

# Formulation Development of Haritaki Cream by Using 2 (square ) Factorial Design

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**Abstract:-** Creams, in general, are versatile skincare formulations that provide a balance of water and oil to deliver hydration and nutrients to the skin. Eye creams are a category of skincare products specifically designed for the sensitive and delicate skin around the eyes. The skin in this area is thinner and more prone to issues such as fine lines, wrinkles, puffiness, and dark circles. Eye creams are formulated to be lightweight and easily absorbed, and they typically contain ingredients tailored to address these specific concerns. Common ingredients in eye creams include hydrating agents, anti-aging compounds, brightening ingredients, and sometimes caffeine or other ingredients to reduce puffiness. From the developed formulation of haritaki cream we concluded that it can be used for dark circle. It contains various other excipients like potato starch, alovera, methyl and propyl paraben etc. it does not only reduce dark circles but also glows skin and reduces skin damage. As it causes no irritation it is better than allopathic cream. As it had passed all the evaluation parameters like pH, washability, phase separation, irritations, edema, spread ability etc.

**Keywords:-** Haritaki , Nourishment, Latanoprost, Bimatoprost.

## I. INTRODUCTION TO EYE CREAMS

Eye creams are a category of skincare products specifically designed for the sensitive and delicate skin around the eyes. The skin in this area is thinner and more prone to issues such as fine lines, wrinkles, puffiness, and dark circles. Eye creams are formulated to be lightweight and easily absorbed, and they typically contain ingredients tailored to address these specific concerns. Common ingredients in eye creams include hydrating agents, anti-aging compounds, brightening ingredients, and sometimes caffeine or other ingredients to reduce puffiness. The application of eye cream is generally a crucial part of a skincare routine. The use of eye creams can contribute to maintaining a youthful appearance, minimizing signs of aging, and providing a well-hydrated and refreshed look to the eye area. It's essential to

choose an eye cream based on individual skin concerns and preferences, considering factors such as ingredients, consistency, and whether the product is intended for daytime or nighttime use. Consistent and proper application of eye creams can contribute to improved skin health and a more vibrant appearance around the eyes.

### ➤ *Advantages of Herbal Cream:*

- Helps the skin glow.
- Herbal cream has pure and organic ingredient.
- They minimize the side effects.
- Easily available in market.
- Reduces skin damage, dryness of skin.
- Cures the skin irritation.
- Provides nourishment to all type of skins.

### B. *Disadvantages of Synthetic Cream:*

- Synthetic cream may cause skin damage.
- Over use may can clog skin follicles.
- May increase skin sensitivity.
- Excessive use may cause skin dryness.
- SLS commonly used in cream may harmful to eyes and skin.

Dark circles under the eyes are a common cosmetic problem. They can appear as shades of blue, purple, brown, or black, depending on your natural skin colour. Due to dark circle the person may appear to be tired. • Darkness under eye may occur due to various reasons. But there is no need to worry as they are not usually symptoms of any medical problem. It mostly happens due to change in life style. There is no need to concern. But we can reduce it or lighten the appearance just for cosmetic purpose. • Dark circle may affect to various people may be of any age, sexes or races. Dark circle under the eye may be too dark or too light that is they vary from person to person. Dark circles are mostly found in few groups, These groups include:

- Elderly people.
- People with a family history of dark circles under their eyes.
- People with darker skin tones.



