Formulation And Evaluation Of Herbal Tablets For The Treatment Of Bone Health Using Cissus Quandrangularis

Jayashri K. Wahatule[1,] Pooja k. Sirsath[2,] Diksha K. Chavan[3], Rekha Goukonde[4,] Dr. Gajanan Sanap[5]
[1,2,3] *Guide, Late Bhagirathi Yashwantrao Pathrikar Collage of Pharmacy, Pathri*
[4,5] *Ast. Prof., Late Bhagirathi Yashwantrao Pathrikar Collage of Pharmacy, Pathri , Phulambri*
Chh.Sambhajinagar-431111. Maharashtra, India

***Abstract*— Cissus Quandrangularisl, belong to the grape family Vitaceae, is a useful plant found in tropical and subtropical regions of Asia and Africa. It is also referred to as devil backbone and veldt grape. Cissus Quandrangularisl is a significant traditional remedy with a variety of medicinal applications. It is distinguished by its fleshy quadrangular stems with leathery edges. In India, it is commonly used as a food item and has been a cornerstone of ayurvedic medicine for a century, the plant is well regarded for its property that aids in the healing of bone fractures and overall joint health. the plant is believed to be useful in helminthiasis, anorexia, dyspepsia, leprosy, skin diseases, tumors**

***Index Terms*— BoneHealing,Bone Regeneration, Cissus quandrangularis , Osteoblast, Osteogenesis.[Medicinal plant, phytochemistry**

I. INTRODUCTION

TABLET- Oral solid dosage forms are administered for attaining a local therapeutic effect in the mouth, throat and digestive tract or for a systemic effect in the body after oral or gastrointestinal absorption.[1] For preparing oral solid dosage forms, active ingredients and suitable excipients can be milled, dried, encapsulated, blended, granulated or tableted. Various oral solid dosage forms such as tablets, capsules, lozenges, powders and granules.[2]

Cissus quadrangularis it's also known as "Hadjod," Cissus quadrangularis (Linn) has been utilized by common people in India and its surrounding nations, Pakistan, Sri Lanka, and Malaysia, to promote fracture healing.Another name for it is Vitis quadrangularis Wall. is a member of the Vitaceae family.[3] It is a widespread perennial eliminator found all over India, especially in tropical areas. It spreads by system cutting throughout the months of June and July and needs a warm tropical climate. These days, the use of medicinal plants and herbs is becoming a significant substitute source for community and individual health.[4] Numerous scientific investigations on the use of traditional herbal remedies to cure illnesses have been conducted in recent decades, and this has led to the creation of alternative medication systems and therapeutic approaches. It is intriguing to employ medicinal plants as an optional food source to get the essential elements required for bodily development because their growth and medical significance are growing daily.[5] Cissus quadrangularis is usually recognized as a member of the Vitaceae family (Hadjod). This plant is indigenous to Bangladesh, Sri Lanka, and India. Additionally, it is seen throughout Southeast Asia and Africa..[5,6]

The plant is imported from Brazil and the southern United States. where its warm tropical temperature is ideal for growth. Stem cuttings are used to propagate the plant in June and July. The months of October through November are then used for collection. Approximately 8,000 kinds of medicinal plants make up 50% of all blooming plants in India. Cissus quadrangularis has quadrangular-sectioned branches with internodes that are 1.2 to 1.5 cm broad and 8 to 10 cm long, with an average height of 1.5 m. There is a leathery edge at each angle. At the nodes, toothed triode leaves that range in width from 2 to 5 cm emerge.[7]

Globular berries are crimson when ripe, and there are racemes of tiny white, yellowish, or greenish flowers. Asian and African nations employ Cissus quadrangularis as a vine. In Thailand, it is one of the most often suggested medicinal plants. It has long

been utilized in Ayurvedic medicine in Africa. Every portion of the plant is used medicinally to treat a variety of illnesses. Cissus quadrangularis is one of the ancient medicines that comes from Ayurveda, but because it grows in many different places, it appears to have a wide variety of sites that are utilized medicinally.

