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TO FORMULATE AND EVALUATE HERBAL TABLETS CONTAINING ACACIA ARABICA AND MORINGA FOR RHEUMATOID ARTHRITIS

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ABSTRACT
Arthritis is a chronic condition that affects nearly a quarter of the globe's population. Osteoarthritis (OA) and rheumatoid arthritis (RA) Are two major forms of arthritis associated with severe joint pain and Reduced quality of life. Various pharmacological interventions may be utilized for arthritis treatment when non-pharmacological therapy is insufficient. However, pharmacological therapy can be associated with serious side effects and high costs. Therefore, alternative therapies have been under investigation. Herbal medications have shown the potential for safe and effective management of arthritis. For this research, we attempt to summarize the mechanisms, safety, and efficacy of herbal treatments for OA and RA. After searching electronic databases, we identified nine herbs used for the treatment of OA or RA patients. Improvement of OA and RA symptoms, pain, and inflammation was demonstrated. The herbs exhibited strong anti-inflammatory and antioxidant activities, contributing to a reduction in inflammation and tissue damage. Several herbs elucidated new mechanisms for OA and RA treatment as well. Though these herbs have shown promise for OA and RA treatment, more studies and clinical trials are required for determining safety and efficacy, bioactivity, and optimal bioavailability.

KEYWORDS: Rheumatoid Arthritis, Herbal formulation, Acacia Arabica, Moringa Oliefera, Herbal tablet.

1. INTRODUCTION

Arthritis is a common health issue that affects millions of people in the world. Patients suffering from arthritis struggle with severe joint pain and nearly half of all adults with arthritis experience persistent pain. More than 100 types of arthritis have been identified. Two of the most common types are osteoarthritis and rheumatoid arthritis. Both osteoarthritis and rheumatoid arthritis impair joint structure and function but differ in symptoms, pathophysiology, and treatment.[1,2]

Osteoarthritis (OA), alternatively termed degenerative joint disease, Stands as the most prevalent form of arthritis. This condition results from a combination of biomechanical stresses and inflammatory Processes influenced by various factors such as mechanical strain, Oxidative stress, injury, age, obesity, and metabolic disorders.[3] OA Manifests through the degeneration of joint cartilage, alterations in underlying bone structures, and inflammation of the synovial lining.[4]

Rheumatoid arthritis (RA) is a systemic disorder characterized by immune dysfunction and inflammation, impacting multiple joints concurrently. Risk factors for RA development include female gender, genetic predisposition, and smoking.[5] RA can be categorized into seropositive or seronegative forms based on the presence or absence of certain antibodies. Seronegative RA patients typically exhibit more pronounced inflammation at diagnosis, while seropositive individuals tend to experience increased inflammation and joint damage as the disease progresses.[6] In severe cases or those with seropositive RA, extra-articular manifestations may arise. The presence of anticitrullinated protein antibody (ACPA) perpetuates inflammation and correlates with bone erosion and pain. The chronic inflammatory process associated with RA ultimately culminates in irreversible joint deformities.[7]

1.1 Herbal formulation

We are using combination of herbal drugs which are Acacia Arabica (Babool) and Moringa oleifera (Moringa).

1.1.1 Plant acacia Arabica

Acacia is the most significant genus of family: Fabaceae. Acacia species are commonly known as 'Babool and Kikar' in India and ethnomedicinally have long been used for the treatment of rheumatoid arthritis.[8]

Synonyms: Acacia nilotica (Lam), Acacia scorpiodes, Mimosa arabica, Mimosa nilotica.[9]

Chemical constituents: The root, leaves, pods, and bark of Acacia hold the uppermost quantity of tannin and phenolic compounds, such as gallic acid, dicatechin, quercetin, robidandiol, β-amyrin, hentriacontane, betulin, sitosterol, kaempferol-3 chlorogenic acid, and glucoside isoquercetin.[10]

1.1.2 Plant moringa oleifera

Moringa is a member of the family Moringaceae. These plants are highly Valuable for their therapeutic properties in addition to their high nutritional content.[11] These plants have a variety of parts, including leaves, roots, seeds, fruit, bark, flowers, and Immature pods. They also have anticancer, antipyretic, anti-inflammatory, anti-ulcer, Antispasmodic, diuretic, and antihypertensive properties. It has been observed that moringa Oleifera has analgesic, antioxidant, anti-inflammatory, anti-cancer, and antibacterial Properties.[12]

Synonym: Sohanjana, Drumstick tree.