Fig 1: Dark Circles

### C. Causes of Dark Circles

There are many possible causes of dark circles, some of which are related to your skin, some to your health, and some to your lifestyle. Commonly dark circle are caused due to:

- **Age:** As you get older, your skin becomes thinner and less elastic, making the blood vessels under your eyes more visible. You may also lose fat and collagen, which can create hollows under your eyes that cast shadows.
- **Fatigue:** Lack of sleep or oversleeping can make your skin pale and dull, which can enhance the contrast between your skin and the dark circles. Sleep deprivation can also cause fluid retention, which can make your eyes puffy and create shadows.
- **Allergies:** Allergic reactions can cause your body to release histamines, which can dilate the blood vessels under your eyes and make them more noticeable. Allergies can also make your eyes itchy, red, and swollen, which can worsen the appearance of dark circles.
- **Ocular hypotensive drugs:** These are medications used to treat glaucoma, a condition that increases the pressure in your eyes. Some of these drugs, such as latanoprost and bimatoprost, can cause dark circles by increasing the pigmentation of the skin around your eyes.
- **Eyestrain:** Staring at a computer or television screen for a long time can strain your eyes, which can enlarge the blood vessels around your eyes and make them darker.
- **Dehydration:** When your body is not well hydrated, your skin can become dry and dull, and your eyes can look sunken. This can make the dark circles more prominent.
- **Sun overexposure:** Too much sun exposure can damage your skin and increase the production of melanin, the pigment that gives your skin colour. This can cause hyperpigmentation, or darkening of the skin, around your eyes.
- **Genetics:** Some people are more prone to dark circles because of their genes. They may inherit thin skin, prominent blood vessels, or increased pigmentation around the eyes from their parents or grandparents.

- **Anemia:** Anemia is a condition where you have low levels of red blood cells or haemoglobin, which carry oxygen to your tissues. This can make your skin pale and your blood vessels more visible, especially under your eyes.
- **Lifestyle factors:** Smoking, alcohol consumption, caffeine intake, stress, and poor diet can all affect your skin health and blood circulation, which can contribute to dark circles.

### D. Need and Rational

- Developing a herbal anti pigmentation cream will provide a new therapeutic option for people with dark eye circle and reduce the use of traditional allopathic medicinal cream.
- Herbal anti pigmentation cream provides / offers safe approach to dark circles hyperpigmentation without the potential side effects of allopathic creams.
- The active compounds in plant extract have the ability to reduce pigmentation, improve blood circulation, and prevent the complication caused to allopathic eye cream.

### E. Aim and Objectives

To develop a herbal cream that includes some natural API to reduce the hyper pigmentation which will give good confidence to one.

### F. The Objective of this Project Includes:

- To identify and select appropriate herbal ingredient that have been traditionally used for managing dark circles.
- To formulate herbal anti pigmentation cream using these ingredients.
- To do evaluation of the Herbal anti pigmentation cream.
- To reduce melanin production and prevent dark circle.
- To compare the herbal product with marketed preparations.

## II. MATERIAL AND METHOD

Herbal formulation are natural remedies formulated using various plant products that have been traditionally used for managing dark circles. The herbal ingredients used to treat dark circles are potato, cucumber, aloe, haritaki, almond oil, etc. the antioxidant property of these herbal ingredients helps to reduce the dark circles. Herbal creams are gaining popularity due to their natural and safety approach and also it is affordable than allopathic creams. They act as alternative or complementary treatment for dark circles. In our research we give information regarding the herbal drug which will cure the dark circles by reducing hyperpigmentation and hydrating the skin. In this research mostly the Haritaki (known as Harda) shows inhibit melanin production, prevent oxidative damage, and purify the blood, which can help to lighten the skin tone and improve the appearance of the eyes. Chebulinic acid, chebulagic acid, and corilagin are some of the tannins found in haritaki, a herb that has many benefits for the skin. These tannins have antioxidant, anti-inflammatory, and antimicrobial properties. They also help to bind and eliminate toxins from the body. In research we are also going

to use Potato which has mild bleaching enzyme called catechol oxidase that reduces melanin production and lightens the skin. Aloe has anti-inflammatory and moisturizing properties that hydrate and heal the skin. In this research we have formulated herbal eye cream from haritaki, potato, aloe, and aloe and evaluations were performed such as determination of Ph, visual appearance, spread ability, stability etc.

