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**ABSTRACT**

*Caesalpinia bonducella* L. is a prickly shrub that belongs to the Caesalpiniaceae family and is commonly found throughout India. It has been utilized in indigenous medical practices such as Ayurveda, Siddha, Homoeopathy, and Unani for several years. The plant is known for its medicinal properties and has been found to possess several beneficial activities such as antimalarial, antifungal, antioxidant, anticancer, antipyretic, antifertility, antiviral, and antimalarial. *Caesalpinia bonducella* from seeds of this plant and was evaluated for various parameters such as Density, Specific Gravity, Determination of Refractive Index, Determination of the Iodine value, Determination of Saponifiation value and Acid value. Ointment was prepared using this oil and was evaluated for various parameters.

**CHAPTER 1**

**BACKGROUND& RATIONALE**



**1.1 BACKGROUND & RATIONALE**

*Caesalpinia bonducella* is a species of flowering plant in the Fabaceae family, sometimes known as the Bonduc nut tree or Fever nut tree. Tropical locations, including sections of Africa, Asia, and the Americas, are where it is indigenous. Small, hard-shelled nuts that are produced by the tree contain oil that has a variety of possible uses.

Many civilizations have traditionally used *Caesalpinia bonducella* as a traditional medicine. The therapeutic virtues of the plant's many components, including the leaves, bark, seeds, and oil, have been used for centuries. Particularly for its possible health advantages and practical uses in industry, the oil derived from Cesalpinia bonducella seeds has drawn interest.

*Caesalpinia bonducella* oil has been utilised traditionally for its wide range of therapeutic effects in Ayurvedic and other traditional medical systems. It has been used as an analgesic, antipyretic, antibacterial, anti-diabetic, anti-inflammatory, and anti-diarrheal drug. The oil has also been used to treat gastrointestinal issues, rheumatism, asthma, and skin conditions.

Studies have looked at the potential anti-cancer effects of *Caesalpinia* *bonducella* oil. According to research, the oil may have anticancer properties by triggering apoptosis (programmed cell death) and preventing the development and spread of cancer cells. To completely comprehend its application in the therapy of cancer, more research is necessary.

Skin Care and Cosmetics: Due to its moisturising and emollient qualities, *Caesalpinia bonducella* oil has attracted interest in the cosmetic sector. It is used in the formulation of various skincare products, such as moisturizers, creams, and lotions. The oil's capacity to moisturise and nourish the skin is aided by its high fatty acid content.

**Here the oil has been extracted and further evaluation has been done**

The first step involves precisely measuring 30 grams of *Caesalpinia crista* kernel powder. This powder is then subjected to the Soxhlet method, utilizing Pet-ether as the solvent, for a minimum duration of 6 hours at a temperature of 40 °C. The purpose of this process is to remove the fats present in the kernel powder, effectively de-fatting it. Subsequently, the round-bottom flask (RBF) containing the resulting mixture of oil and PET ether is separated from the extraction apparatus. Finally, the solvent is evaporated from the RBF, leaving behind the desired components for further analysis or application**.**

After the evaluation of the extracted oil the ointment has been prepared and after the preparation of the ointment various stability testing has been done.

**CHAPTER 2**

**AIM AND OBJECTIVE**



**2.1 Aim**

To prepare and evaluate ointment from *Caesalpinia bonducella* seed oil.

**2.2 Objective**

* To extract oil from seed of *caesalpinia bonducella*
* To evaluate oil for physicochemical parameter
* To prepare placebo batches of Ointment
* To prepare Ointment from *Caesalpinia bonducella* seed oil

**CHAPTER 3**

**INTRODUCTION**



**3.1 INTRODUCTION**

Plants have played an important role in maintaining health of human beings and improving the quality of their life from ancient times and have served humans well as important components of medicine, seasoning, beverages, cosmetics and dyes. The philosophy of herbal medicine is centered on the notion that the compounds found in plants possess curative properties that can enhance health and alleviate illness. There has been a global increase in plant research in recent years, providing extensive evidence of the therapeutic properties of medicinal plants that have been traditionally used for centuries. The use of herbal remedies is gaining popularity among the general public.

