

A Review : Formulation And Evaluation Of Cissus Quadrangularis Ointment For The Treating Fracture Bone Healing

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Abstract- *Cissus quadrangularis* is a medicinal plant traditionally used in Ayurvedic medicine for its bone-healing properties. The plant contains bioactive compounds such as ketosterones, flavonoids, and triterpenoids, which are believed to stimulate bone formation and accelerate fracture healing. When formulated into an ointment, *Cissus quadrangularis* can be applied topically over the fracture site to enhance local bone regeneration, reduce inflammation, and promote quicker recovery. Studies suggest that such ointments may support callus formation and improve the biomechanical strength of healing bones, offering a complementary therapy to conventional fracture treatment. *Cissus quadrangularis* ointment for treating fracture bone healing. *Cissus quadrangularis* (CQ), a traditional medicinal plant widely used in Ayurveda, has been reputed for its bone-healing properties. Rich in vitamins, steroids, and anabolic steroidal substances, CQ is known to enhance fracture healing through stimulation of osteoblast activity and reduction of inflammation. While oral formulations have been well-documented, topical applications such as ointments are gaining attention for localized and targeted therapeutic benefits. *Cissus quadrangularis* has gained attention as a natural therapeutic agent for enhancing bone fracture healing, often compared with conventional treatments such as calcium supplements, vitamin D, and other pharmacological agents. Studies have demonstrated that *Cissus quadrangularis* not only accelerates the healing process but also improves bone strength and mineralization more effectively than standard therapies alone. Its phytochemical components—such as ketosteroids, flavonoids, and calcium—contribute to osteoblastic activity and collagen synthesis, which are essential for bone regeneration. Compared to placebo or standard calcium therapy, patients and animal models treated with *Cissus quadrangularis* often show reduced healing time, better callus formation, and improved clinical outcomes. While preliminary results are promising, further comparative clinical trials are needed to fully validate its effectiveness and integrate it into mainstream orthopedic care.

Keywords- *Cissus quadrangularis*, fracture healing, bone

regeneration, herbal ointment, osteogenesis, phytotherapy.

I. INTRODUCTION

CQ (*Cissus quadrangularis*), also known as *Cissus succulent*, is a herb that can be annual or perennial and possesses a variety of therapeutic benefits. In Hindi and Bengali, this plant is referred to as harjora, while in Tamil, it is called Pirandai. A distinctive feature of CQ is its ability to climb thanks to its twisting and twining growth pattern. This plant originates from regions in Asia and Africa, including India, Malaysia, Java, Sri Lanka, Ghana, Niger, Nigeria, and Senegal. Historically, it has been utilized in India, Indonesia, and certain western African nations since ancient times. In India, it is referenced in Ayurvedic texts, and in Africa, there are mentions in various traditional medicinal writings. Research into this plant's phytochemical makeup, pharmacological effects, and safety has shown it to possess significant potential for healing bones. Additional pharmacological benefits include regulation of diabetes, treatment of gastrointestinal issues, antimicrobial actions, prevention of ulcers, relief from arthritis, anti-inflammatory effects, enhancement of muscle tone, pain relief, fever reduction, and addressing menstrual disorders. Ayurveda practitioners commonly recommend this herb for a multitude of health concerns. It has been tested and affirmed as an effective remedy. For initial healing, the prepared stem is consumed. The herb's alleged effectiveness in aiding early bone ossification and remodeling may be attributed to its ability to enhance metabolism and support mineral absorption by osteoblasts, earning it the title of a "Bone setter." It is believed that various bioactive compounds within the plant work synergistically to provide its medicinal benefits (1). A bone fracture or osteotomy refers to a complete or partial disruption in the structural integrity of the bone, resulting in loss of mechanical stability. This fracture is typically associated with varying levels of damage to the surrounding soft tissues, including blood supply, and frequently leads to impaired functioning of the locomotor system. Fractures often occur alongside penetration injuries (2). The medicinal

