WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 8, 1282-1308. Research Article ISSN 2277–7105

FORMULATION AND EVALUATION OF HERBAL DRY POWDER HAVING WOUND HEALING ACTIVITY

Sejal Kadam*, Pranita Kadam, Omkar Kallakuri and Ramdas Dudhate

Dept. of Pharmacology, D.K. Patil Institute of Pharmacy, Sayal Road, Loha, Nanded-431708.

Article Received on
05 March 2025,

Revised on 25 March 2025,
Accepted on 14 April 2025

DOI: 10.20959/wjpr20258-36376

***Corresponding Author**
Sejal Kadam
Dept. of Pharmacology,
D.K. Patil Institute of
Pharmacy, Sayal Road,
Loha, Nanded-431708.

ABSRACT

Herbal medicine has become an item of global importance both medicinal and economical. Although usage of these herbal medicines has increased, their quality, safety, efficiency are serious concerns in industrialized and developing countries. Herbal remedies are getting increasing patient compliance as they are devoid of typical side effects of allopathic medicines. The present research has been undertaken with the aim to formulate and evaluate the herbal gel containing *Tridax procumbens* leaf and *Annona squamosa* seed. The medicinal plants used in various plants have been used in treatment of wounds are the result of injurious to the skin that disrupt the soft tissue. single hand information regarding these plants with their specific parts used for wound healing activity is lacking.

KEYWORD: Tridax procumbens, Annona Squamosa, Wound Healing powder, Annonaceae, Asteraceae.

1. INTRODUCTION

- Wound is the breach of tissue continuum, It arises due to various events of like Physical injury, Chemical injury, microbial injection.
- Wound healing is a physical trauma where the skin is torn, cut or punctured. On explore to air, microorganism enter the wound which leads to wound contamination and finally development of infection.

Fig No: 1 Wound Healing.

- It is a process that is fundamentally a connective tissue response. Initial stage of this process involves an acute inflammatory phase followed by synthesis of collagen and other extracellular macromolecules that helps in the formation of a scar.
- This Intericate process is initiated in response to an injury restores the function and integrity of damaged tissues.
- Herbal therapy predominates in traditional medicine as well as in alternative medicine practiced in the developing and the developed countries.
- The widespread interest in because of the belief that plants is because of the belief that plants are safe and dependable, and with lesser side effects.
- Review of literature reveals that traditional plant drugs are beneficial for several skin related problems and for wound healing.
- World Health Organization (WHO) as well as our country has been promoting use of traditional medicine because they are less expensive, easily available and comprehensive, especially in developing countries.
- In day's conventional medical system, ethno medicinal plants plays a great role for new drug development. Relying on the ethnobotanical information, potential biological activities of the plants have been investigated. Wound is one among common health problem in presenAt era. Wounds are one of the major case of physical disabilities.

Fig No: 2 Stages of wound healing.

- Wounds are physical injuries that result in an opening or break of the skin that causes disturbance in the normal skin anatomy and function. They result in the loss of continuity of epithelium with or without the loss of underlying connective tissue.
- Wounds, that are most difficult to heal, includes delayed acute wounds and chronic wounds. Current estimates indicate that nearly 6 million people suffer from chronic wounds worldwide.
- In traditional medicine all over the world, a wide range of plant preparations are employed as wound healing agents. Through scientific studies, many plants used for wound healing have been investigated intensively, in order to validate them for their reported usage. Therefore, the search for natural products as new wound healing agents becomes a great targets.
- Wound healing is a complex mechanism for the repairment of tissue integrity, and comprises of four main phases

1) **Haemostasis** :- Occurs immediately after the injury and lasts for a few hours Blood vessels open to allow more blood flow to the wound Blood clots to stop bleeding.
2) **Inflammation** :-Occurs 1–3 days after the injury Blood vessels open to bring oxygen and nutrients to the wound White blood cells arrive to fight infection and clean the wound may appear red, swollen, warm, or tender.
3) **Proliferation**:- Occurs 4–21 days after the injury New blood vessels grow in the area White blood cells send out chemical messengers to help repair the area.

4) **Remodelling** -Occurs 21 days–1 year after the injury. The wound is mostly healed and the body replaces temporary tissue with strong skin This is the active scar tissue phase of healing.

1.1 Types of Wound Healing

1) **Primary healing:** Also known as primary intention healing Involves closing a wound with stitches, glue, or staples within hours of it being created Helps the body focus on healing a smaller area.
2) **Secondary healing:** Also known as secondary intention healing Involves leaving a wound to heal naturally without formal closure Recommended when a wound is too large to close right away take a long time and may have a higher risk of infection.
3) **Tertiary healing:**-known as healing by delayed primary closure Involves initially debriding the wound and then closing it with sutures or another method.

after a period of time doctor may delay closing a wound if they fear trapping infectious germs or tissue wound healing process involves four stages: Haemostasis, Inflammation, Proliferation, and Remodelling. Wound healing can be complicated by keloids and hypertrophic scars, which are examples of exuberant healing.