It's noteworthy that many conventional medicines have their roots in plant extracts. Numerous herbs are particularly effective in treating conditions related to cardiovascular health, liver function, central nervous system disorders, and metabolic and digestive issues. The vast therapeutic potential of medicinal plants makes them a valuable resource for treating and managing various diseases. Herbal drugs, medicinal plants, their extracts, and isolated compounds have exhibited a broad spectrum of biological activities. They have been used for centuries as medicines in folklore and as food supplements to address various disorders.

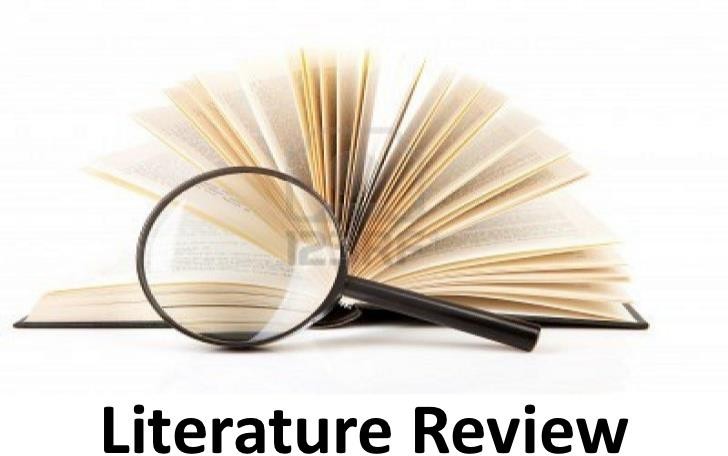
*Caesalpinia Bonducella,* an Indian herb mentioned in Ayurveda, has attracted attention from researchers worldwide for its potential medicinal properties. Despite the significant interest in ethno pharmacological studies on medicinal plants, the lack of standardized quality control profiles has been a hindrance in the widespread acceptance of Ayurveda or Siddha formulations. According to the World Health Organization (WHO), plants that possess properties or compounds suitable for therapeutic purposes or have the ability to synthesize metabolites for useful drugs are known as medicinal plants. The Indian herb *Caesalpinia Bonducella*, which belongs to the family Caesalpiniaceae, It is widely distributed across the world, with a particular presence in India, Sri Lanka, and the Andaman and Nicobar Islands. In India, it is primarily found in tropical regions. It was described under the same name as *Caesalpinia bonduc*, also known as *C. bonducella*, leading to significant confusion between the two plants. Beside this, species like *C. nuga* and *C. jayoba* are also sometimes wrongly designated as synonyms for C. crista. The species name "*Bonducella*" is derived from the Arabic word "*Bonduce*" meaning 'a little ball', referring to the globular shape of the seed. Although *Caesalpinia bonducella* has been widely used in traditional medicine, there have been very few systematic pharmacological studies to date evaluating its therapeutic properties. Additionally, it should be noted that *C. jayoba* is often used as an adulterant for *C. crista*. Seeds of *C. Bonducella* contain bonducin, an active molecule that exists in the form of an incredible glycoside.

Additionally, saponins and terpenoids have also been found in these seeds. Studies have reported that these seeds exhibit anti-diabetic properties. With the abundance of natural resources in India and the rising number of diabetes patients, there is potential for the development of new and improved medications or complementary treatments to manage this disorder. However, it is important to conduct further research and clinical trials to validate the efficacy and safety of such treatment.

*Caesalpinia bonducella* oil's chemical makeup and related bioactive components provide the basis for research into and use of the oil. Numerous phytochemicals, such as fatty acids, flavonoids, alkaloids, and phenolic compounds are abundant in the oil. These bioactive components are thought to have a role in the oil's therapeutic effects and wide range of possible uses.