potential of *Cissus quadrangularis* L., commonly referred to as edible stemmed vine in English, is being investigated. Grown from stem cuttings in June and July, this annual or perennial plant requires a warm tropical climate and has entire leaves that are buff in colour with a hint of green. While there are many medicinal applications for this plant, some of the more popular ones are weight loss, anthelmintic, asthma, muscle aches, bone repair, antiulcer, anti-hemorrhoidal, antibacterial, etc (3). Contemporary research supports the long-standing use of *Cissus quadrangularis* in promoting bone healing. It has been demonstrated to stimulate osteoblastogenesis, the process involved in forming new bone tissue, positioning it as a potentially effective natural treatment for disorders like osteoporosis and bone fractures. The plant's capacity to increase bone mineral density and promote quicker healing in models of bone fractures has been thoroughly documented. Investigations into the molecular mechanisms behind these effects, especially its impact on the Wnt/ β -catenin signaling pathway, have paved the way for a deeper understanding of its role in bone regeneration (16). This systematic review aims to fill existing gaps by thoroughly assessing and synthesizing the current scientific research on *Cissus quadrangularis*. By systematically examining *in vitro* (laboratory), *in vivo* (animal), and clinical studies, this review intends to offer a comprehensive understanding of the plant's mechanisms of action, its effectiveness in enhancing bone health, and its possible applications in contemporary medicine (17). The steroid compounds from *C. quadrangularis* demonstrated a significant impact on the initial regeneration of all connective tissues derived from mesenchyme, thus enhancing the healing of bones. The goal of this study was to assess the influence of *C. quadrangularis* in speeding up the healing process of facial fractures by minimizing postoperative issues like pain, swelling, and restricted movement (18). Numerous studies regarding the anti-obesity effects of these significant medicinal plants have been published in the literature. Taking into account all the advantageous features and medicinal benefits of these plants for the current research, *Achyranthes aspera* and *Cissus quadrangularis* were selected to explore and provide scientific evidence for their traditional uses (19).

TYPES OF FRACTURES:

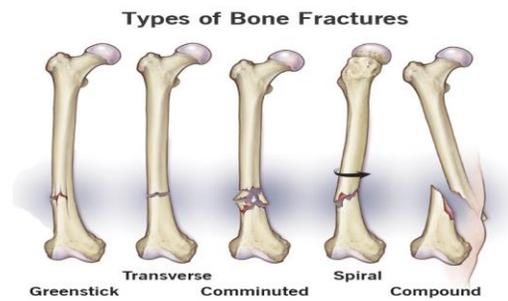


Fig.no:1(12).

1.Greenstick radius fracture:

Incomplete: bone bends and cracks on one side. Occurs in children (typically <10) with softer, more flexible bones. Forearm (radius and ulna) most commonly involved. Excellent outcomes with proper treatment, low complication risk (12).

2.Transverse tibia fracture:

Perpendicular to long axis of bone, horizontal line across bone shaft. Generally more stable than spiral or oblique fracture. Often via direct trauma such as a direct blow (baseball bat or car bumper). Heal well due to good bone-to-bone contact or stability. Lower risk of non union vs other fracture types (12).

3.Comminuted Humerus Fracture:

Bone breaks into 3+ separate pieces, complex fracture pattern. from severe forces such as MVA, high falls, crushing injuries. highly unstable fracture. often requires surgical intervention w/plates, screws, rods. increased risk of non-union, malunion, infection, compartment syndrome (12).

4. Spiral Tibia Fracture

Fracture line curves around bone shaft in helical pattern. caused by rotational/ torsional forces with one end fixed (twisting falls). highly unstable due to the long/oblique fracture line. Often require surgical fixation, Intramedullary rods or plates. higher risk of malunion, non-union vs stable fracture patterns (12).

5.Compound femur fracture:

Bone breaks through skin; external wound communicates with fracture site. High risk of bone infection. Requires thorough debridement (cleaning), irrigation, fixation. Higher rates non-union, malunion, chronic infection, amputation vs closed fractures. Longer recovery time: infection risk, soft tissue damage, surgical procedures (12).

PLANT PROFILE:

Fig.no:2 Cissus quadrangularis plant.