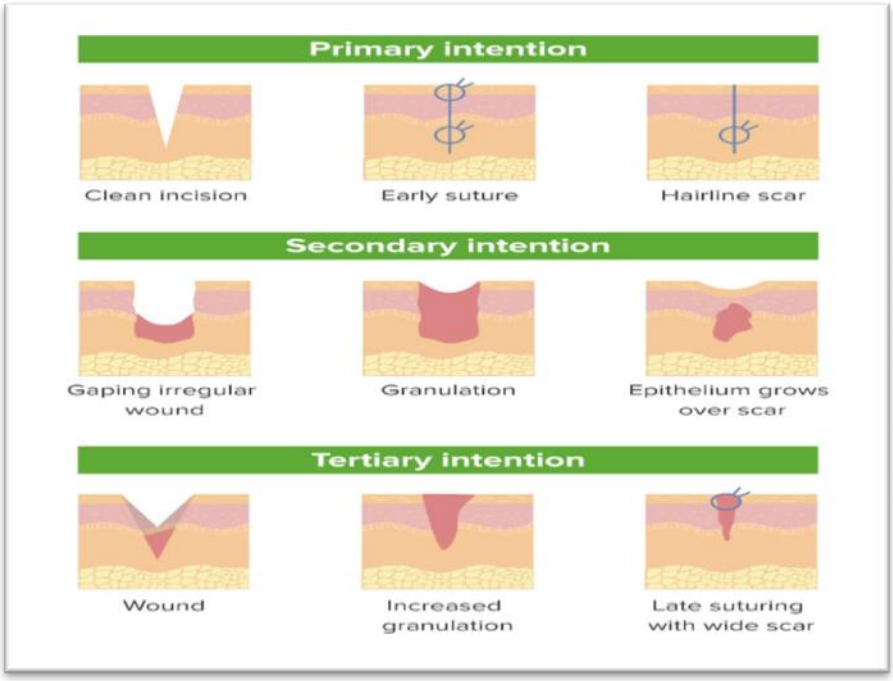

Fig No: 3 Types of wound healing.

1.2 Example of wound healing Drugs

1. **Antibiotics**

- **Penicillins:** A systemic antibiotic used to treat wounds
- **Cephalosporins:** A systemic antibiotic used to treat wounds
- **Clindamycin:** A systemic antibiotic used to treat wounds
- **Metronidazole**: A systemic antibiotic used to treat wounds
- **Co-trimazole**: A systemic antibiotic used to treat wounds

2. **Antiseptics**

- **Hansaplast Antiseptik Pembersih Luka Spray:** A wound-healing medicine that accelerates the healing process
- **Betadine Sol**: An antiseptic used to treat wounds.

3. **Ointments**

- **Neosporin:** An antibiotic ointment used to treat minor cuts and scrapes
- **Bacitracin:** An antibiotic ointment used to treat minor cuts and scrapes
- **Aloe Vera-Based Ointments**: An ointment used to treat first-degree burns.

4. **Powder**

- **Betadine powder**: An antiseptic and disinfected agents.
- **Collagen powder**

2. POWDER

- Powder is a simplest dosage forms and the basis of many other solid dosage forms such as Tablets, Capsule, etc.
- Powder were originally designed as a convenient mode of administering hard vegetables drugs such as roots, bark and woods.
- Powders are intimate mixture of dry, finely divided drugs and or chemical that may be intended for internal or external use (external applications to the skin).

Fig No.4: Pharmaceutical bulk powder.

Fig No.5: Medicinal herbal powder

2.1 Types of powders

1) Divided powder

- Simple powder
- Compound powder

2) Bulk powder

- Dusting powder
- Effervescent powder
- Dentifrices
- Douche powder

➢ **Advantages**

- They impart flexibility with regard to a wide selection of drugs.
- They are stable when compared to other dosage forms.
- They show rapid therapeutic effect.
- Ease in administration to all categories of patients.
- They are economical because they do not require special technique or chances of incompatibility are less.
- Acceptable to patients.

➢ **Disadvantages**

- Time consuming preparation
- Inconvenient to carry.
- Inaccuracy of dose in case of bulk powder.
- May block pores causing irritation.

- Possibility of contamination.

Allopathy Medicinal powder	Ayurvedic medicinal powder
	
Allopathy medicine refers to conventional or mainstream medical practices that use pharmacological or surgical interventions to treat diseases.	Ayurvedic medicine is a traditional system of medicine that originated in India. In Ayurvedic medicine, powders are often used to treat various health conditions
Uses-Nausea, vomiting, Diarrhea, rashes, itching, Swelling.	**Uses**-No side Effects it`s herbal preparation.
Application- drugs, surgery, radiation to treat diseases.	**Application**- skin & hair care, health concerns like digestion, wound healing, topical & internal remedies**.**
Drawbacks- allergies & sensitivities, Interaction with other medication, overdose or misuse, inactive ingredients, addiction.	**Drawbacks**-Dosage preparation issues, regulatory issues, potential overdose, allergic & sensitivities

➢ **Pharmacological Properties**

1. **Anti-inflammatory:** Herbal powders can exhibit anti-inflammatory activity, reducing inflammation and pain.
2. **Antimicrobial**: Herbal powders can exhibit antimicrobial activity, inhibiting the growth of microorganisms.
3. **Antioxidant:** Herbal powders can exhibit antioxidant activity, protecting against oxidative stress and cell damage.
4. **Immune system support:** Herbal powders can support the immune system, enhancing its function and response.