**CHAPTER 4**

**LITERATURE REVIEW OF CAESALPINIA BONDUCELLA**



**4.1 LITERATURE REVIEWS**

*Caesalpinia bonduc* L. is a member of the Caesalpiniaceae family and is a thorny shrub with a global distribution, particularly in India, Sri Lanka, and the Andaman and Nicobar Islands, with a preference for tropical regions. This plant has been recognized as a valuable remedy for a variety of illnesses in traditional Indian medicine. *Caesalpinia bonduc L*. is well-regarded in Ayurveda, Siddha, Unani, and Homeopathy, which are all indigenous systems of medicine. These traditional medical systems rely on natural remedies such as *Caesalpinia bonduc L*. for the treatment of numerous ailments.

*Caesalpinia bonducella* is commonly referred to as Fever Nut, Bonduc Nut, or by its scientific names*, C. bonducella Flem* and *C. crista Linn*. This plant is classified under the Caesalpiniaceae familyIn Ayurveda, Caesalpinia bonducella (roxb) has been traditionally used for its antipyretic, antiperiodic, anthelmintic, antimalarial, and anti-inflammatory properties, as well as for treating various ailments such as skin diseases, hydrocele, leprosy, spasms, orchitis, paralysis, and neurological disorders.

The seeds contain a variety of chemical components, including furanoditerpenes (a, b, g, d, e, and f-caesalpin), fatty acids, and *caesalpin-F.*

Phytosterinin, b-sitosterol, homoisoflavone bonducellin, palmitic, stearic, octadeca-2, 4-dienoic, lignoceric, oleic, and linoleic acids; aspartic acid, arginine, and citrulline amino acids; starch and sucrose carbohydrates; b-carotene, glycoside-bonducin, gums, and resins.

The majority of the 2800 species and over 152 genera in the Caesalpiniaceae family are spread primarily in tropical and subtropical areas.

The major Caesalpinia species listed below are some of the more popular ones medicine that has been around for a while. The first two are *C. bonduc (Linn.) Roxb. and C. benthamiana (Baill.)* Herend. & Zarucchi. 3. *C. cacalaco Humb. & Bonpl. 4. Coriaria (Jacq.)* Willd. 5. The cactus decapetala (Roth) Alston.7. C. digyna Rottl etc.

**CHAPTER 5**

**EXPERIMENTAL SETUP**



**5. EXPERIMENTAL SETUP**

**5.1 List of Instrument/Equipments used in present investigational work**

Table 5.1 List of instruments/equipment’s used in study

|  |  |  |  |
| --- | --- | --- | --- |
| Sr. No. | Instrument/Equipment’s | Model | Make |
| 1. | Weighing Balance | XB-2200A | Precisa |
| 2. | Water bath | K-1356 | Labfit |
| 3. | Brookfield Viscometer | Expert Series | Fungilab |
| 4 | Auto Digital ph meter | S-901 | Systonic |
| 5. | Micro pipette |  | Lab line stock center |

**5.1 List of Reagent used in present research work**

Table 5.2 List of Reagent utilized in present research work

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr No.** | **Chemical Name** | **Grade** | **Make** |
| 2. | 50% Sulfuric Acid | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 3. | Potassium Iodide | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 4. | Sodium Thiosulphate | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 5. | Potassium Hydroxide | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 6. | Ethanol | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 7. | Bromide | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 8. | Iodine Monochloride | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 9. | Pyridine | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |
| 10. | Water | AR | Fischer Scientific India Pvt. Ltd., Mumbai, India |

**CHAPTER 6**

**EXPERIMENTAL WORK**

****

**6.1 Extraction of seed oil**

* 30gm of caesalpinia crista kernel powder was accurately weigh.
* Then treatment with Pet-ether using the soxhlet method for at least 6 hours at 40 °C has been done ( for de-fatting)
* Subsequently, the round-bottom flask (RBF) containing the resulting mixture of oil and PET ether was separated from the extraction apparatus.
* The solvent was evaporated at 90°C
* Oil was collected.