#### ➤ Formulation

- Literature survey and analysis of collected data.
- Selection of dosage form. 3. Designing the formulation.
- Collection of required ingredients.
- Sterilization of containers.
- Preparation of the formulation in required environment.
- Evaluation of prepared herbal eye cream.

#### ➤ Applications

- Haritaki powder- It reduces darkskin and puffiness, and to improve skin elasticity. Acts as antioxidant which protects the skin from damage.
- Potato starch powder- Moisturizes the skin and reduces wrinkles, rashes etc.
- Amla powder- Reduces pigmentation, rich source of vit. C. use to glow the skin.
- Alovera gel- Acts as skin moisturizer.

### III. METHOD AND PREPARATION OF HARITAKI CREAM

#### A. Haritaki



Fig 2: Haritaki Nut

- Scientific name- Terminalia chebula. ▪ Family - Combretacea. ▪ Higher classification- Tropical almond. ▪ Order- Myrates. ▪ Kingdom- Plantae. ▪ Rank- Species. ▪ Part used- Fruit. ▪ Height- 15-25m. ▪ Leaves- leathery and oval leaves ▪ Uses- Antioxidant Synonyms: Harar (Hindi), Haritaki (Bengali and Sanskrit), Myrobalan Biological Source: Myrobalan consists of dried mature fruits, of Terminalia chebula Retz.
- Family: Combretaceae. Habita: The plant is found abundantly in north India.

- Chemical Constituents: Myrobalan contains hydrolysable tannins (30-40%), purgative compounds like anthraquinones. fixed oil containing esters of palmitic, oleic and linoleic acids. astringent compound chebulinic acid, ellagic acid, gallic acid and resin. The carbohydrates found in myrobalan are- glucose, Sorbitol, fructose, sucrose and gentiobiose. More 18 typical amino acids are also present with phosphoric. Succinic, quinic, shikimic, dihydroshikimic and dehydroshikimic acids. During maturation of the fruits. the amount of tannin decreases whereas the acidity Increases.



Fig 3: Haritaki Plant

#### ➤ Preparation of Haritaki

- 50 gm of Haritaki crack and open the nuts.
- Remove the seeds; Take this in mixture / mortar pestle.
- Extracted powder transfer into airtight container.



Fig 4: Potato Starch Powder

#### B. Potato Starch:

- Scientific name- Solanumtuberosum. ▪ Family- Nightshade. ▪ Higher classification- Nightshade. ▪ Order- Solanales. ▪ Kingdome- Plant. ▪ Part used- Fruit. ▪ Hight- 100cm Synonym: Amylum Biological Source: Starch consists of polysaccharide granules obtained from the tubers of potato (Solanum tuberosum), belonging to family Solanaceae. Geographical Source- Most of the tropical, as well as sub-tropical countries prepare starch commercially.

- **Chemical Constituent:** Amino acids, Enzymes, Organic acids, Nitrogen compounds, Phenolic compounds, Mineral substances. Potatoes are mainly composed of carbohydrates, primarily in the form of starch. The carb content ranges from 60–80% of dry weight. Simple sugars, such as sucrose, glucose, and fructose, are also present in small amounts.

➤ *Extraction of Potato Starch:*

- Take sweet potato and wash it.
- Peel it and wash again.
- Grind the potatoes and do sieving.
- Extraction and dewatering.
- Dry the wet starch.
- Potato starch obtained.