➢ **Therapeutic Properties**

1. **Digestive health:** Herbal powders can support digestive health, relieving symptoms of indigestion, bloating, and gas.

2. **Respiratory health:** Herbal powders can support respiratory health, relieving symptoms of coughs, colds, and bronchitis.
3. **Skin health:** Herbal powders can support skin health, relieving symptoms of acne, eczema, and dermatitis.
4. **Stress and anxiety:** Herbal powders can help reduce stress and anxiety, promoting relaxation and calmness.

➢ **Uses of Powders**

1. **Pharmaceuticals:** Powders are used in the pharmaceutical industry to make tablets, capsules, and other medications.
2. **Food industry**: Powders are used in the food industry as ingredients in recipes, such as spices, flavourings, and texture modifiers.
3. **Cosmetics:** Powders are used in the cosmetics industry to make face powders, blushes, and other makeup products.
4. **Industrial applications**: Powders are used in various industrial applications, such as in the manufacture of paints, coatings, and adhesives.

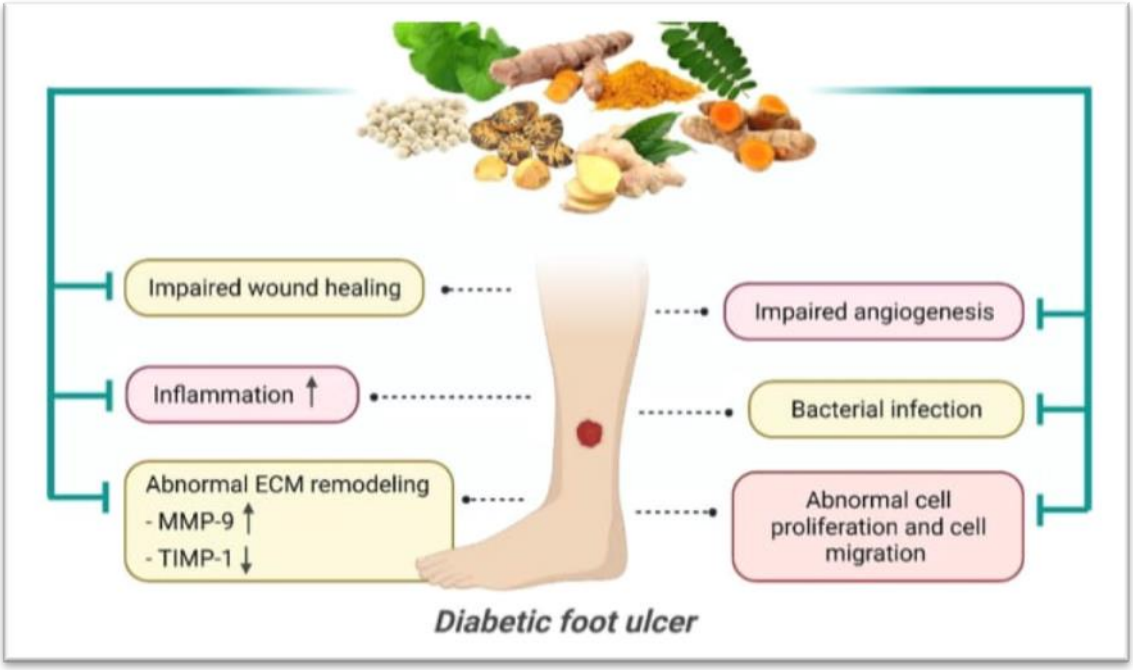

Fig No. 6: Diabetic Foot Ulcer.

Fig No 7: advantages & disadvantages of herbal powder.

- **Application on skin apply on herbal powder**

1. **Clean the wound**: Clean the wound with saline water or a mild soap solution.
2. **Pat dry**: Pat the wound dry with a clean towel.
3. **Apply powder:** Apply a thin layer of the powder mixture (*Tridax procumbens* and *Annona squamosa Linn)* to the wound.
4. **Cover with a bandage:** Cover the wound with a bandage or dressing to protect it from dust and bacteria.

- **Dosage and Duration**

1. **Dosage**: Apply a thin layer of the powder mixture (about 1-2 grams) to the wound.
2. **Duration**: Apply the powder mixture 2-3 times a day for 7-10 days or until the wound is healed.

- **Precautions**

1. **Allergic reactions**: Monitor for any allergic reactions, such as redness, itching, or swelling, and discontinue use if they occur.
2. **Infection**: If the wound becomes infected or shows signs of infection (e.g., increased redness, swelling, or pus), discontinue use and consult a healthcare professional.
3. **Pregnancy and breastfeeding**: Consult a healthcare professional before using the powder mixture during pregnancy or breastfeeding.

- **Mechanism of Action**

1. ***Tridax procumbens***: The leaves of *Tridax procumbens* contain flavonoids, alkaloids, and glycosides, which have anti-inflammatory, antimicrobial, and antioxidant properties that promote wound healing.
2. ***Annona squamosa Linn***: The seeds of *Annona squamosa Linn* contain annonacin, a compound with antimicrobial and anti-inflammatory properties that help prevent infection and promote wound healing.