**6.2 Physicochemical analysis of seed oil extracted from pet-ether.**

**6.2.2 Determination of Density**

**Principle**

The principle of density is based on the mass and volume of an object or substance. It states that the density of a material is constant, regardless of the size of the sample.

**Procedure: -**

1. By repeating the above procedure as same calculate the density of empty gravity bottle.
2. The formula for density is as mass/volume i.e. W3-W1/10.

**6.2.1 Determination of specific gravity**

**Principle**

The principle of specific gravity is a measure of the density of a substance relative to the density of a reference substance. It is defined as the ratio of the density of a given substance to the density of water at a specified temperature.

**Procedure**

* Water or alcohol was used to wash and dry the density bottle.
* The stopper-equipped empty bottle was used for weight (w1).
* In the stopper-capable bottle, 10ml of distilled water was added.
* Label was added to it saying (w2).
* Then 10 ml of the sample was added to the bottle with the stopper, labelled with (w3).
* Formula [W3-W1/W2-w1] was used to get the specific gravity of the bottle.

**6.2.3 Determination of viscosity of the sample by Brookfield viscometer**

**Principle**

The Brookfield Viscometer measures the viscosity of a liquid by determining the torque required to rotate a spindle at a constant speed in the liquid. The principle is based on the relationship between viscosity, torque, and rotational speed of the spindle.

**Procedure: -**

* Consult the product specifications to determine the appropriate model spindle number, rotating speed (rpm), sample size, sample temperature, and, if necessary, container size. Identify the sample's maximum level of viscosity if it isn't already stated.
* The sample should then be poured 400–600 ml into the beaker and heated to the chosen measurement temperature
  + Spindle should be put into the test substance until the fluid level reaches the immersion groove carved into the spindle shaft. When using disk-shaped spindles, caution should be taken to prevent air bubbles from sticking to their surface. The spindle should be immersed at an angle or while tilting the beaker before being attached to the viscometer.
  + Set the viscometer to the suggested RMP level as indicated in the applicable article. based on the expected viscosity range of the sample

**6.2.4 To find Refractive index of the given liquid samples**

**Principle**

The principle of refractive index is based on the measurement of the bending or refraction of light as it passes through a substance, which is characterized by its refractive index.

**Procedure: -**

* Prism's surface was cleaned using cloth, alcohol, and acetone, in that order, and then it was allowed to air dry.
* Two to three droplets of the supplied liquid was placed, using a pipette or dropper, between the prisms before pushing them together.
* Light was allowed to reach the mirror.
* In order to reflect the most light into the prism box, the mirror was adjusted.
* When the boundary between the bright and shaded areas is discernible in the field of vision, the prism box was rotated using the lever
* The compensator was rotated to make the edge sharp to check if a ring of colours emerges at the edge of the light shade.
* The lever was adjusted to make sure that the cross-wire's midpoint is where the light shade border should be
* The RF was read from the scale.
* Average reading of the three sets were taken.

**6.2.5 Determination Of The Iodine Value**

**(Pyridine – Bromide method)**

**Pre-Experimental Preparation**

**1. Pyridine -Bromide solution**

* 0.54ml of concentrated sulphuric acid and 0.8ml of pyridinewas taken respectively and combined together.
* 0.2ml of glacial acetic acid was added and the mixture was kept for cooling.
* 500 ml was diluted with glacial acetic acid after adding 0.25 ml of bromine that has been dissolved in 0.2 ml of the acid.
* It was Prepared immediately before use.

**2.Potassium iodide solution**

* To make 50 ml, we dissolved 8.3 g of potassium iodide in distilled water

**4. (0.1M) Sodium thiosulphate solution**

* We Dissolved 12.4 disintegrate 500 ml of distilled water, 12.4 grammes of sodium thiosulphate, and 0.1 grammes of sodium carbonate.