1. Family:

Vitaceae (Grape family)

2. Synonyms:

Cissus quadrangularis Linn.

Common names:

English: Veldt Grape, Devil's Backbone, Asthisamharaka

Hindi: Hadjod

Tamil: Pirandai

Kannada: Haridra hannu

Sanskrit: Asthisamharaka (bone healing)

3. Botanical Description:

Habit: Perennial, succulent, woody climber or creeper with quadrangular (4-angled) stems.

Stem: Erect or climbing with fleshy, quadrangular, jointed, green stems that become reddish on maturity. Stem is succulent and has swollen nodes.

Leaves: Simple, opposite, ovate to oblong, fleshy with a cordate base and entire margin; petioles are also quadrangular.

Tendrils: Present, arising from leaf axils, helping the plant to climb.

Flowers: Small, greenish-yellow, arranged in small clusters (cymes), usually dioecious.

Fruit: Small, globose berries, black when ripe.

Root: Taproot with numerous fibrous branches.

4. Morphological Characters:

Stems: Four-angled, fleshy, and succulent.

Leaves: Opposite, fleshy, ovate.

Tendrils: Arise from leaf axils.

Flowers: Small, dioecious.

Fruit: Berry, globose.

5. Chemical Constituents:**Active compounds:**

Triterpenoids (e.g., ketosteroids)

Ascorbic acid (Vitamin C)

Phytosterols

Flavonoids (quercetin, kaempferol)

Stilbenes (resveratrol and piceatannol)

Tannins

Saponins

Alkaloids

Calcium oxalate crystals

Carbohydrates, proteins, and minerals

6. Uses:**Traditional medicine:**

Treatment of bone fractures and osteoporosis.

Healing of wounds and ulcers.

Treatment of asthma, bronchitis.

Relief in hemorrhoids and bleeding piles.

Used as a general tonic.

Modern applications:

Used in nutraceuticals and dietary supplements for bone health.

Anti-inflammatory and antioxidant formulations.

Other uses:

Edible shoots and stems are sometimes consumed as a vegetable.

7. Macroscopic Characters:

Stems are quadrangular and fleshy.

Leaves are opposite and fleshy

Colour : Green to reddish in color, with swollen nodes.

Odour : Odorless and taste slightly bitter.

8. Microscopic Characters:

Epidermis with thick cuticle.

Presence of calcium oxalate crystals in parenchyma.

Collenchyma and sclerenchyma in the cortex.

Vascular bundles collateral and conjoint.

9. Habitat and Distribution:

Native to India, Sri Lanka, Africa, and parts of Asia.

Grows in dry, rocky, and hilly areas.

Found as a wild climber or cultivated plant.

TAXONOMIC CLASSIFICATION:

Classification:

| | | |
|----|----------------|----------------|
| 1 | Kingdom | Plantae |
| 2 | Subkingdom | Tracheobionta |
| 3 | Super division | Spermatophyte |
| 4 | Division | Magnoliophyta |
| 5 | Class | Magnoliopsida |
| 6 | Subclass | Rosidae |
| 7 | Order | Vitales |
| 8 | Family | Vitaceae |
| 9 | Genus | Cissus |
| 10 | Species | Quadrangularis |

table no:3 (6).

Monographs:

Bengali Names : Hadjod, Harbhanga
 English Names : Edible Stemmed Vine
 Sanskrit : Asthisamdhani
 Marathi : Kandvel
 Tamil : Perandi
 Scientific Name : *Cissus quadrangularis* L.
 Family : Vitaceae
 Duration : Perennial or annual
 Growth habit : Herb
 Bangladesh nativity : Native (13).

PLANT DESCRIPTION:

PARTS USED - Whole plant, habitat, stem, leaves, flower, seeds, berry, fruit.

1.Habitat:

A ubiquitous plant in the arid habitat of tropical and subtropical countries, *Cissus quadrangularis* is frequently found in lowland and coastal settings. For its therapeutic properties, the plant is quite well-known in India and Africa. In India and the Indian subcontinent Thickets, open forests, scrub jungles, forest borders, riverbanks, and wastelands at low to medium elevations are all home to the *Cissus* plant in places like Bangladesh and Pakistan (5).