Its traditional name, "Bone Setter" (Hadjod), comes from the fact that it was primarily used to treat female disorders (menopause, libido, and menstrual disorders) and bone disorders. Other traditional uses include its purported antiulcer,pain-relieving, and wound-healing qualities[8].cissus quandrangularis is used a traditional herbal remedy aliment.[7,9]

II. COMPOSITION OF HERBAL TABLET

CISSUS QUANDRANGULARIS Extract
Microcrystalline cellulose
Starch
Croscarmellose sodium
Povidone
Magnesium stearate
Talc powder
Aerosol
Vit d3
Calcium citrate
Buswellia serrata extract
Lavender

III. PLANT PROFILE:[9]

1.CISSUS QUANDRANGULARIS
* Kingdom Plantae –
Plants Subkingdom Tracheobionta - Vascular plants
* Super division Spermatophyta - Seed plants
* Division Magnoliophytes - Flowering plants
* Class Magnoliopsida - Dicotyledons
* Subclass Rosida

ORDER RHAMNALES
* Family Vitaceae - Grape family
* Genus Cissus L. - Treebine
* Species Cissus quadrangularis L

SYNONYMS
Cissus succulent, Cissus tetragonal, Vitis quadrangularis, Vitis succulent[10] Cissus fischeri Gilg [11]

PLANT PARTS USED
The whole plant used specially leaves, roots and stem.[12]
Bengali Names: Hadjod, Harbhanga English Names: Edible Stemmed Vina Sanskrit: Asthi-sandhi
Marathi : Kandvel
Tamil: Pirandai
Scientific Name: Cissus quadrangularis L. Family: Vitaceae
Duration: Perennial or annual Growth habit: Herb.

CHEMICAL CONSTITUENT
Quadrangularis is a plant rich in a variety of chemical components, including as flavonoids Genistein are flavonoids like quercetin and myricetin and triterpenoids like beta-sitosterol and alpha-amyrin.[13] It also includes stilbenes, iridoids, gallic acid derivatives, and a number of other substances like vitamins, tannins, and saponins. Alpha-Amyrin, beta-Amyrin, Friedelin, beta-Sitosterol, Keto-sitosterol, and examples of triterpenoids. Quercetin, Myricetin, Daidzein, Genistein, and Genistein are flavonoids.[14] Derivatives of gallic acid gallate methyl. Picroside 1, 6-O-meta-methoxy-benzoyl and 6-O-[2,3-dimethoxy]-trans-cinnamoyl are iridoids. Pallidol and Stilbenes Quadrangularin A. Other substances Carbs Saponins and Tannins Phenols Alkaloids Vitamins, such as vitamin C Minerals (such as phosphorus and calcium) Fats and fixed oils.[15]

USES- bone health, joint health, weight management, antioxidant properties. wound healing, obesity, bone loss, gout [14,15]

ADVANTAGES-
1. Low cost
2. Light weight
3. Easy to handle

DISADVANTAGE
1.Difficult to administration in the older patient
2.LavenderSynonyms:-Common Lavender

BIOLOGICAL SOURCE:-It is the volatile oil obtained by steam distillation of fresh flowering tops of Lavandula officinalis Chaix.[16]

Family:- Labiatae.

GEOGRAPHICAL SOURCE:- It is found in Portugal and eastwards throughout the Mediterranean region. Lavender is cultivated to some extent in India.