**Procedure**

* We weighed Accurately 0.25 gram of substance that has to be examined in a dry iodine flask.
* 10ml of carbon tetrachloride was dissolved after adding it.
* 25ml of pyridine bromide solution was added, and then we waited 10 minutes in the dark.
* 15 ml of potassium iodide solution was added in the cup top.
* The stopper was removed with care. Shake the flask and titrate with 0.1 molar sodium thiosulphate solution after washing the stopper and sides with 100 ml distill water.
* As an indicator, 0.1 ml of the starch solution was added near the conclusion of the titration.
* The iodine number was calculated by using the following equation

**Iodine Value = 1.269(b-a)÷W**

Where,

b = Quantity of standard sodium thiosulphate solution needed for the blank, expressed in ml.

a = Quantity of standard sodium thiosulphate solution needed for the sample, expressed in ml.

W = Weight of sample in g

Table 6.5 Formulation table :-

|  |  |  |  |
| --- | --- | --- | --- |
| Sr no. | Requirements | Quantity | |
|  |  | **Given (100ml)** | **Taken (100ml)** |
| 1. | Fixed oil (Cesalpinia Oil) | 2.5 ml | 0.25 ml |
| 2. | Pyridine | 8 ml | 0.8 ml |
| 3. | Sulfuric acid | 5.4 ml | 0.54 ml |
| 4. | Glacial acetic acid | 20 ml | 0.2 ml |
| 5. | Potassium carbonate | 0.2 gm | 0.1 gm |
| 6. | Bromine | 2.5 ml | 0.25 ml |
| 7. | Potassium iodide solution | 8 ml | 0.8 ml |
| 8. | Starch solution | 1 ml | 0.1 ml |
| 9. | Sodium Thiosulphate solution | 24.8 gm | 12.4 gm |

**6.2.6 Determination of saponification value**

**Principle**

* Saponification value is determined by hydrolyzing ester bonds in a fat/oil with alcoholic KOH, titrating unreacted KOH with acid, and calculating the mg of KOH required to saponify 1g of the sample. It provides information on fatty acid molecular weight and aids in quality control/formulation of products with fats/oils.

**Requirements**

**Chemicals used** :- Fixed oil(caesalpinia oil) , 0.5ML Ethanolic KOH Solution , Phenolpthalein

**Apparatus** :- Iodine flask , Reflux Condenser , Burette , Beaker

**Principle** :- The amount of potassium hydroxide (KOH) needed to thoroughly hydrolyze (saponify) one gram of oil or fat is known as the saponification value. In actual practice, an amount of oil or fat known to be present is refluxed with an excess of a standard alcoholic potash solution, and the unused alkali is titrated against a standard acid.

**Procedure :**-

* The material being studied weighs roughly 2g and is being filtered with a reflux condenser.
* Add 25ml of a 0.5M ethanolic KOH solution, and then boil the mixture for 30 minutes on a water bath.
* Take off the condenser, add 1 ml of the phenopthelin solution, and titrate with 0.5 M HCL right away. The reading should be "a".
* Repeat the process, leaving out the object being studied. Take note of the "b" reading.
* Calculate the saponification value from the following equation.

Saponification value = 28.05×(b-a)÷W

Where, W is weight of the substance in gm

**6.2.6 Determination Of Acid Value**

**Principle**

The acid value provides information on the quality and freshness of oils and fats and can be used to monitor their deterioration due to oxidation or hydrolysis.

**Preparation of 0.1N NaOH Solution**

* Accurately weighed 1gm of sodium hydroxide (NaOH) was taken in 250 ml volumetric flask and was dissolved in distilled water. The final volume was made up to mark.