3. DRUG PROFILE

***3.1 Annona Squamosa Linn*:-** *Annona squamosa* is a small, well branched tree or shrub from the family *Annonaceae* that bears edible fruits called sugar apple or sweetsops.

Fig No: 9 *Annona Squamosa.*

- **Chemical constituents:-** Squamosa seed extract are caused mainly because of phenolic compounds, alkaloids, peptides, amino acids, sterols, tannins, flavonoids, polysaccharides and tocopherols.

- **Scientific Classification**

Name: Sugar Apple, Custard Apple

Scientific Name: *Annona Squamosa*

Kingdom: Plantea

Family: *Annonaceae*

Genus: Annona

Species: *Annona Squamosa Linn*

➢ **Pharmacological Activity**

- Anti-Bacterial,
- Anti-inflammatory,
- Antioxidant,
- Antidiabetic,
- Anticancer,
- Analgesic,
- Hepatoprotective,
- Antiulcer,

➢ **Medicinal properties**

1. **Antibacterial and Antifungal**: The seeds have been shown to exhibit antibacterial and antifungal activities, making them effective against various microorganisms.
2. **Antioxidant:** *Annona squamosa* seeds possess antioxidant properties, which help protect the body against free radicals and oxidative stress.
3. **Anti-Inflammatory**: The seeds have anti-inflammatory properties, which may help reduce inflammation and alleviate conditions such as arthritis.
4. **Anticancer**: Some studies suggest that Annona squamosa seeds may have anticancer properties, although more research is needed to confirm this.
5. **Anthelmintic**: The seeds have been traditionally used to treat parasitic worm infections, such as tapeworms and roundworms.
6. **Insecticidal**: *Annona squamosa* seeds have been shown to possess insecticidal properties, making them effective against various insect pests.

➢ **Traditional Uses**

1. **Digestive Issues**: The seeds have been used to treat digestive issues such as diarrhea, dysentery, and indigestion.
2. **Respiratory Problem**s: *Annona squamosa* seeds have been used to treat respiratory problems such as coughs, colds, and bronchitis.
3. **Skin Conditions**: The seeds have been used to treat skin conditions such as eczema, acne, and dermatitis.

➢ **Precautions**

1. **Toxicity**: *Annona squamosa* seeds contain a toxic compound called annonacin, which can be toxic in large quantities.
2. **Pregnancy and Breastfeeding**: The seeds should be used with caution during pregnancy and breastfeeding, as they may stimulate the uterus and affect milk production.
3. **Interactions**: *Annona squamosa* seeds may interact with certain medications, such as blood thinners and diabetes medications.

➢ ***Annona Squamosa* Seeds Benefits**

1. **Antibacterial and Antifungal:** *Annona squamosa* seeds have been shown to exhibit antibacterial and antifungal properties, making them effective against various microorganisms.
2. **Antioxidant:** The seeds possess antioxidant properties, which help protect the body against free radicals and oxidative stress.
3. **Anti-Inflammatory***: Annona squamosa* seeds have anti-inflammatory properties, which may help reduce inflammation and alleviate conditions such as arthritis.
4. **Anticancer**: Some studies suggest that *Annona squamosa* seeds may have anticancer properties, although more research is needed to confirm this.
5. **Insecticidal**: The seeds have been shown to possess insecticidal properties, making them effective against various insect pests.
6. **Digestive Health:** *Annona squamosa* seeds have been traditionally used to treat digestive issues such as diarrhea, dysentery, and indigestion.

➢ **Cultivation of Annona squamosa seed**

prepare well-draining soil, scarify the seeds, soak them in warm water, sow them in individual pots, keep the soil moist, and provide warmth and indirect sunlight for germination, which typically takes 2-8 weeks.

***3.2 TRIDAX PROCUMBENS*:-**It is a widely spread hispid, procnnial in nature with proumbents herb usually found as a weed. It is perennial in nature with flowering-fruiting throughout the year the scientific name is *Tridax procumbens* the generic name is derived from the Greek, meaning summer eating, implying that it was a summer vegetable.

Fig No: 10 *Tridax procumbens.*

- **Chemical constituents:-**Alkaloids, glycosides, flavonoids, terpenoid, steroids, carotenoids, fatty acids, phenolic acid, saponins, tannis, mineral.
- **Scientific Classification**

Name:-*Tridax procumbens*

Common name:-Jayanti Veda

Kingdom:- plantae

Family:-*Asteraceae*

Class:-Magnoliopsida-dicotyledons

Sub-class:- Asteriidae

Genus:-Tridax

Species:-procumbens.

- **Pharmacological Activity**

- Anti-microbial.
- Anti-Fungal.
- Anti-Inflammatory
- Anti-septic
- Wound healing
- Anti-diabetic
- Anti-cancer

- Anti-tumour
- Anti-arthritic.

