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FORMULATION AND EVALUATION OF ORGANIC *Xanthan Gum* WITH SYNTHETIC *Carbopol 940* AS UNDER EYE GEL

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Abstract: It is a natural desire of humans to look stunning, young, and lovely. Compared to other parts of the skin, the skin surrounding the eyes is comparatively thin and has less fat. For this reason, puffiness, bags, pigmentation, and dark circles under the eyes are the first signs of aging, stress, illness, environmental pollution, melanin deposition, lifestyle, and genetics. The bilateral, symmetrical, homogeneous pigment maculae's under the eyes' periorbital region are known as dark circles. Periorbital hyper pigmentation, puffiness, fine lines, and wrinkles are the main issues around the eyes.

A cosmetic product that effectively delays the appearance of bags, puffiness, pigmentation, fine lines, and wrinkles is therefore needed. Natural components are becoming increasingly more popular because they have fewer adverse effects than synthetic ones. In the current study, a herbal under-eye derma gel containing liquorice extract, turmeric powder, almond oil, wheat germ oil, and several essential oils like tea tree oil, rosemary oil, and lemon oil is developed and evaluated. According to reports, the aforementioned plant compounds have effective anti-tan, anti-aging, skin-whitening, anti-puffing, antioxidant, and moisturizing properties. Additionally, it may help in reducing hyper pigmentation, fading spots, removing fine lines and wrinkles, and increasing ceramide synthesis. The herbal elements' overarching qualities serve to keep the skin around the eyes moisturized, smooth, anti-puff, and pigmentation-free. From F1 to F5, different formulations of batches were created utilizing gelling agents such carbopol 940 in varying concentrations. Herbal under-eye gel was made, examined for clarity, pH, spreadability, photosensitivity, viscosity, and extrudability, and the results were good.

Keywords: pH, spreadability, photosensitivity, viscosity, and extrudability

INTRODUCTION

People often refer to the human eye as the "Windows of our Soul." One of the most prevalent conditions that people of all ages experience is dark circles. Due to the thinness of the skin and the presence of many veins, the area behind the eyes appears blue. Dark circles deepen when the skin around the eyes is overly thin. Periorbital hyper pigmentation is the term for the condition that occurs when the amount of melanin produced around the eyes is more than normal, giving them a darker hue.

Periorbital hyper pigmentation

Under the eyelids or around the eyes, dark circles are a very common ailment that affects people of all ages. It is sometimes referred to as a consistent, circular darkening of the skin under or around both eyes. Excessive pigmentation, shadows from eye bags, infraorbital fat prolapse,

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shadows from infraorbital sagging and wrinkles, and thin, translucent skin above the orbicularis ocular muscle can all result in dark circles.

Pathological mechanisms of periorbital hyper pigmentation

Numerous external and endogenous factors, such as sex, aging, anatomical differences, atopic dermatitis, dryness, inheritance, and other physical problems, might contribute to the development of dark circles. A few of the clinical factors that cause dark circles are excessive pigmentation, tear troughs, shadowing from infraorbital laxity and wrinkles, thin, translucent skin above the orbicularis ocular muscle, shadowing from infra-orbital fat herniation, and vein running. Below is a list of the main pathological mechanisms for dark circles.

Excessive Pigmentation

People who have allergic contact dermatitis and atopic dermatitis are more prone to have dark under eye circles. These people may develop post-inflammatory hyper pigmentation (PIH) around their eyes as a result of periorbital dermatitis and an unpleasant rubbing habit.
Post-purpuric pigmentation, or PPP, is another cause of periorbital darkening that develops after a cosmetic procedure.

Tear Troughs (Nasojugal groove)

The palpebromalar groove, also known as the lid/cheek junction, is a concave, oblique groove that naturally forms around the lateral part of the inferior orbit. It can cause dark circles and make people appear tired and worn out.

Infraorbital Fat Herniation

Though it does not directly produce dark circles, the infraorbital fat protrusion does deepen the tear trough and exacerbate the black circles.

Thin, Translucent Skin Overlying the Orbicularis Oculi Muscle

The transparent eyelid skin reveals the underlying subcutaneous vascular plexus or vasculature within the muscle.

Presence of Vein

Dark circles can also be caused by large veins under the eyes.

Wrinkles and Laxity

Age-related laxity and wrinkles in the infraorbital region exacerbate the dark circles.

Classification of Dark Circles

A dark circle is characterized as a uniform, rounded darkening of the skin beneath or around both eyes. The following categories of dark circles are assigned based on the examination of the clinical pattern of pigmentation and vasculature.