**Preparation of potassium hydrogen phthalate solution**

* Accurately weighed 0.95 gm of the dried potassium hydrogen phthalate (C8H5KO4) was transferred to 250ml conical flask.
* Then 100 ml of distilled water was added, and the solution was stirred gently to dissolve the sample.

**Standardization of 0.1 N Sodium Hydroxide:**

* Accurately measured 10ml of potassium hydrogen phthalate solution was taken in a conical flask then 3 drops of a 1.0% solution of phenolphthalein were added. The solution was titrated using 0.1 N NaOH solution.

**Procedure**

* First the 10 gm of the oil sample was accurately weighed. Then two conical flasks were taken and were labeled as A and B.
* In Conical flask A: - 10 gm of the sample was taken.
* In conical flask B: 50 ml of alcohol was taken and boiled at 70°C or above.
* Then the mixture of the conical flask B was added into conical flask A. Again, this mixture was boiled at 70 °C. After that, the boiled mixture was cooled at room temperature.
* After this mixture was neutralized with 0.1 N NaOH and 2-3 drops of phenolphthalein indicator was added.
* Then the mixture was titrated with 0.1 N NaOH. The colour of the mixture changed (pink colour).

**6.7 Ointment Preparation**

**Placebo batches**

Here we have prepared Iodine Ointment using Iodine , Arachis oil and yellow soft paraffin.

Table 6.8 Formulation Table of Iodine ointment (placebo batches)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr No. | Ingredient | Given | Taken | Category |
| 1 | Iodine | 50g | 1g | Antiseptic |
| 2 | Yellow soft parafin | 150ml | 3ml | Free fatty acid |
| 3 | Arachis Oil | q.s | 16g | Ointment base |

**Procedure**

* Iodine should be ground up in a glass mortar and pestle. Arachis oil should be added, and the mixture should be thoroughly mixed**.**
* The aforementioned combination should be heated over a water bath at roughly 50°C until the brown hue turns greenish black.
* Iodized oil is added after yellow soft paraffin has been melted. Mix well, pour into a heating saucepan, and let cooling without stirring any more.

**Theoretically,**

Consumers dislike iodine because it stains. Iodine attaches to the double bond found in the free fatty acids, oleic acid and linoleic acid, when mixed with arachis oil to create a non-staining product.

I2 + CH3 (CH2)7CHICHI (CH2)7COOH = CH3 (CH2)7 CH=CH(CH2)7COOH

*Arachis Oil*                                                     *Di Iodostearic Acid*

**Category** : Analgesic (counterirritant)

**Labelling Instructions**: Rub gently onto healthy skin. After usage, securely replace the cap.

**Storage:** Keep out of direct sunlight. Store in a dry, cold environment.

**6.9 Preparation of Ointment using Cesalpinia Bonducella Oil**

Table 6.9 Preparation of Ointment using Cesalpinia Bonducella Oil

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr No. | Ingredient | Given | Taken | Category |
| 1 | Cesalpinia Oil | 50g | 1g | Antiseptic |
| 2 | Yellow soft parafin | 150ml | 3ml | Ointment base |
| 3 | Hard paraffin | q.s | 16g | Emollient |

**Procedure**

* Hard paraffin was melted completely and Cesalpinia oil was heated simultaneously in a petri dish on a water bath.
* The aforementioned combination should be mixed thoroughly.
* Yellow soft paraffin should be melted. Mix well, pour into a heating saucepan, and let cooling without stirring any more.
* Mix the melted yellow soft paraffin with the aforementioned combination and let cooling without stirring anymore.

**6.10 Evaluation**

**Colour and Smell**

Visual inspection was used to assess physical characteristics including colour and smell.

**Consistency**

Smooth and no signs of greed are there.

**pH**

An electronic pH metre was used to measure the pH of the produced herbal ointment. 100ml of distilled water was used to make the ointment solution, which was then left to sit for two hours. The solution's pH was measured three times, with the average value being computed.