➢ **Medicinal properties**

1. **Anti-inflammatory**: *Tridax procumbens* leaves have been shown to possess anti-inflammatory properties, which can help reduce inflammation and alleviate conditions such as arthritis.
2. **Antimicrobial**: The leaves have been found to exhibit antimicrobial activity against various microorganisms, including bacteria, fungi, and viruses.
3. **Antioxidant**: *Tridax procumbens* leaves possess antioxidant properties, which can help protect the body against free radicals and oxidative stress.
4. **Wound healing**: The leaves have been traditionally used to treat wounds, cuts, and abrasions due to their wound-healing properties.
5. **Antipyretic**: *Tridax procumbens* leaves have been found to possess antipyretic properties, which can help reduce fever.
6. **Analgesic**: The leaves have been traditionally used to treat pain and inflammation due to their analgesic properties.
7. **Antidiabetic**: *Tridax procumbens* leaves have been found to possess antidiabetic properties, which can help regulate blood sugar levels.

➢ **Traditional uses**

1. **Skin conditions**: *Tridax procumbens* leaves have been traditionally used to treat skin conditions such as eczema, acne, and dermatitis.
2. **Respiratory problems**: The leaves have been used to treat respiratory problems such as bronchitis, asthma, and coughs.
3. **Digestive issues**: *Tridax procumbens* leaves have been traditionally used to treat digestive issues such as diarrhea, dysentery, and indigestion.

➢ **Precautions**

1. **Allergic reactions**: Some people may be allergic to Tridax procumbens leaves, which can cause allergic reactions such as skin rashes and itching.
2. **Pregnancy and breastfeeding**: The leaves should be used with caution during pregnancy and breastfeeding, as they may stimulate the uterus and affect milk production.

3. **Interactions**: Tridax procumbens leaves may interact with certain medications, such as blood thinners and diabetes medications

➢ ***Tridax procumbens* leaves benefits**

1. **Anti-Inflammatory:** *Tridax procumbens* leaves have anti-inflammatory properties, which may help reduce inflammation and alleviate conditions such as arthritis.
2. **Antimicrobial:** The leaves possess antimicrobial properties, which help protect the body against various microorganisms.
3. **Antioxidant:** *Tridax procumbens* leaves have antioxidant properties, which help protect the body against free radicals and oxidative stress.
4. **Wound Healing:** The leaves have been traditionally used to treat wounds, cuts, and abrasions due to their wound-healing properties.
5. **Skin Conditions:** *Tridax procumbens* leaves have been used to treat skin conditions such as eczema, acne, and dermatitis.
6. **Respiratory Health:** The leaves have been traditionally used to treat respiratory problems such as bronchitis, asthma, and coughs.

➢ **Cultivation of Annona squamosa seed**

choose a sunny location with well-draining soil, and ensure the soil dries out between waterings to prevent root rot.

4. MATERIALS AND METHODS

➢ **Materials**

1. *Tridax procumbens* Leaves powder
2. *Annona Squamosa* seed powder

➢ **Apparatus**

1. Weighing balance
2. pH meter
3. Hot air oven
4. Measuring Cylinder
5. Sieve
6. China dish
7. Test tube
8. Beaker

➢ **Preparation method of powder**

- **The process typically involves the following steps**

1. **Collection & cleaning:-** collection fresh leaves or seeds of *Tridax procumbens* and *Annona squamosa*. Wash thoroughly under running water to remove dirt and microorganism. Air-dry for a few minutes to remove surface moisture.
2. **Drying process:-**spread the plants parts in a well- ventilated, dust- free area away from direct sunlight to retain active compounds.
3. **Grinding into powder:-**Once dried, use a mortal and pestle, blender or grinder to crush the dried plants parts into a fine powder. Sieve the powder to obtain a uniform particle size.
4. **Storage**:-Store the powdered *Tridax procumbens* and *Annona squamosa* in airtight plastic containers. Keep in a cool, dry place away from direct sunlight and moisture. label the containers with the date of preparation to tract freshness.

Fresh plant material (seed, leaves).

Dried plant Material.

Plant powder.

Herbal dry powder.

Fig No. 11: Preparation of herbal dry powder.

5. PREFORMULATION STUDY

1. Bulk density
2. Tapped density
3. Porosity
4. Carr's index
5. Hausner's ratio
6. Angle of repose
7. % Ash Value
8. Solubility

1) Bulk density

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the inter-particulate void volume.

FORMULA

$$\text{BULK DENSITY} = \frac{\text{MASS}}{\text{BULK VOLUME}}$$

2) Tapped density

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample.

FORMULA

$$\text{TAPPED DENSITY} = \frac{\text{MASS}}{\text{TAPPED VOLUME}}$$

3) Porosity

Porosity or void fraction is a measure of the void (i.e., "empty") spaces in a material, and is a fraction of the volume of voids over the total volume, between 0 and 1, or as a percentage between 0% and 100%.

FORMULA

$$\text{POROSITY} = (\text{VOLUME OF VOIDS})/(\text{TOTAL VOLUME}) \times 100$$

4) Carr's index

Carr's Index of any solid is calculated for compressibility of a powder which is based on true density and bulk density.

FORMULA

$$\text{CARR'S INDEX} = \frac{\text{TAPPED DENSITY} - \text{BULK DENSITY}}{\text{TAPPED DENSITY}} \times 100$$

5) Hausner's ratio

Hausner ratio is defined as the ratio of a powder's tapped bulk density to its poured (loose) bulk density.