1. Pigmented (brown colour)
2. Vascular (blue/pink/purple colour)
3. Structural (skin colour)
4. Mixed

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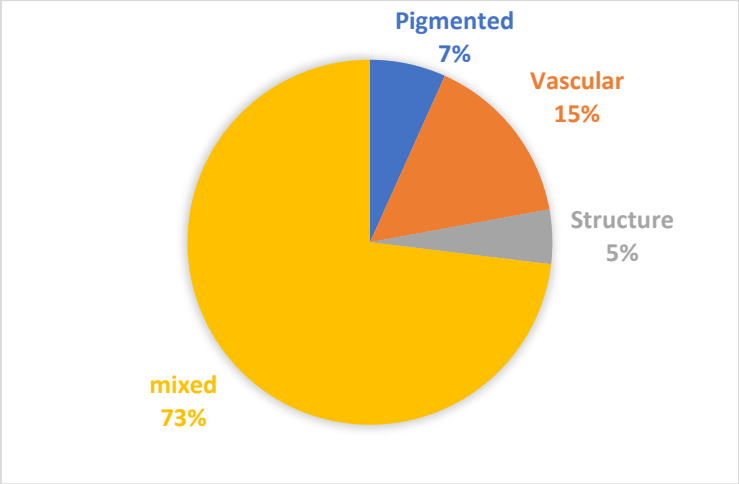

TABLE 01:

S.NO	TYPE	APPEARAENCE
1.	Pigmented	Brown hue, Infra orbital
2.	Vascular	Blue, Pink or Purple hue with or without puffiness
3.	Structured	Associated with Blepharoptosis and loss of fat with bony prominence. Also appears as structural shadows formed by facial anatomic surface
4.	Mixed type	Combination of two or three of the above

MATERIALS AND METHODS

It hasn't been generally reported how herbal under eye gel affects dark circles. The purpose of this thesis was to learn and comprehend how an under-eye gel may reduce dark circles without causing any negative side effects while also feeding and calming the skin. The impact of several elements on dark circles was examined to determine that gels are more quickly absorbed by the skin than other items.

MATERIALS

Carbopol 940 Glycerine, Liquorice extract, Tea tree oil, Almond oil, Rosemary oil, sufficient quantity of water, lavender oil, xanthan gum, neem oil, tri ethanol amine.

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Preparation of extract

One litre of ethanol (96%) was used to kinetically macerate 100 g of liquorice powder for four hours. Using 4L of solvent, the maceration process was repeated ten times. To create an ethanolic extract of liquorice root, the filtrate was evaporated in a rotary evaporator under vacuum at a temperature of 40°C, 180 mmHg, and 60 rpm.

Preparation of gel formulation

Twelve topical gel formulations were prepared using carbopol 940 and xanthan gum where F1 to F6 formulations were made using the gel base of carbopol 940 (1.5 %) and F7 to F12 formulations was made using the gel base of xanthan gum (1.5 %). Details of formulation compositions are recorded.

FORMULATION:

Formulation and evaluation of under eye gel Twelve different gel formulations (F1 to F12) were prepared using different concentrations (0.5, 1, 1.5, 2, 2.5 and 3% w/w) of ethanol extract of liquorice with 0.5 % concentration of Carbopol 940 and xanthan gum polymers respectively. Xanthan gum and carbopol 940 were used as gelling agent in the formulation as they are biodegradable, bio adhesive, biocompatible, irritation free and not absorbed into body. Among the two polymers used, xanthan gum was reported to have more gelling property than carbopol 940 (Blonco-Flonte et al., 1996), which is in correlation with our study. Xanthan gum polymer proved to be a promising carrier for controlled release of active phytoconstiuents in the gel formulation. The percentage of polymer was optimized after preparing the gel with various concentrations of carbopol 940 and xanthan gum containing gels was found to be compatible with the requirements of gel formulations.

Reference: liquorice extract (g)-A, Carbopol 940 (g)-B, Xanthan gum (g)-C, Triethanol amine (ml)-D, Almond oil (ml)-E, Rosemary oil (ml)-F, Tea tree oil (ml)-G, Neem oil (ml)-H, Lavender oil (ml)-I, Demineralised water (q.s)-J

TABLE 02:FORMULATION WITH CARBOPOL 940 AND XANTHAN GUM

Gel Code	A	B	C	D	E	F	G	H	I	J
F1	0.5	0.2	—	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F2	0.5	0.3	—	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F3	0.5	0.4	—	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F4	0.5	0.5	—	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F5	0.5	0.6	—	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F6	0.5	1.0	—	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F7	0.5	—	0.2	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F8	0.5	—	0.3	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F9	0.5	—	0.4	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F10	0.5	—	0.5	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F11	0.5	—	0.6	0.2	0.1	0.1	0.1	0.1	0.1	q.s
F12	0.5	—	1.0	0.2	0.1	0.1	0.1	0.1	0.1	q.s

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EVALUATION: The evaluation of gels was done using the following variables.