**Washability**

After applying the formulation to the skin, the ease of water washing was evaluated.

**Anti-Irritability Test**

A produced herbal ointment was applied to human skin, and the results were tracked.

**6.11 Physicochemical evaluation of formulated ointment**

Table 6.10 Physicochemical evaluation of formulated ointment

|  |  |
| --- | --- |
| Physicochemical parameters | Observation |
| Colour | Yellow |
| Odour | Characteristic |
| Consistency | Smooth |
| Ph | 5.4 |
| Solubility | Soluble in boiling water, miscible with alcohol, ether, chloroform |
| Washability | Good |
| Anti-Irritancy | Anti-Irritant |

**CHAPTER 7**

**RESULT & DISCUSSION**

****

**7.1 Results**

**7.1.1 Determination of Density**

**Calculation: -**

1. Density = mass/volume = 24.18-16.97/10

=7.21/10

=0.721g/ml

1. Density = mass/volume = 24.10-16.97/10

= 7.13/10

=0.713

1. Density = mass/volume = 24.15-16.97/10

= 7.18/10

=0.718

Average of Density = 0.721+0.713+0.718/3

= 2.152/3

= 0.717g/ml

**7.1.2 Determination of Specific Gravity**

**Calculation**

Weight of empty specific gravity bottle (w1) = 16.97g

Weight of empty gravity bottle + water (w2) =25.32g

Weight of empty gravity bottle + sample (w3) =24.18g

Specific gravity of sample = w3-w1/w2-w1

=24.18-16.97/25.32-16.97

=7.21/8.35

=0.863

Weight of empty specific gravity bottle (w1) = 16.97g

Weight of empty gravity bottle + water (w2) =25.21g

Weight of empty gravity bottle + sample (w3) =24.10g

Specific gravity of sample = w3-w1/w2-w1

=24.10-16.97/25.21-16.97

=7.13/8.24

=0.865

Weight of empty specific gravity bottle (w1) = 16.97g

Weight of empty gravity bottle + water (w2) =25.30g

Weight of empty gravity bottle + sample (w3) =24.15g

Specific gravity of sample = w3-w1/w2-w1

=24.15-16.97/25.30-16.97

=7.18/8.33

=0.861

Table 7.1 Determination of average specific gravity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SR No. | Weight Of Bottle (w1) G | Weight of bottle + water (w2) G | Weight of bottle + sample (w3) G | Specific Gravity |
| 1 | 16.97 | 25.32 | 24.18 | 0.863 |
| 2 | 16.97 | 25.21 | 24.10 | 0.865 |
| 3 | 16.97 | 25.30 | 24.15 | 0.861 |
| Average Specific Gravity | 0.863 | | | |

**7.1.3** **Calculation of Standardization**

Table 7.2 Back Titration

|  |  |  |  |
| --- | --- | --- | --- |
| Sr No. | Initial Reading  (ml) | Final Reading  (ml) | Difference  (ml) |
| 1 | 0 | 6 | 6 |
| 2 | 0 | 8 | 8 |
| 3 | 0 | 8 | 8 |
| Mean | | | 6.6 |

Table 7.3 Blank Titration

|  |  |  |  |
| --- | --- | --- | --- |
| Sr no. | Initial Reading (ml) | Final Reading (ml) | Difference (ml) |
| 1 | 0 | 18 | 18 |
| 2 | 0 | 19 | 19 |
| 3 | 0 | 18 | 18 |
| Mean | | | 18.3 |

**Formula** = 1.269×(b-a)÷W

= 1.269×(18.3-6.6)÷0.25

= 59

**7.1.4 Determination of Viscosity**

Table 7.4 Reading pf RPM and Range

|  |  |
| --- | --- |
| **RPM** | **Range (mPa-s)** |
| 60 | 0-10 |
| 30 | 0-20 |
| 12 | 0-50 |
| 6 | 0-100 |