FORMULA

$$\text{HAUSNER'S RATIO} = \frac{\text{TAPPED DENSITY}}{\text{BULK DENSITY}}$$

6) Angle of repose

Angle of repose powder poured from a vessel forms a cone-like pile. The angle of repose- the angle between the slope of the pile and the horizontal correlates with the strength of particle-particle interactions and, therefore, is measured to infer flow ability.

FORMULA

$$\emptyset = \tan^{-1}(h/r)$$

Where,

- h : the height in cm
- r : the radius in cm
- Ø: the angle of repose

7) % Ash value

The ash values usually represent the inorganic residues such as phosphates, carbonates and silicates present in herbal drugs.

FORMULA

$$\%\,\text{ASH} = \frac{W2-WO}{W1} \times 100$$

- W2: weight of crucible + ash
- WO: weight of crucible
- W1: weight of sample

8) Solubility

Solubility is the ability of a solid, liquid, or gaseous chemical substance (referred to as the solute) to dissolve in solvent (usually a liquid) and form a solution. We are going to check solubility of our sample in water, acidic and alkaline solution.

6. EVALUATION PARAMETER

1. Colour
2. Texture
3. Odour
4. PH
5. Irritation test
6. Moisture content

1) Physical Appearance

The physical appearance tests help ensure the herbal powder meets required standard for quality, safety and efficacy.

2) Colour Test

The evaluate the colour of the herbal powder. Compare the colour of the powder with a standard colour reference or a previously approved batch.

3) Odour Test

To evaluate the odour of herbal powder. Smell the powder and compare it with a standard reference or previously approved batch.

4) Texture Test

To evaluate the texture of the herbal powder, Observe the texture by pouring The powder onto a surface or by feeling it with the figure.

5) pH Test

To evaluate the pH of the herbal powder. Measure the pH using a pH meter. The pH meter should be within the specified range (Typically 4.5-6.5)

6) Moisture Contents

To evaluate the moisture content of powder, the loss in weight (%) after oven drying at 102 until constant weight is obtained.

$$MC = \frac{\text{Total weight}}{\text{Dry weight}}$$

7. RESULT AND DISCUSSION

A. Procurement:- A *Tridax procumbens* leaves & *Annona squamosa* seed has been collected from Loha, Dist – Nanded.

B. Authentification:-The sample was Authentified by Dr. Marathe, HOD(Botany dept.) of NES Science college, Nanded.

Fig No: 12 Batches of powder.

❖ **PRE-FORMULATION TABLE**

A. ***Tridax procumbens***

Table No. 1

BATCH	A (Sieve no. 46)	B (Sieve no. 60)	C (sieve no. 80)	D (sieve no. 100)
1.Bulk Density	0.28g/ml	0.33g/ml	**0.31g/ml**	0.25g/ml
2.Tapped Density	0.33g/ml	0.35g/ml	**0.34g/ml**	0.32g/ml
3.Carr`s Index	17.85%	5.71%	**8.82%**	21.87%
4.Hausener`s ratio	1.17	1.06	**1.09**	1.28
5.Angle of repose	5º 37 `	9º 53`	**2º 53`**	10º 56`
% Ash Value	15%	15%	**15%**	15%

In this pre-formulation study of Tridax procumbens sample we observed that, the **Batch C (sieve # 80)** has good flow property and other parameter then can be utilized have final preparation of powder.

B. ***Annona squamosa***

Table No. 2

BATCH	A (Sieve no. 46)	B (Sieve no. 60)	C (sieve no. 80)	D (sieve no. 100)
1.Bulk Density	0.33g/ml	**0.31g/ml**	0.28g/ml	0.28g/ml
2.Tapped Density	0.28g/ml	**0.35g/ml**	0.32g/ml	0.35g/ml
3.Carr`s Index	13.15%	**11.42%**	12.5%	20%
4.Hausener`s ratio	1.15	**1.12**	1.14	1.25
5.Angle of repose	10º 74`	**5 º 37`**	12 º 82`	9 º 92`
6.%Ash value	12%	**12%**	12%	12%

In this pre-formulation study of Annona squamosa sample we observed that, the **Batch B**

(sieve # 60) has good flow property and other parameter then can be utilized have final preparation of powder.

❖ SOLUBILITY

A. *Tridax procumbens*:

Table No. 3 Solubility of *Tridax procumbens* powder.

BATCH	Solubility in water	Solubility in NaOH(0.1N)	Solubility in Ethanol
A	Insoluble	Soluble	Freely soluble
B	Insoluble	Freely soluble	Freely soluble
C	**Soluble**	**Freely soluble**	**Very soluble**
D	Soluble	Extremely soluble	Extremely soluble

In this study of tridax procumbens sample we observed that Batch C sample was Soluble in water, 0.1N NaOH, Ethanol, while other batches are Insoluble or Poorly soluble.

B. *Annona Squamosa*

Table No. 4 Solubility of *Annona squamosa* powder.