2.Stem:

Plant material is found in fragments of different sizes; internodes are 4–15 cm long and 1–2 cm thick, while stems are four-angled and four-winged. Its angular portion is reddish-brown in colour, and its glabrous, pubescence-free surface is buff with a hint of greenish blue. It has no taste or odour (4).

3.Leaves:

The plant's stem has simple ovate or reniform leaves that are entire or cordate, serrulate dentate or crenate-serrate, three to seven lobed, terminal lobes that are triangular or sub-spathulate, subacute or cuspidate, membranous, glabrous on both sides, and ovate or cuneate, obtuse, and deciduous stipules (5).

4.Flower:

10 to 20 cm is the tap-root. *C. quadrangularis* blooms from June to December. Short peduncle cymes with spreading umbellate branches are the flowers. The calyx can be truncate, cup-shaped, or incredibly obscurely lobed. There are four short, robust, ovate-oblong petals (4).

5.Seeds:

The seed has a thick testa and is tiny (4).

6.Berry:

The berry is globose or oblong, about 6 mm long, apiculate, single-seeded, and scarlet when ripe. the ecotypes that bear berries and those that bloom (4).

7.Fruit :

The shrub produces single-seeded, globose, red, succulent, highly acidic berries that range in diameter from 6 to 10 mm. The smooth, oblong seeds have a diameter of 4–8 mm. June and July are determined to be the flowering and fruiting seasons (5).

8.Inflorescence:

The plant's inflorescence is an umbellate cyme with 1–2.5 cm long peduncles. The stem exhibits the existence of simple, long, and thin tendrils (4).

PHYTOCHEMICAL TEST FOR CISSUS QUADRANGULARIS:

Table.no:4. (19).

| S.no: | Experiment | Observation | Inference |
|---------------------------|---|--|---|
| 1.Test for carbohydrate | Fehling's test: sample Filtrate (1 ml) was boiled on water bath with 1ml each of Fehling solution A & Fehling solution B. | colored product | presence of sugar |
| 2. Test for alkaloids | Dragendorff's test: To a few ml of sample filtrate, 1 or 2 ml of Dragendorff's reagent was added by the side of the test tube. | A prominent red precipitate indicates test as positive. | Presence of alkaloids |
| 3.Test for flavonoids | Shinoda's Test: A few Magnesium turnings and 5 drops of concentrated Hydrochloric acid was added drop wise to 1 ml of test solution. | A crimson red color appeared after few minutes confirmed the test. | Presence of flavonoids. |
| 4. Test for tannins | Ferric Chloride test: To test solution added 10 ml distilled water, then filtered, in the filtrate 2 ml FeCl ₃ (10%) was added. | blue-black or green precipitate formed, | presence of tannins. |
| 5. Test for saponins | Foam test or Froth test: to the 0.5 ml of test solution added 2ml distilled water and shake the all tubes. | foam produced persist for 10 min. | presence of saponins |
| 6.Test for phytosterols | Libermann test or LB test: To the test solution added 10 ml of chloroform then filtered. To the 2 ml filtrate added 2 ml of acetic anhydride and con. H ₂ SO ₄ . | Blue green ring indicate . | presence of phytosterols. |
| 7. Test for triterpenoids | Salkowskis test Approximately 2 mg of dry extract was shaken with 1 ml of chloroform and a few drops of concentrated Sulfuric acid were added along the side of the test tube. | A red brown color formed. | Presence of triterpenoids and steroids. |

PHARMACOLOGICAL ACTIVITIES:**1. Antioxidant and free radical scavenging activity:**

Strong antioxidant and free radical scavenging properties are demonstrated by *Cissus quadrangularis*

methanol extract both in vitro and in vivo systems primarily because of β -carotene (6).

2. Antibacterial activity :

Fresh ethyl acetate and methanol extracts from the dry stems exhibit antibacterial properties, especially against Gram-positive bacteria including *Staphylococcus aureus*, *Bacillus subtilis*, and *Sin shadow boxing bacteria* (7).