Quality control of topical herbal gel formulation

Estimation of active constituents in gel formulation: Each formulation (1 g) was taken in a 50 mL volumetric flask and made up to volume with methanol and shaken well to dissolve the active constituents in methanol. The solution was filtered through Whatmann filter paper and 0.1 mL of the filtrate was pipette out and diluted to 10 mL with methanol. The content of active constituents was estimated spectro photo metrically by using standard curve plotted at 275 nm (λmax of active constituents in the extracts)

Visual appearance and clarity:

Under fluorescent lighting, the visual appearance and clarity of the created in situ formulation are examined for the presence of any particle matter against a white and black background.

pH DETERMINATION:.

pH measurement of the gel was carried out using a digital pH meter by dipping the glass electrode completely into the gel system to cover the electrode. The measurement was carried out in triplicate and the average of the three readings was recorded

Spreadability

There were two sets of slides taken in standard size. One of the slides held the formulation for the herbal gel. The gel was sandwiched between another slide and the substrate. At a distance between the two slides in the occupied region along the slide, 7.5 cm. A 100 g layer of gel was applied to the top slide in order to equally push the gel between the two slides. To create a slender layer. The extra gel is discarded. The process of peeling off the slide is done with a scraper. There is a pair of slides positioned that are firmly secured to the stand without causing any agitation and so that the top slide is the only one that is able to move freely because of the gravity linked to it. On the top slide, the 20 g weight is firmly secured. The amount of time needed for the upper slide to move 7.5 cm and split off from the lower slide when under the influence of was noted. Three repetitions of the experiment were conducted, and the average time was recorded for computation.

Spreadability was calculated by using the following formula:

$$S = m \times l/t$$

where, S= spreadability, m-weight tied to upper slides (20 g), l- length of the glass slide (7.5 cm), t- time taken in sec.

RHEOLOGICAL STUDY: VISCOCITY

Viscosity of gel was determined using Brookfield viscometer (S-62, model LVDV-E) at 25 o C with a spindle speed of the viscometer rotated at 12 rpm

Extrudability

The crimped end is tightly forced against a closed collapsible tube filled with about 20g of gel, and a clamp is affixed to prevent rewinding. The gel is extruded after the cap has been removed.

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The amount of gel that was extruded was gathered and weighed. The extruded gel percent was calculated.

PHOTOSENSITIVITY

It has been discovered that several pharmacological formulations are photosensitive, showing instability when exposed to light. A sun exposure test was done to gauge the product's photo stability. In this experiment, the under eye gel's physical qualities were tracked while it dried in the sun from 8 am to 18 pm.

Appearance and Homogeneity Physical appearance and homogeneity of the prepared gels were evaluated by visual perception.

Table03: Evaluation Results for under Eye Gel

Code	Conc.(mg)	Physical appearance	PH	Viscosity	Spreadability	Extrudability
F1	0.2	Pale brown and homogenous	5.3	140	5	Good
F2	0.3	Pale brown and homogenous	5.6	150	5.5	Good
F3	0.4	Pale brown and homogenous	5.4	160	6	Excellent
F4	0.5	Pale brown and homogenous	5.5	170	6.5	Excellent
F5	0.6	Pale brown and homogenous	5.4	180	7	Excellent
F6	1	Pale brown and homogenous	6	190	6	Good
F7	0.2	Pale brown and homogenous	5.5	110	6	Excellent
F8	0.3	Pale brown and homogenous	5.2	120	6.5	Excellent
F9	0.4	Pale brown and homogenous	5.3	130	5	Good
F10	0.5	Pale brown and homogenous	5.5	160	5.5	Good
F11	0.6	Pale brown and homogenous	5.3	180	7	Excellent
F12	1	Pale brown and homogenous	6	210	9	Good

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RESULTS AND DISCUSSION

In general, gel formulations, including semi-solid topical preparations, are preferred because they have a long residence time on the skin, a high viscosity, a moisturizing effect on flaky skin due to their occlusive properties, more bio adhesiveness, less irritation, independence from water solubility of the active ingredient, ease of application, and better release characteristics. The under eye derma gel formulation was created with these qualities for the treatment of dark circles under the eyes. The prepared gels were observed to be uniform, appealing, and consistent. Since all of the formulations' pH values fell within a narrow range (5.2 to 6), they shouldn't irritate the skin. Although the polymer concentration was set at 0.2% in each gel formulation, there were variations in viscosity. Additionally, it was said that the results ranged from 130 to 280 centipoises.

The spreadability value indicates how simple it is to apply the gel formulation. More than 90% of the contents of the gel formulations F1 to F12 are extruded, demonstrating their high extrusion capacity, with the exception of F1, F9 and F11 where only 80% of the contents are extruded.

CONCLUSION

The gels that were created were seen to be consistent, beautiful, and uniform. Since the pH range of all the formulations was very small (5.2 to 6), the skin shouldn't be irritated by them. There were variances in viscosity even though the polymer concentration was fixed at 0.2% in each gel composition. The results reportedly ranged from 130 to 280 centipoises as well. How easily the gel formulation can be applied is indicated by the spreadability value. With the exception of F1, F9 and F11, where only 80% of the contents are extruded, the gel formulations F1 through F12 exhibit great extrusion capacity, with more than 90% of the contents being extruded. The fact that under eye derma gels are chemical-free and more effective than synthetic under eye gels is the most significant quality they have. Thus, it can be deduced from this research that the manufactured under eye derma gel has anti-aging and anti-tanning qualities, which makes the skin look fresh and free of dark circles.

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