C. *Amala Powder*



Fig 5: Amla Powder

- Scientific name- *Phyllanthusemblica* ▪ Family- *Phyllanthaceae* ▪ Higher Classification- *Leaf flower.* ▪ Order- *Malpighiales* ▪ Kingdom- *Plant* ▪ Extraction Method- *Dry extraction method* ▪ Part used- *Fruit* ▪ Hight- *1-8m* ▪ Leaves- *Small, greenish-yellow or pinkish.* Synonyms: *Emblic Myrobalan Tree, Indian Gooseberry, Emblica, Amalk, Amla, Aonla, Auna.* Biological Source: *Amla consists of the fresh or dried fruits of Emblica officinalis Gaertn. (syn. Phyllanthus emblica Linn).* Family: *Euphorbiaceae.* Habitat: *The plant is a middle-sized tree commonly found in the mixed deciduous forests of India, Sri Lanka. China and Malaya.*



Fig 6: Amla Tree

- **Chemical Constituents:** The principal chemical constituent of Amla is vitamin C (650-900 mg/100 g). It also contains tannins (5%), glucose, pectin, and minerals like iron, phosphorus and calcium. Tannins are mixture of gallic acid, ellagic acid and phyllembin. The presence of the tannins prevents the oxidation of vitamin. Formulation.

D. *Alovera Gel:*



Fig 7: Alovera Gel

- Scientific name- *Aloebarbadensis miller* ▪ Family- *Asphodelaceae* ▪ Higher Classification- *Vera* ▪ Order- *Asparagales* ▪ Kingdom- *Plantae* ▪ Rank- *Species* ▪ Extraction method- *Simple drain method* ▪ Part used- *Leaves* ▪ Hight- *24-39 inches* ▪ Uses- *Burns.* Synonym: *Aloe, Musabbar, kumari, korphad.* Biological Source: *Aloe is the dried latex of leaves of various species of Aloes, Like, Aloe barbadensis Miller (or Curacao Aloe); Aloe ferox Miller (or Cape Aloe); Aloe perryi Baker (or Socotrine Aloe); Aloe africana Miller and Aloe spicata Baker (or Cape Aloe).* Belonging to family *Liliaceae.* Habitat: *Aloe is indigenous to eastern and south Africa and grown in Cape colony, Zanzibar and island of Socotra. It is also cultivated in Caribbean islands, Europe and many parts of India, including North West Himalaya region.*



Fig 8: Alovera

- **Chemical Constituents:** Aloe contains 10- 30% aloin. It is a mixture of three substances, barbaloin,  $\beta$ -barbaloin and iso-barbaloin. Aloe also contains a resin ester formed from ferulic acid, para coumaric acid and cinnamic acid.

Polysaccharides aloferon and aloeculcin are also present in aloe. It also contains glycoprotein, aloctin A & B.

Table 1: Formulation Table for Each Batch

Sr.no	Ingredients	F1	F2	F3	F4	ROLE
1.	Haritaki powder	4.0 g	4.0 g	4.0 g	4.0 g	Antioxidant
2.	Potato starch	1.0 g	1.0 g	1.0 g	1.0 g	Helps to lighten dark sport
3.	Amla powder	0.5 g	0.5 g	0.5 g	0.5 g	Antioxidant
4.	Alovera gel	2.0 ml	3.0 ml	2.0 ml	3.0 ml	Anti ageing, Moisturizer
5.	Stearic acid	1.3 g	1.00 g	1.3 g	1.00g	Emulsifier
6.	Cetostyrl alcohol	0.1 g	0.1 g	0.1 g	0.1 g	Emulsifier, Emollient
7.	Potassium hydroxide	0.04 g	0.04 g	0.04 g	0.04 g	Stabilizer
8.	Sodium hydroxide	0.03 g	0.04 g	0.03 g	0.04 g	Adjust the pH.
9.	Triethanolamine	0.2 ml	0.1 ml	0.2 ml	0.1ml	Adjust the pH
10	Glycerine	3 ml	2 ml	3 ml	2 ml	Moisturizing Agent
11	Methyl paraben	0.002 g	0.003g	0.002 g	0.003g	Preservative
12	Propyl paraben	0.004 g	0.004 g	0.004 g	0.004 g	Preservative
13	Rose water	q. s	q. s	q. s	q. s	Flavouring vehicle
14	Vitamin E	1 cap.	1 cap.	1 cap.	1 cap.	Skin Softner
15	Distilled water	5ml	5ml	5ml	5ml	Vehicle
*	Speed in RPM	100	70	70	100	