3. Analgesic activity:

Cissus showed notably higher analgesic activity than Aspirin when tested using the Heffner's clip and Eddy's hot plate procedures. The fact that the ideal effective dose for analgesic effect fell between 1/20th and 1/10th of its LD50 indicates its broad margin of safety for the treatment of pain. The analgesic properties of *cissus* may be particularly beneficial in reducing bone fracture pain (3).

4. Bone healing activity:

The anabolic steroid components found in the CQ plant had a considerable impact on the rate of bone fracture healing by influencing early connective tissue formation. It has also been demonstrated that the vitamins and steroids in CQ have a particular impact on fracture repair (1).

5. Anabolic and Androgenic activity:

Cissus not only expedites the bone's remodelling process but also causes a far quicker rise in Tensile strength of bone. *Cissus* has caused fracture healing times in clinical trials to be between 55 and 33 percent faster than controls. According to several research, *Cissus* has anti-glucocorticoid qualities. In these studies, cortisol therapy weakened bones; however, when *Cissus* extract was administered, the cortisol-induced weakening stopped and the healing process started (8).

6. Anti-ulcer activity:

In a rat model of chemically generated ulcer, methanol extract demonstrated strong antiulcer efficacy by raising glycoprotein levels and reducing stomach secretions.

Through its antioxidative mechanism, methanol extract has a therapeutic effect on rats' stomach mucosal injury caused by aspirin. The methanol extract's triterpenoids and β -sitosterol have an anti-lipid peroxidising effect, preventing stomach injury (6).

7. Antipyretic activity :

When given orally to albino rats, the several serial extracts of *Cissus quadrangularis* demonstrated a decrease ($p \leq 0.01$) in the hyperpyrexia brought on by an injection of dried yeast, with activity becoming noticeable after 18 hours. The antipyretic properties of *Cissus quadrangularis* are demonstrated by this (7).

8. Anti-diabetic activity:

Diabetic prevention *Ce baris'* anti-diabetic properties were shown in an experiment where dry powder derived from ethyl acetate extraction was distributed. Wister albino rats were made diabetic by administering alloxan (1).

9. Antihemorrhoidal Activity:

It is also possible that the flavonoids in the extract, which function similarly to diosmin and hesperidin, are responsible for the venotonic effect of *C. quadrangularis*. Since diosmin and hesperidin are used to treat haemorrhoids, an extract that has the same anti-inflammatory and venotonic properties can also be utilised as an anti-hemorrhoidal medication. In addition to these benefits, *C. quadrangularis* has analgesic properties that can be quite helpful in cases of painful haemorrhoids. The current investigation demonstrated that *C. quadrangularis* has long been used in Thai traditional medicine as an anti-hemorrhoidal medication (8).

10. Anti-inflammatory and stimulatory activity:

Methanol extract has analgesic, anti-inflammatory, and venotonic properties related to haemorrhoids; β -sitosterol and flavonoids, particularly luteolin, are responsible for the anti-inflammatory action. The ability of β -sitosterol found in methanol extract to lower MPO enzymes suggests a decrease in neutrophil infiltration in inflammatory tissue. Rats' aspirin-induced tissue damage caused by neutrophils is protected against by ethanol extract (6).

11. Anti-obesity activity :

Globally, obesity and its associated complications like metabolic syndrome are widespread issues. A randomised, double-blind, placebo-controlled study was conducted to examine the potential benefits of *Cissus quadrangularis* in

metabolic syndrome, specifically for weight loss and central obesity. 123 overweight and obese individuals received Cissus treatment for eight weeks while following a regular or calorie-restricted diet. significant net decreases in fasting blood glucose, total cholesterol, LDL cholesterol, triglycerides, C-reactive protein levels, and weight and central obesity at the conclusion of the trial period (7).