BATCH	Solubility in water	Solubility in NaOH(0.1N)	Solubility in Ethanol
A	Soluble	Slightly soluble	Slightly soluble
B	**Insoluble**	**Soluble**	**Slightly soluble**
C	Insoluble	Soluble	Slightly soluble
D	Insoluble	Freely soluble	Soluble

In this study of Annona squamosa sample we observed that Batch B sample was Soluble in water, 0.1N NaOH, Ethanol, while other batches are Insoluble or Poorly soluble.

❖ FORMULATION TABLE

Table No. 5: formulation of powder.

INGREDIENTS	F1	F2	F3	F4
***Annona Squamosa* Seed powder(API)**	**2.3 gm**	2.1 gm	2 gm	1.9 gm
***Tridax Procumbens* leaves powder(API)**	**2.3 gm**	2.5 gm	2.6 gm	2.7 gm
TOTAL	**4.6 gm**	4.6 gm	4.6 gm	4.6 gm

We have prepared all batches having 4.6 gm wt. and concentration were changed to prepare F1, F2, F3, F4 batches.

Fig No. 13: formulation Batches of Powder.

❖ ORGANOLEPTIC CHARACTER

Table No. 6: Organoleptic Characteristic of powder.

Parameter	Observation
Colour	Green
Odour	pleasant
Texture	smooth
Irritation	Non irritation

Fig No. 14: pH Test of powder.

❖ EVALUATION TABLE

Table No. 7 evaluation of powder.

Test	F1	F2	F3	F4
Irritation test	**Non irritation**	Non irritation	Non irritation	Non irritation
Phytochemical analysis	**Pass**	pass	pass	pass
Moisture contents	**5.90%**	8.32%	10.74%	9.57%
pH Test	**6.5**	7.0	5.5	5.5

From above Evaluation Study we observed that Batch F1 Qualified all the evaluation test.

8. CONCLUSION

From Current research work, we come to know that, *the Tridax procumbens* and *Annona squamosa linn* can be converted to herbal powder & having good organoleptic properties. We also Find out from the initial powder batch B & C (Sieve # 60, 80) has good flow property, bulk density, tapped density, car's index, Hausner's ratio, angle of repose, % ash value was performed. After that, we have used this batch B & C (Sieve # 60, 80) for final preparation. then, we come to the conclusion that, qualify all the evaluation test like, pH test, moisture contents, stability etc.

This herbal dry powder to treat the diseases are follow

- Bronchinal catarrh
- Diarrhea
- Dysentery
- Wound healing
- Epilepsy
- Dysentery
- Heart problems
- Diabetic ulcer
- Anti-inflammatory
- Anti-helmintis

Fig No. 15: Herbal dry powder.

9. REFERENCE

1. Rodhes, M (editor), Principles of powder technology, John Wiley & Sons, 1997; ISBN 0-471-92422-9.
2. Fayed, M. E., Otten L. (editor), Handbook of powder science & technology, second edition, Chapman & Hall, ISBN 0-412-99621-9.
3. Bagnold, R.A., Physics of Blown Sand and Desert Dunes, First Springer edition, 1971; ISBN 0-412-10270-6.
4. K. Paez, M. Gregg, C. T. Massion, B. Macy, Promoting excellence in symptom man-agement case series: case study: a new intervention for rapid end-of-life symptom control in the home setting, J. Hosp. Palliat. Nurs. 18 (2016) 498–504.N. M. Latuga, M. Gordon, P. Farwell, M.O. Farrell, A cost and quality analysis of uti-lizing a rectal catheter for medication administration in end-of-life symptom man-agement, J. Pain Palliat. Care Pharmacother., 2018; 32: 63–70.
5. J. K. Lam, Y. Xu, A. Worsley, I.C. Wong, Oral transmucosal drug delivery for pediatric use, Adv. Drug Deliv. Rev., 2014; 73: 50–62. S. Senel, M. J. Rathbone, M. Cansiz, I. Pather, Recent developments in buccal and sublingual delivery systems, Expert Opin. Drug Deliv., 2012; 9: 615–628.
6. M. Darwish, K. Tempero, M. Kirby, J. Thompson, Pharmacokinetics and dose pro-portionality of fentanyl effervescent buccal tablets in healthy volunteers, Clin. Pharmacokinet, 2005; 44: 1279–1286.
7. N. Salamat-Miller, M. Chittchang, T. P. Johnston, The use of mucoadhesive polymers in buccal drug delivery, Adv. Drug Deliv. Rev., 2005; 57: 1666–1691.
8. F. Laffleur, Mucoadhesive polymers for buccal drug delivery, Drug Dev. Ind. Pharm., 2014; 40: 591–598.
9. P. J. Hoskin, G. W. Hanks, G. W. Aherne, D. Chapman, P. Littleton, J. Filshie, The bio-availability and pharmacokinetics of morphine after intravenous, oral and buccal administration in healthy volunteers, Br. J. Clin. Pharmacol., 1989; 27: 499–505.
10. E. Beyssac, F. Touaref, M. Meyer, L. Jacob, P. Sandouk, J.M. Aiache, Bioavailability of morphine after administration of a new bioadhesive buccal tablet, Biopharm. Drug Dispos., 1998; 19: 401–405.
11. K. Mystakidou, E. Katsouda, E. Parpa, M. L. Tsiatas, L. Vlahos, Oral transmucosal fen-tanyl citrate for the treatment of breakthrough pain in cancer patients: an over-view of its pharmacological and clinical characteristics, Am. J. Hosp. Palliat. Med., 2005; 22: 228–232.