MORPHOLOGY:-
COLOUR:- Colourless or yellow liquid.
ODOUR:- Characteristics pleasant aroma.
SOLUBILITY:- Slightly soluble in water, soluble in 4 volume of 70% alcohol, Carbon disulphide.[17]






Pharmacological Properties
Neurological effects (↑γ-aminobytric acid,↓ acetylcholine)
Aromatherapy (↑Positive feelings)
Anti-microbial (↓germination and fungal boom)
Anti-parasitic and pesticidal (↓Giardia lamblia and Trichomonas vaginalis growth)
Antioxidant (↑GSH)
Hypnotic (↑ sleep)
Anesthetic (blockade of ion channels (Na or Ca2+)
Others (↓hormone-sensitive lipase (HSL) and pancreatic lipase (PL)

2.MICROCRYSTALLINE CELLULOSE:
Microcrystalline cellulose Refined wood pulp is known as microcrystalline cellulose (C6H1005). It is a free-flowing, white powder. It has no discernible absorption, is chemically inert, and is not broken down during digestion.[3] When consumed in excess, it gives food bulk and may have laxative effects. The pharmaceutical business frequently uses microcrystalline cellulose as an excipient. It is utilized in solid dosage forms, such tablets, and has good compressibility qualities. It is possible to create hard tablets that disintegrate fast. Similar to cellulose, microcrystalline cellulose satisfies USP Standards.[17,18]

3.STARCH:
All living things depend on carbs for their basic metabolism, which is centered around them regardless of autotrophic or heterotrophic feeding. The fact that polysaccharides are the most prevalent polymers in the biosphere is therefore not surprising. Plants and some cyanobacteria are the primary producers of starch,[19] which is quantitatively the most prevalent storage carbohydrate on Earth . Starch accumulates as water-insoluble particles, or starch granules.[20]

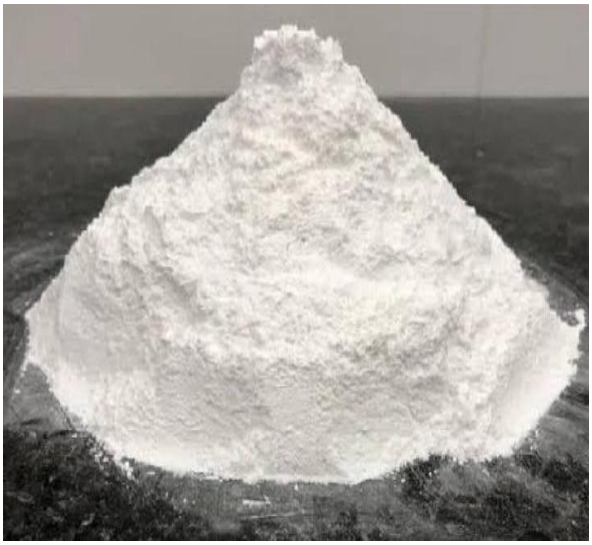
4.SODIUM CARBOXYMETHYL CELLULOSE

Cellulose with sodium carboxymethyl Croscarmellose sodium is a cross-linked polynomial found in sodium carboxymethyl cellulose (SCMC). Croscarmellose sodium has exceptional swelling properties because to its insoluble, hydrophilic, and very absorbent nature. Its fibrous structure also contributes to its excellent water-wicking abilities. Croscarmellose sodium improves the bioavailability of different formulations by providing dissolving and disintegration properties. In biomedicine, it has been used to prevent adhesions of the epidural scar and postsurgical soft tissue. It is used as a disintegrant [21]

5.TALC

Talc The Arabic term "talk," which refers to the white hue of a tale, is where the name "tale" originates. Tale is a hydrous magnesium silicate with the chemical formula Mg Si,01 (OH) Si and Fe can be replaced by small amounts of Al or Ti, Mg can be replaced by Mn and Al, and very small amounts of Ca can be used in place of Mg. The mineral is called Minnesota when more Fe is swapped for magnesium, and pyrophyllite when Al is substituted for magnesium[22]

Tale is typically white, or green. Brown or colourless, mildly soluble in diluted mineral acids, and insoluble in water.