12. Gastro-protective activity:

Due to its significant levels of carotenoids, triterpenoids, and ascorbic acid, *C. quadrangularis* has garnered a lot of attention because of its effects on human nutrition and has been thoroughly investigated for the detection of gastrointestinal disorders in conventional medications. Numerous studies have investigated and demonstrated the benefits of CQ extract (CQE) on gastrointestinal toxic and gastro-protective properties, as well as its potential for clinical therapy of aspirin-induced stomach mucosal degradation (1).

13. Parasympathomimetic activity:

The isolated ileum of rabbits and rats, the uterus of rats, the tracheal muscle of dogs, and the ileum in situ of dogs all exhibited acetylcholine-like action when exposed to aqueous extract. The effects on canine blood pressure were comparable to acetylcholine's muscarinic and nicotinic effects. On the rectus muscle of frogs, it had no impact (8).

14. Central nervous system activity:

Reduced exploratory behaviour is a sign of the root extract's central nervous system depressive action. Saponins found in root methanol extract have strong hypnotic effects and prevent mice's spontaneous motor activity (6).

15. Miscellaneous:

The plant's stem paste may also help with burns, wounds, muscle aches, bug bites, and horse and camel saddle sores. For digestive issues, dry shot powder is used. For body aches, a mixture of the shoots, dry ginger, and black pepper is used. The plant infusion has anthelmintic properties. Additionally, the plant extracts have cardiotoxic qualities. Young shoots are used to treat indigestion and dyspepsia. As a treatment for a number of vata illnesses, the powdered stem is combined with pulses and fried in sesame oil. Additionally, it is utilised to treat skin conditions like convulsions, epilepsy, cough, and leprosy (8).

FORMULATION OF CISSUS QUADRAGULAI:

Material and Methodology :

After being gathered, the plant material *Cissus quadrangularis* was shade-dried, ground into a fine powder, and kept in an airtight container. Analytical-grade chemicals and reagents were all utilised (9).

Step 1. Preparation of cissus quadrangularis extract:

Dry and powder the plant material. use ethanol:water (70:30) as solvent. extract using Soxhlet extractor or maceration method for 24-48 hours. Filter and evaporate the solvent to obtain a semi solid or dry extract (10).

Step2. Melting the base:

Weigh white soft paraffin , hard paraffin, beeswax, lanolin. Melt together in a water bath (around 70-75°C). stir gently to form a homogenous oily base (11).

Step3. Incorporation of extract:

Alone the melted base to cool slightly (to 50-55°C). add cissus quadrangularis extract slowly with continuous stirring to disperse evenly. Ensure uniform mixing. If using dry extract, levigate with a small amount of melted base first (10).

Step4: Colling and packing:

Once mixed, pour into sterilized jars or collapsible tubes while still semi-fluids. Allow it to cool at room temperature. Label properly with name, concentration, date, and storage instruction (11).

EVALUATION OF CISSUS QUADRANGULARIS OINTMENT:

1. Physical Appearance:

evaluated the prepared ointment's colour, consistency, and texture before applying it. It was discovered that the ointment was homogeneous, smooth, and devoid of any lumps or phase separation. The addition of plant extracts and turmeric gave it a pleasing herbal hue (10).

2. PH:

A digital PH meter was used to measure the produced herbal ointment's PH. 100 millilitres of distilled water were used to make the ointment solution, which was then left for

two hours. The solution's PH was measured three times, and the average was computed (11).

3. Spreadability:

To assess the ointment's ease of application on the skin, its spreadability was examined. To measure the area of spread, a predetermined quantity of ointment was sandwiched between two glass slides, and weight was applied. Good spreadability means that the ointment is easy to apply and doesn't get greasy (10).

$$S=M \times L/T$$

Where,

S = Spread ability

M = Weight tide to the upper slide

L = Length of glass slide

T = Time taken to separate the slides (11).

4. Viscosity:

The preparation should have a viscosity that makes it simple to apply the product to the skin and remove it from the container. Cone plate and Brook field viscometers were used to obtain the rheological property(11).

5. Consistency:

Through touch and observation, the ointment's consistency was assessed. It was discovered to be non-gritty, semisolid, and to have retained its structure while stored. A stable base was made possible by the inclusion of paraffin and beeswax (10).

