: Melting Point of Different Lip balm batches.

level, melting point, softening point, surface abnormality, aging stability, perfume stability, skin irritability.

Organoleptic properties: The color, shape and size with perfume tested after 1 Months.^[38,39]

Color: The lip balm batches A1-A5 color was found to be creamy- golden-yellow- off-white- light-golden yellow- light green respectively as showed in Figure 6. The lip balm batches B1-B5 off white- dark golden -yellow- brown-light yellows- khaki, it changed due to using different herbal pigment extraction as shown in Table 3.

Texture: All 10 batches give smooth texture which no grittiness and precipitation or separation of any solid particles can be found during applying as shown in Table 3.^[40,41]

pH: The pH of lip balm formulation obtained around A batches of lip balm 6.3 ± 0.15 to 6.4 ± 0.26 , B batches of lip balm 6.3 ± 0.25 to 6.4 ± 0.25 shown in Figure 7 and Table 3.^[42,43]

Melting point: Respectively, A1-A5 melting point of lip balm yield varied from 53.63 ± 1.24 to 53.63 ± 1.53 and B1-B5 yield varied from 44.34 ± 1.12 to 44.34 ± 1.35 shown in Figure 8 and Table 3.^[44]

Softening Point: Softening point of formulated lip balm was recorded around 40.35 ± 1.12 to 42.12 ± 1.64 °C shown in Figure 9 and Table 3.^[45]

Surface Abnormalities: Total 10 lip balm visually showed smooth texture, no presence of any surface imperfections such as wrinkle and crystal formation, also no contamination of microorganism like mold and fungi as shown in Table 3.^[46]

Aging stability: All batches were stable as shown in Table 3.

Perfume stability: The formulated lip balm has been stored at 25°C room temperature for month, the fragrance has been recorded as retained.^[46,47]

Skin irritability: was no skin irritation discovered after applying formulation on the skin as shown in Table 3.^[48,49]

Spread-ability test: The lip balm spread smoothly with no gritless as shown in Figure 10.

Table 3: Evaluation of lip balm.

Sl.No	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	
1	Color	Creamy	Golden-yellow	Off-white	Light-golden yellow	Light-green	Off-white	Dark golden -yellow	Brown	Light yellows	Khaki
2	Texture	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
3	pH	6.3±0.23	6.4±0.26	6.3±0.18	6.3±0.15	6.4±0.16	6.3±0.25	6.3±0.25	6.4±0.25	6.3±0.26	6.4±0.24
4	Melting point	53.63±1.34	53.63±1.53	53.63±1.24	53.63±1.32	44.34±1.46	44.34±1.35	44.34±1.35	44.34±1.23	44.34±1.21	44.34±1.12
5	Softening point	42.12±1.24	42.12±1.31	42.12±1.64	42.12±1.23	40.35±1.61	40.35±1.12	40.35±1.12	40.35±1.21	40.35±1.26	40.35±1.17
6	Surface abnormalities	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
7	Aging stability	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
8	Perfume stability	Retained	Retained	Retained	Retained	Retained	Retained	Retained	Retained	Retained	Retained
9	Skin irritability	No	No	No	No	No	No	No	No	No	No

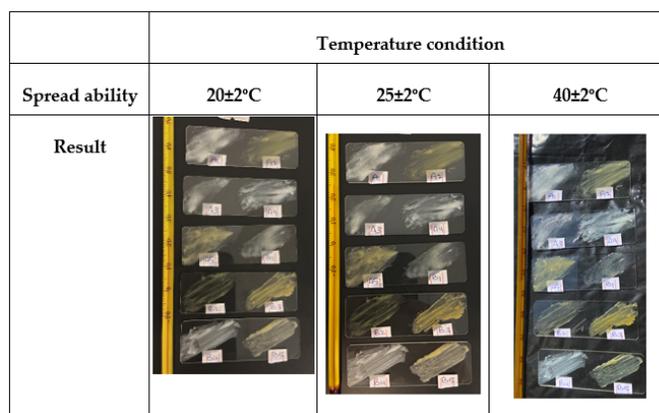


Figure 10: Spreadability of different batches of lip balm in different temperature.

CONCLUSION

In summary, developed herbal based lip balm formulation by using fusion were stable, smooth, and efficient as marketed products. Natural pigments were found to be compatible with excipient used to prepare lip balm. The developed lip balm batches showed good quality, color, appearance, texture, perfume stability, pH, spread ability, melting point, softening point, no surface abnormalities (smoothness), aging stability, perfume stability and no skin irritation.

ACKNOWLEDGEMENT

The author is thankful for provide every necessary support for this research from Tishk International University.

CONFLICT OF INTEREST

The authors declare that there is no conflicts of interest.

ABBREVIATIONS

%; Percentage; °C: Degree centigrade; cm: Centimeter; FTIR: Fourier transform infrared; g: Gram; Min: Minute; rpm: Rate per minute; TiO₂: Titanium dioxide; UV: Ultraviolet; β: Beta; ZnO: Zinc oxide.

SUMMARY

The Lip balm was prepared successfully using pigments extracted from *Opuntia* fruit, *Curcuma longa* rhizome, *Nyctanthes arbortristis* flowers, pigment of *Centaurea orientalis* flowers and carotene by using fusion method to prevent treat dry lips and their dehydration. The composition of lip balm was bees wax, wool fat (Lanolin), white Petroleum jelly, glycerol, oleic acid, saccharine/ aspartame, zinc oxide (ZnO), titanium dioxide (TiO₂), lemon oil, peppermint oil, pigment. Lip balm batches were stable, convenient, effective to apply, showed smooth texture and no surface abnormalities. The retention of perfume was good enough even on storage. It was concluded that the lip balm

prepared using herbal pigments also bears ideal characteristic of lip balm.

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Cite this article: Visht S, Salih SS, Mohammed DA, Abduljabbar AA, Hama SJ, Khudhair IA. Formulating and Evaluation of Lip Balm with Using Different Herbal Pigments. *Pharmacog Res*. 2024;16(2):367-75.