* RPM was checked if it is increasing or decreasing when increasing the viscosity.
* **Calculation: -**

Viscosity = 70 cp

Torque = 34.4 Nm

Temp = 24.6°C

RPM = 150

RPM increases then viscosity decreases

Viscosity = 69.5 cp

Torque = 34.5 Nm

Temp = 24.6°C

RPM = 150

RPM increases then viscosity decreases

Viscosity =69.8 cp

Torque = 34.5 Nm

Temp = 24.6°C

RPM = 150

RPM increases then viscosity decreases

**7.1.5** **Determination of Refractive index**

Table 7.5 Refractive Index of water

|  |  |  |
| --- | --- | --- |
| **Sr.no** | **Liquid** | **Refractive Index** |
| 1 | Water | 1.33 |
| 2 |  | 1.34 |
| 3 |  | 1.34 |
|  | Avg | 1.33 |

Table 7.6 Refractive index of sample

|  |  |  |
| --- | --- | --- |
| Sr.no | Liquid | Refractive Index |
| 1 | Sample | 1.32 |
| 2 |  | 1.33 |
| 3 |  | 1.33 |
|  | Avg | 1.32 |

**7.1.6 Determination Of Saponification Value**

**Calculation**

* Saponification value = 28.05×(b-a)÷W

= 28.05×(46-39.4)2

= 92.565

**Result**

* The saponification value of given sample of caesalpinia oil was found to be 92.565

**7.1.7 Determination Of Acid Value**

**71.7 Calculation of standardization**

Normality of NAOH soluton (n)as follows

|  |  |
| --- | --- |
| Burette reading | Volume (ml) |
| 1 | 28 |
| 2 | 24.5 |
| 3 | 26 |
| Avg. | 25.1 |

Acid Value = = 56.1 V×N/W

Where,

V = The amount of standard potassium hydroxide or sodium hydroxide used in millilitres,

N = The normality of the potassium hydroxide solution, and

W = Sample weight in grams

* **Calculation**
* N = 2 ml (Reading in burette)
* W = 1.08g
* Acid Number = 5.61×2×0.1

1.08

= 1.122÷1

= 1.122

* **Placebo Batches**
* **Observation**
* **Colour –** dark brown
* **Odour –** Iodine type smell
* **Spreadabilty –** Spreadable
* **Physicochemical evaluation of formulated *caesalpenia* ointment**

Table 7.7 Physicochemical evaluation of formulated ointment

|  |  |
| --- | --- |
| Physicochemical parameters | Observation |
| Colour | Yellow |
| Odour | Characteristic |
| Consistency | Smooth |
| Spreadability(seconds) | 7 |
| Extrudability | 0.4gm |
| Diffusion study (after 60 min) | 0.7cm |
| Loss on drying | 30% |
| Solubility | Soluble in boiling water, miscible with alcohol, ether, chloroform |
| Washability | Good |
| Anti-Irritancy | Anti-Irritant |
| Stability study (2°C, 25°C, 37°C | Stable |

* The goal of the current study was to formulate and assess the herbal ointment. To get a good yield of extract for this, the herbal extracts were made utilizing a straightforward maceration technique without causing any damage to the chemical contents or their activity.
* Ointment was made using the levigation process, which ensured that the herbal extract and ointment base were mixed uniformly and remained stable throughout storage.
* The physicochemical qualities were investigated, and the spreadability, extrudability, washability, solubility, loss on drying, and other findings are good.
* Additionally, the formulation was left for four weeks for a stability investigation at a range of temperatures, including 2°C, 25°C, and 37°C. The diffusion study and spreading abilities both showed no differences.

**CHAPTER 8**

**CONCLUSION**

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**8.1 Conclusion**

Cesalpinia Bonducella has been utilised for its several therapeutic characteristics, including antibacterial, antifungal, and anti-inflammatory ones, since ancient times. As a result, this ointment may be used as a simple dose form to make good use of these therapeutic chara