Fig 9: Ingredients for Haritaki cream

➤ *Factorial Design:*

- Factor – (independent variable) There are 2 factors
  - ✓ Ingredients
  - ✓ Speed of Mixing
- Evaluation – (dependent) There are 2 evaluation parameters
  - ✓ pH
  - ✓ Phase separation
  - ✓ Factorial design = 2<sup>2</sup>

➤ *Equipments Used*

- **Weighing Balance /Analytical Balance:** It is the most important equipment used for any formulation. It gives us the accurate weighed quantity of any drug use for the formulation. All ingredients use for formulation are weighed on same.
- **Magnetic Stirrer:** It utilizes a rotating magnetic field to induce the rotation of a stir bar submerged in a liquid, facilitating rapid stirring and mixing of the solution. I used REMI MS 500 magnetic stirrer for the formulation.



Fig 10: Magnetic Stirrer

- **Rectangular Water Bath:** It is rectangular with many openings and consist of heater and thermostat to regulate temperature. It is been use for mixing of oil and water phase at 75°C for the cream herbal cream formulation. I used SSI-Singhla scientific industries water bath.



Fig 11: Rectangular Water Bath

- **pH meter:** pH, which indicates the concentration of hydrogen ions in the solution. used to check the acidity or alkalinity of a solution. pH meter provides a numerical value. The make and model of pH meter use was of chemi line.

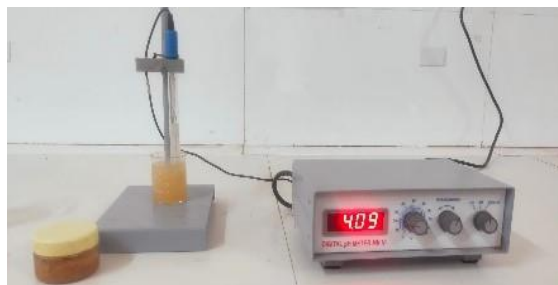
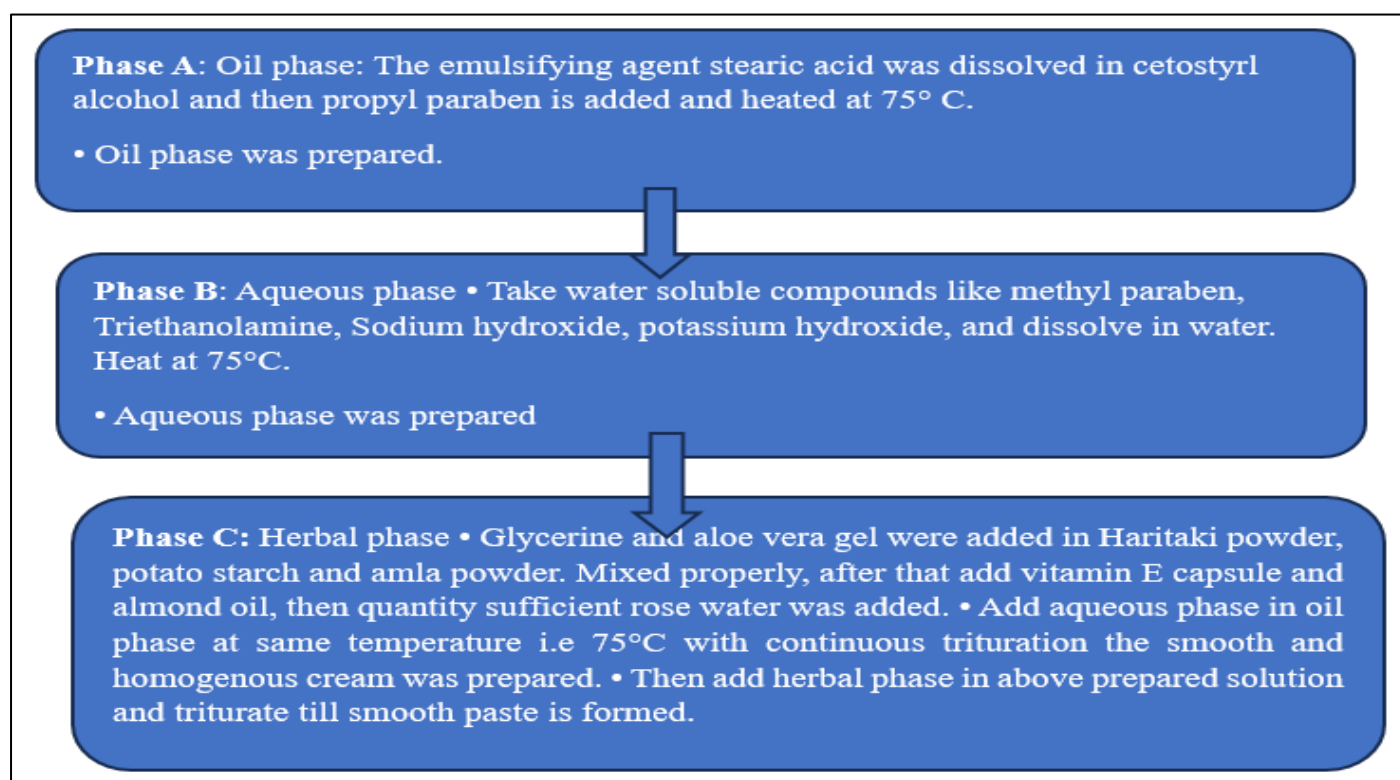