12. G. Walker, A. Wilcock, C. Manderson, R. Weller, V. Crosby, The acceptability of different routes of administration of analgesia for breakthrough pain, Palliat. Med., 2003; 17: 219–221.
13. S. Lindert, J. Breitkreutz, Oromucosal multilayer films for tailor-made, controlled drug delivery, Expert Opin. Drug Deliv., 2017; 14: 1265–1279.
14. N. Vasisht, L.N. Gever, I. Tagarro, A.L. Finn, Single-dose pharmacokinetics of fenta-nyl buccal soluble film, Pain Med., 2010; 11: 1017–1023.
15. A. Wanasathop, S.K. Li, Iontophoretic drug delivery in the oral cavity, Pharmaceutics, 2018; 10.
16. L. H. Goldstein, M. Berlin, M. Berkovitch, E. Kozer, Effectiveness of oral vs rectal acetaminophen: a meta-analysis, Arch. Pediatr. Adolesc. Med., 2008; 162: 1042–1046.
17. G. Kowalski, W. Leppert, M. Adamski, D. Szkutnik-Fiedler, E. Baczyk, M. Domagalska, A. Bienert, K. Wieczorowska-Tobis, Rectal enema of bupivacaine in cancer patients with tenesmus pain - case series, J. Pain Res., 2019; 12: 1847–1854. S. H. F. Lam, D. R. Li, C. E. Hong, G. M. Vilke, Systematic review: rectal administration of medications for pediatric procedural sedation, J. Emerg. Med., 2018; 55: 51–63.
18. S. Hua, Physiological and pharmaceutical considerations for rectal drug formula-tions, Front. Pharmacol., 2019; 10: 1196.
19. R. Nunes, B. Sarmento, J. das Neves, Formulation and delivery of anti-HIV rectal microbicides: advances and challenges, J. Control. Release, 2014; 194: 278–294.
20. R. D. Pullan, G.A.O. Thomas, M. Rhodes, R.G. Newcombe, G.T. Williams, A. Allen, J. Rhodes, Thickness of adherent mucus gel on colonic mucosa in humans and its rel-evance to colitis, Gut., 1994; 35: 353–359.
21. T. J. Purohit, S. M. Hanning, Z. Wu, Advances in rectal drug delivery systems, Pharm. Dev. Technol., 2018; 23: 942–952.
22. A. G. De Boer, L.G. De Leede, D.D. Breimer, Drug absorption by sublingual and rectal routes, Br. J. Anaesth., 1984; 56: 69–82.
23. S. Inthavilay, T. Franchard, M. Yang, E. A. Ashley, H. Barennes, Knowledge and acceptability of the rectal treatment route in Laos and its application for pre-referral emergency malaria treatment, Malar. J., 2010; 9: 342.
24. Y. W. Lam, A. Lam, B. Macy, Pharmacokinetics of phenobarbital in microenema via Macy catheter versus suppository, J. Pain Symptom Manag., 2016; 51: 994–1001.
25. D. E. Warren, Practical use of rectal medications in palliative care, J. Pain Symptom Manag., 1996; 11: 378–387.

26. A. S. Ham, R.W.J. Buckheit, Designing and developing suppository formulations for anti-HIV drug delivery, Ther. Deliv., 2017; 8: 805–817.
27. K. M. C. Macygin, E. Kulstad, R. K. Mokszycki, M. Goldsmith, Evaluation of the Macy catheter(R): a rectal catheter for rapid medication and fluid administration, Expert. Rev. Med. Dev., 2018; 15: 407–414.
28. I. Garcia-Lopez, M. Cuervas-Mons Vendrell, I. Martin Romero, I. de Noriega, J. Benedi Gonzalez, R. Martino-Alba, Off-label and unlicensed drugs in pediatric pal- liative care: a prospective observational study, J. Pain Symptom Manag., 2020; 60: 923–932.
29. C. O'Dell, S. Shinnar, K. R. Ballaban-Gil, M. Hornick, M. Sigalova, H. Kang, S. L. Moshe, Rectal diazepam gel in the home management of seizures in children, Pediatr. Neurol., 2005; 33: 166–172.
30. T. Fakhoury, A. Chumley, M. Bensalem-Owen, Effectiveness of diazepam rectal gel in adults with acute repetitive seizures and prolonged seizures: a single-center experience, Epilepsy Behav., 2007; 11: 357–360.
31. N. S. Barakat, In vitro and in vivo characteristics of a thermogelling rectal delivery system of etodolac, AAPS PharmSciTech., 2009; 10: 724–731.
32. M. A. Akl, H.R. Ismael, F.I. Abd Allah, A. A. Kassem, A.M. Samy, Tolmetin sodium-loaded thermosensitive mucoadhesive liquid suppositories for rectal delivery; strategy to overcome oral delivery drawbacks, Drug Dev. Ind. Pharm., 2019; 45: 252–264.