6.MAGNESIUM STEARATE

Magnesium stearate is a white, powdery material that is used as an ingredient in cosmetics and as a lubricant and anti-caking agent in the production of tablets and capsules. Although excessive consumption can have a laxative effect and inhaling the powder can irritate the respiratory system, it is generally regarded as safe[23]. It is a magnesium salt of stearic acid, a fatty acid present in many foods. Magnesium stearate

AEROSIL

An all-purpose rheology, free flow, and anti-caking agent is AEROSIL fumed silica. Pharma quality is also available. Evonik uses flame hydrolysis to create artificial fumed silica, which is marketed under the brand name AEROSIL. As a rheology controller, anti-caking, and free flow agent, AEROSIL® works incredibly well. Numerous hydrophilic and hydrophobic fumed silica with various surface areas and product attributes are included in the AEROSIL® portfolio. Many industrial and consumer items use silica, a white, powdered material as a thickening and anti-caking ingredient.[24] It keeps powders running freely by covering the individual particles, increasing the viscosity of liquids, and preventing particles from settling. This makes it beneficial for a variety of uses, such as coatings,[25]

7. CALCIUM CITRATE

Calcium Citrate raises your body's calcium levels. The element calcium is crucial for both heart health and the development of strong bones. A calcium salt of citric acid, calcium citrate is added to meals and found in calcium supplements[26] It is advised for persons with inflammatory bowel illness, absorption difficulties, or those taking acid blockers because of its high rate of absorption, particularly for those with low stomach acid. This is an overview of calcium citrate: Advantages Promotes healthy nerves, muscle contraction, strong bones and teeth, and hormone

8.BOSWELLIA SERRATA

The tree Boswellia serrata is common in North Africa, the Middle East, and India. Frankincense or olibanum are typical names for the sticky exudate or resin that is obtained by removing the bark. In Ayurveda, Boswellia is frequently used to treat asthma, ulcerative colitis, coughs, sores, arthritis, and wound healing. is a tree that is common in North Africa, the Middle East, and India. Frankincense or olibanum are typical names for the sticky exudate or resin that is obtained by removing the bark. In Ayurveda, Boswellia is frequently used to treat asthma, ulcerative colitis, coughs, sores, arthritis, and wound healing.[26,27]

9. POVIDONE:

Povidone, sometimes referred to as polyvinyl pyrrolidone (PVP)or polyvidone, is a synthetic water-soluble polymer derived from the monomer N vinyl |pyrrolidone that is used as a lubricant in eye drops and a binder in numerous medicinal tablets. Additionally, it serves as an emulsifier, glue, and additive in a variety of technical applications. Povidone-iodine exhibits antiseptic qualities when combined with iodine; povidone serves as a carrier while iodine, a bactericidal component, mostly contributes to this effect. One Over-the-counter topical treatments, ointments, pessaries, liquid soaps, and surgical scrubs all include povidone-iodine. Povidone iodine's therapeutic efficacy in promoting wound healing is still up for debate[28]

IV. METHODOLOGY

1.Plant material collection and verification
2. Plant extract preparation, including
-drying,
-extraction, and concentration
3. tablet formulation
-weighing and mixing
-granulation

*WET GRANULATION

Drug Filler
↓
Blending
↓
Wetting
↓
Granulation
↓
Drying

Lubricant
↓
Glidant
↓
Disintegrant
↓
Sizing
↓
Blending Compression

*DRY GRANULATION

Raw material
↓
Waving
↓
sizing
↓
Weight massing
↓
seaving
↓
Drying
Screeing
Mixing
Direct compression

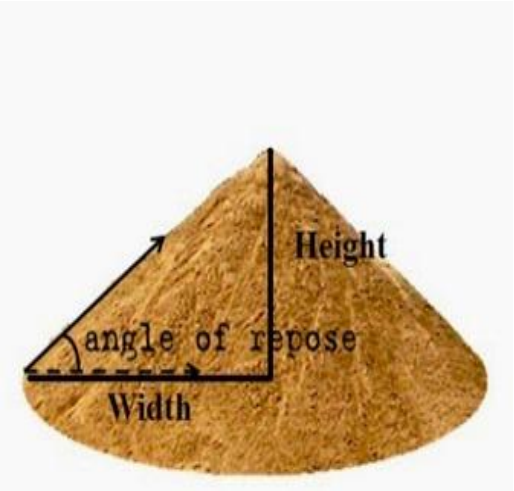
EXCIPIENT
Diluents
Granulating agent
Binding agent
Disintegrating agent
Lubricant glidant
Adsorbing agent
Preservatives colouring agent sweeting agent flavours