Fig 12: pH Meter

### ➤ Procedure



### ➤ Evaluations

- Physical evaluation - Colour, odour, texture, and states of the cream where all evaluated in this test.
- Wash ability- Tiny amount of cream is washed off using tap water.
- Spread ability - The spread ability was measured by the time it took two slides to slip away from the cream, where as the cream was placed in between the slides, under a specific force. If takes less time for separation of slides that means it has better spread ability.

### ➤ Steps Involved:

- Take two standard glass slides.
- Place the cream at center of slides.
- Place cream on top of another slide.
- The two slides are pressed uniformly, to form a thin layer of cream. For uniform pressure use some load and place on upper slide.
- Remove the load, and scrape the excess formulation on slide.
- Let the upper slide effortlessly glided off.
- Record the time when upper slides fall down.

Where,

m = weight attached on top of upper slide.

l = length of slide.

t = time took for upper slide to fall down.

$$\text{Spread ability} = m \times l/t$$

- Phase Separation: The prepared cream was kept at Room temperature for about 15-30 days. Away from light, in a sealed / air tight container.
- pH- Using digital pH the pH of the cream was checked.

• *Steps:*

- ✓ 0.5 g cream was weighed and dissolved in 50 ml of distilled water.
- ✓ Calibrate the digital Ph meter, using distilled water.
- ✓ Keep the rod of digital Ph meter in beaker of solution of cream.
- ✓ Measure the reading on screen.
- ✓ Irritation and edema - On the dorsal surface of the left hand, a 1cm<sup>2</sup> mark was made. The cream was then applied to that area, and the time was recorded. The area was monitored for 24 hours, and any signs of irritancy or edema were noted and reported.