6. Rheological Properties:

The preparation should have a viscosity that makes it simple to apply the product to the skin and remove it from the container. Cone plate and Brook field viscometers were used to obtain the rheological property (11).

7. Odor:

assessed the ointment's smell by sensory analysis. Because it contained turmeric and neem, the product had a subtle herbal scent. The absence of an offensive or rancid odour demonstrated that the substances had not changed throughout formation (10).

8. Loss on drying:

This is applied in IP and USP. Although water is the primary cause of the weight loss in the sample under test, a minor amount of other volatile materials will also contribute to the weight loss. Put 1g of ointment in the digital moisture balance[10], set the temperature to 105°C, and operate the device until the weight remains constant. Lastly, automatically read out the drying percentage loss (11).

9. Skin Irritation Test:

Healthy human volunteers participated in an initial skin irritation test to evaluate the ointment's safety (with informed consent). After a day of observation, a tiny quantity was administered to the inner forearm. The absence of redness, itching, or irritation suggests that the ointment is safe to apply topically (10).

10. Content uniformity:

Ten filled ointment containers are weighed to calculate their net weight. Both the labelled quantity and the results should match. Another name for this test is the minimal fill test (11).

11. Washability:

After applying the formulation to the skin, the ease of washing with water was assessed (10).

12. Rate of absorption:

The medicine enters deeper skin tissues and then enters the systemic circulation through diadermic ointments. The rate at which medications are absorbed from such ointments should be assessed. A specific area of the skin should be rubbed with the ointment. Serum and urine samples should be tested for the amount of medication absorbed at regular intervals. The amount of medicine taken per unit of time, or the rate of absorption, ought to be higher (11).

13. Stability Study:

The ointment was stored for 30 days at room temperature and at a higher temperature (40°C) as part of a short-term stability study. Periodically, the formulation was checked for alterations in colour, consistency, or smell. Under both circumstances, the ointment stayed stable and showed no outward symptoms of deterioration (10).

14. Weight Variation Test:

Choose a sample of 6 filled containers and eliminate any labels that could affect the weight when emptying the contents. Thoroughly clean and dry the exterior of each container, then weigh them individually. Empty the contents of each container by opening and rinsing with an appropriate solvent, ensuring that the closures and all other components of each container are preserved. Dry the containers again and weigh each one alongside its corresponding parts.

The difference in weights determines the net weight of the contents in each container.

The average net weight of the contents from the 6 containers should not be less than the labeled amount, and the net weight of the contents from any single container should not fall below 90% of the labeled amount, provided the labeled amount is greater than 60g but less than 150g (11).

II. RESULT

| S.no | Evaluation tests | Ranges |
|------|------------------------|--|
| 01 | Appearance(color) | Light greenish yellow. |
| 02 | PH test | 5.9 – 6. |
| 03 | Rheological properties | 180cp to 210cp. 185cp is better viscosity. |
| 04 | Spreadability | 5cms to 7cms, 6.5 is good spreadability. |
| 05 | Non irritancy | No irritant. |
| 06 | Rate of drug release | 0.95 about 1cm |
| 07 | Solubility | Soluble in alcohol, ether, chloroform and boiling water. |
| 08 | Washability | Easy washable. |
| 09 | Stability | Study Stable. |
| 10 | Consistency | Smooth. |
| 11 | Odour | Characteristic. |

III. CONCLUSION

The development and assessment of *Cissus quadrangularis* ointment showed encouraging potential for facilitating the healing of fractured bones. The formulated ointment exhibited satisfactory physicochemical properties, stability, and ease of use. Pharmacological assessments indicated improved bone regeneration, which may be

attributed to the plant's well-established osteogenic, anti-inflammatory, and antioxidant characteristics. These findings reinforce the traditional application of *Cissus quadrangularis* in promoting bone healing and suggest that the created ointment could be an effective topical treatment for aiding fracture recovery. Additional clinical trials are suggested to confirm its effectiveness and safety in human populations.

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