V. COMPRESSION

EVALUATION PARAMETER
PRE COMPRESSION PARAMETER
Angle of repose
Bulk and tapped density
Carr index and Hausner ratio

POST COMPRESSION PARAMETER
Weight variation
Hardness test
Friability
Disintegration
Dissolution thickness

PRE COMPRESSION
1.ANGLE OF REPOSE
Take the funnel and place on the stand and fix it horizontal surface.
Pure the drug in to the funnel and allow to flow freely on the surface
Continue adding until the tip of the pile reach to the bottom of the funnel[29]
And last step measure the height [h]and diameter [d] or radius [r] of the base of the drug
Formula= (theta =\tan ^{-1}(h/r)



2. BULK AND TAPPED DENSITY

Bulk Density, Bulkiness, and Compression Index The following process determines the bulk density of the medication.

For a 100 mL measuring cylinder, weigh powder with an apparent volume between 60 and 100 mL; for a 250 mL measuring cylinder, weigh powder with an apparent volume between 150 and 250 mL (minimum 60% of cylinder capacity). After recording the mass of an empty 100 mL graduated cylinder, use a funnel to add the sample up to at least 60% of the cylinder's capacity, then note the total weight.[29,30] To find the actual mass of the sample for that volume, deduct the weight of the empty cylinder from the total weight. You can use a measuring cylinder with a 50 mL or 25 mL capacity if the sample quantity is smaller. (a) Fill the measuring cylinders that come with the instrument with the weighed sample. This volume should be noted as (untapped) bulk volume (V). Place the measuring cylinder in the designated holder on the device. (c) Using the knob that comes with the equipment, adjust the number of drops (tapping) in relation to the time that the test is to be conducted**.** Use the ON switch to turn on the device for set tapping, then wait for the test to finish. (After the set tapping is finished, the knob returns anticlockwise to its initial position.) (d) Use the same equipment to test for 10, 500, and 1250 taps using the same powder sample. Then, read the appropriate volumes as Vid. V son and Viso to the closest graded unit

FORMULA=

Bulk density = mass of powder/ bulk volume

Tapped density= mass of powder / tapped volume

NOTE

1. V son is the final tapped volume if the difference between Vio and V son is less than or equal to 2 ml.
2. Repeat in increments, such as 1250 taps on the same sample, until the difference between subsequent measurements is less than or equal to 2 mL if the difference between V1o tapped volume and V son exceeds 2 ml.
3. Repeat in increments, such as 1250 taps on the same sample, until the difference between subsequent readings is less than or equal to 2 mL if the difference between V son and V12so tapped volume exceeds 2 ml .

V10. V500. V1250, (Final tapping volume, V+)

(a) After the test is finished, take the measuring cylinder out of the device and empty it into the container.

(b) Determine the bulk density using the formula Mass Bulk density = g/mL, where M is the sample's mass and V is its total bulk volume.

(c) Use the formula Mass Density = Vy 9/mL to determine the tapped density. where V is the sample's ultimate tapped volume and M is its mass.

The bulkiness is determined by the reciprocal of the bulk density or the particular bulk volume. The formula 1 = 1-Bulk density/Tapped density- × 100 can be used to determine the drug's percent compressibility index[31]

$$\text{Hausner Ratio (HR)} = \frac{\text{Tapped Density}}{\text{Bulk Density}}$$

$$\text{Carr's Index(CI)} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}} \times 100$$

VI. POST COMPRESSION PARAMETER

1. GENERAL APPEARANCE: AFTER-COMPRESSION PARAMETER Overall Look: Consumer acceptance, lot-to-lot uniformity control, and tablet-to-tablet uniformity all depend on a tablet's overall design, identity, and elegance.