➤ *Observation of Evaluation of Batch*

• *Batch 1*

- ✓ Physical evaluation:
  - ❖ Colour- yellowish brown
  - ❖ Odour- pleasant
  - ❖ Texture- smooth
  - ❖ State- semisolid
- ✓ Washability: Easily washable



Fig 13: pH for Batch 1

- ✓ Spread ability: Time – 15sec. Spread ability- 25 Moderate spread ability
- ✓ Phase separation: There is no phase separation.
- ✓ pH: the pH of the solution was found to be 5.04.
- ✓ Irritation: No Edema : No



Fig 14: Result for Batch 1

• *Batch 2*

- ✓ Physical Evaluation:
  - ❖ Colour- yellowish brown
  - ❖ Odour- pleasant
  - ❖ Texture- smooth, scrubby
  - ❖ State- semisolid.
- ✓ Washability: Easily Washable



Fig. 15: pH for Batch 2

- ✓ Spread ability: Time – 18 sec
- ❖ Spread ability- 20 low spread ability as compared to batch1.
- ✓ Phase separation: There is no phase separation.
- ✓ pH: The pH of the solution was found to be 5.9.
- ✓ Irritation: No , Edema: No

**IV. RESULT & DISCUSSION**

Table 2: Observation Table of All Formulation

Sr. no	Name of test:	Specification	F 1	F 2	F 3	F 4
1	Colour	Yellowish brown	Yellowish brown	Yellowish brown	Brown	Brown
2	Odour	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
3	Texture	Smooth, slippery	Smooth,	Smooth, scrubby	Smooth,	Smooth,
4	State	Semi solid	Semi solid	Semi solid	Semi solid	Semi solid
5	Washability	Easy/moderate	Easy	Easy	Easy	Easy
6	Spread Ability	Complete/Low/ moderate	Moderate	Low	Low	Low
7	Phase Separation	No	No	No	No	No
8	pH	4.0-5.9	4.09	5.90	4.2 5	5.6
9	Skin Irritation	No	No	No	No	No
10	Edema	No	No	No	No	No



Fig 16: Formulation 1



Fig 17: Formulation 2

➤ As per all observation the formulation 1 [F1] had showed best result for dark circle.



Fig 18: Result Before and After Use

From the developed formulation of Haritaki cream we concluded that it can be used for dark circle. It contains various other excipients like potato starch, alovera, methyl and propyl paraben etc. It does not only reduce dark circles but also glows skin and reduces skin damage. As it causes no irritation it is better than allopathic cream. As it had passed all the evaluation parameters like pH, washability, phase separation, irritations, edema, spread ability etc.

We confirmed the use of haritaki for eye cream for dark circles. Haritaki shows antioxidant property which helps to reduce dark circle. Astringent property of haritaki helps to tighten the skin and anti-inflammatory property of it helps to reduce puffy eyes. Dark circles are mostly caused due to dehydration, over exposure to screens, change in life style, less sleep, anemia etc. natural way to prevent dark circles are to drink plenty of water and taking sleep of 6-7 hours at night. For formulation best herbal remedies are use of haritaki, amla, alovera etc. Advantages of herbal cream over allopathic creams is that it has fewer side effects as compared to allopathic eye cream. And effect is for longer duration and does not causes side effects. Formulation prepared from these reviews goes under various evaluation parameters like spread ability, washability, pH, irritation, edema etc.



Table 3: Formulation Development of Haritaki Cream by using 2<sup>2</sup> Factorial Design

CONTENTS	TITLE OF FIGURES & TABLES
Fig No. 1	Dark Circles
Fig No. 2	Haritaki Nut
Fig No. 3	Haritaki Plant
Fig No. 4	Potato Starch Powder
Fig No. 5	Amla Powder
Fig No. 6	Amla Tree
Fig No. 7	Aloe vera gel
Fig No. 8	Aloe Vera
Fig No. 9	Ingredients of Haritaki Cream
Fig No. 10	Magnetic Stirrer
Fig No. 11	Rectangular water bath
Fig No. 12	pH Meter
Fig No. 13	pH for batch 1
Fig No. 14	Result of Batch 1
Fig No. 15	pH for batch 2
Fig No. 16	Formulation 1
Fig No. 17	Formulation 2
Fig No. 18	Result before and after use
Table no. 01	Formulation Table for each batch
Table no. 02	Observation Table of all formulations

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