2.HARDNESS AND FRIABILITY

Tablets necessitate a specific degree of strength or hardness and resistance to friability to endure the mechanical vibrations encountered during manufacturing, packaging, and transportation

Equipment used to check hardness:

- Monsanto Hardnes tester
- prizes Hardnes tester.
- Erweka Hardness tester
- strong-cobb hardness tester.[1]

VII. METHOD:

A number of tablets, let's say twenty, are weighed and put inside the device, where they are subjected to rolling and repeated shocks as they fall six inches with each rotation. ii) The tablets are weighed and their weight is compared to their starting weight after four minutes of this treatment or 100 revolutions. Tablet friability is measured by the loss from abrasion. (iii) A percentage of tablets is used to describe the value Broken or cracked tablets are not picked up during the friability test, and more than 1% of the weight of the tablets being tested is deemed generally acceptable. [1] Friability = (where, Tw-total initial, tablet weight) FW stands for total final tablet weight

(i)

Friability = $(iw - fw) \div iw \times 100$

Where,

Tw- total initial, wt. of tablet

FW -total final wt. of tablet

VIII. DISINTEGRATION

A medication must initially be in solution in order to be absorbed from a solid dosage form following oral administration, and the disintegration of the tablet is typically the first crucial step toward this condition. The disintegration test measures how long it takes for a set of tablets to break down into particles that can pass through a 10 mesh screen under specific conditions. The disintegration tester, which consists of a basket rack with six plastic tubes that are open at the top and bottom and have a 10-mesh screen covering the tube's bottom, is used to conduct the disintegration test[30,31]

The basket is submerged in a bath of appropriate liquid that is kept at 37 degrees Celsius, ideally in a 1-liter beaker. * The BP stipulates that the majority of uncoated pills must dissolve in 15 minutes, however this varies for some uncoated tablets; coated tablets may take up to two hours. One tablet is put in each test tube, and a basket rack is placed in a 1-liter beaker of water that simulates stomach contents at 37 to 2 degrees Celsius so that the tablets stay 2.5 cm, below the liquid's surface when they rise. The basket assembly is moved at a frequency of 28–32 cycles per minute by a typical motor-driven device.

The basket assembly is moved at a frequency of 28–32 cycles per minute using a typical motor-driven device. The tablet must dissolve and all particles must pass through a 10 mesh screen within the allotted time in order to meet USP criteria. Aspirin tablets that are uncoated take five minutes to dissolve. * Most tablets take thirty minutes to dissolve. Enteric coated pills = 2 hours plus the monograph's time (simulated intestinal fluid).

IX. DISSOLUTION

A solid solute enters a solution by the process of dissolution. In the pharmaceutical industry, it can be described as the quantity of drug substance that enters solution per unit of time under standardized conditions of temperature, solvent composition, and liquid/solid interface. When assessing a drug's bioavailability, dissolution kinetics are crucial. The creation of in-vitro dissolving testing aims to demonstrate two things:- (i) that the tablet's medication release is as near to 100% as feasible. (ii) that the drug release rate is consistent from batch to batch. Therefore, we might argue that a

product's rate of dissolution indicates its efficacy. Bioavailability and dissolution rate. It is done in.

X. CONCLUSION

In conclusion Traditionally, Cissus quadrangularis has been used as a medicinal plant to strengthen bones and hasten the healing of fractures. Tablets made from Cissus quadrangularis have the potential to improve bone health, especially in fracture repair, pain and inflammation reduction, and bone metabolism marker modification, according to preclinical and clinical data currently available. According to experimental research, the plant encourages quicker bone repair, increases mineralization, and stimulates osteoblastic activity. Its potential as a supportive treatment for bone diseases is shown by clinical studies that show improvements in fracture healing outcomes and effects on bone turnover indicators.[31]

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