Chemical constiuents: Vitamins, carotenoids, polyphenols, phenolic acid, flavonoids, alkaloids, glucosinolates, isothiocyanates, tannins, and saponins.[13]

1.2 Advantages of herbal tablet

- Lower risk of side effect.
- More effectiveness.
- Lower cost.
- Wide spread availability.
- Longer duration of treatment.[14]

1 Materials and Their method of extraction

1. Acacia arabica

1.1 Part of plant used for formulation

Babul Pods and Seeds-. Babul pods have a 12% CP and a 55% TDN content. 56.50% RDP and 43.50% RUP, or bypass protein, are present in the pod (Feedstuffs, 2005). It is similar to cottonseed meal in terms of bypass protein and is very advantageous for dairy cows with large yields. A modest source of energy are babul seeds (TDN 59%). Babul seed chuni has a content of 55% TDN and 16% CP.[15]

Fig. Babul pods (Babul phali).

1.2 Preparation of Acacia Arabica powder (Babul phali powder)

- Collect the dried babul pods from babul tree.
- Wash the babul pods thoroughly under running water to remove any dirt or debris.
- Pat the pods dry using clean towel or paper towel.
- Cut the pods into small pieces and do not remove seeds from them.
- Using a clean and dry grinder grind the dried pods and seeds- into fine powder. You may need to grind it in batches if you have a large quantity.
- Sieve the powder using fine mesh sieve.
- Transfer the powder to an airtight container.
- Store the container in cool and dry place.

Fig: Babul phali powder.

2. Moringa

2.1 Part of plant used for formulation

Moringa leaves and seeds-The entire plant, including the leaves and seeds of the moringa tree, is used to cure rheumatism, ascites, poisonous stings, and painful swellings. Anti-inflammatory properties can be favorably enhanced by moringa leaves and seed oil. Additionally, there are notable anti-inflammatory and anti-arthritic properties of M. peregrina oil.[16, 17]

Fig: Moringa Pods and Seeds.

2.2 Preperation of moringa powder

- Harvest fresh moringa leaves from a tree that is at least six months old.
- Wash the leaves thoroughly with clean water to remove any dirt or debris.
- Spread the leaves out on clean cloth or paper towel and allow them to air dry completely. This can take several days depending on the humidity levels in your area.
- Once the leaves are completely dry, remove the stem and any tough parts of the leaves Grind the leaves into a fine powder using a morter and pestle or a food processor.
- You can also use a coffee grinder or blender, but make sure to grind the leaves in small batches to avoid overheating the machine.
- Store the moringa leaf powder in an airtight container in a cool, dry place away from direct sunlight.

Fig: Moringa powder.

3. Experimental work

3.1 Collection and Cultivation

The whole plant of Acacia Arabica and Moringa oliefera was collected from local place of Maharashtra. The fresh leaves and pods of moringa oliefera and acacia arabica was collected from village Phulambri. For tablet preparation the leaves and pods of both plants were properly wash, dried. Drying process done without sun rays to avoid removal of phytochemical of plant.

3.2 Materials used

The material used in formulation of the 250mg herbal tablet are given below.

Table 1: Materials used.

Sr. no.	Materials used	Roles	Quantity taken [for 250mg]	Sources
1	Babul phalli powder	API, antiarthritic drug	85mg	Botonical garden of pathri
2	Moringa powder	API, antiarthritic drug	85mg	Botonical garden of pathri
3	Methyl cellulose	Disintigration agent	45mg	Oxford laboratory.
4	Mag.strearate	Lubricant antiaderant	10mg	Research lab fine chem industries Mumbai.

5	Talc	Lubricant	10mg	Oxford laboratory.
6	Lactose	Diluent	15mg	Research lab fine chem industries Mumbai.
7	HPMC-10	Binder	Q.S	Research lab fine chem industries Mumbai.
8	Sodium aliginate	Binder	Q.S	Research lab fine chem industries Mumbai.

3.3 Preperation of granules

- The wet granulation process was used to create the granules.
- By taking the proper amounts of HPMC-10 and sodium alginate and dissolving them in distilled water, the solutions were made.
- The drug powders i.e. babul phali and moringa powders—were put into a mortar along with the proper quantity of talc, lactose, and magnesium stearate
- To make dough, the solution was added to the mixture and thoroughly combined.
- Then dough was passed through sieve number 22, which has a 710 µm mesh. Granules were then dried in a hot air oven
- Granules were sized after drying by passing them through sieve number 20 then evaluate prepared granules.[18]

3.4 Evaluation of powder blend

1. Bulk density

By measuring the volume (V) and weight (M) of the pre-sieve blend in a graduated cylinder, the apparent bulk density (ρb) of the powder blend was determined. Bulk density was calculated by using given equation:

ρb=M/V

2. Tapped density

Pouring the accurately measured amount of powder blend into the graduating cylinder and measuring the volume (V) allowed for the determination of tapped density. After that, the graduated cylinder's lid was closed, and it was tapped with a bulk density apparatus until the cylinder's volume remained constant. The tapped density was calculated by using given equation.

ρt= M/V

3. Angle of repose

The fixed funnel method was utilized to calculate the angle of repose. The tip of the funnel was keeping at a specific height (h) above a graph paper that was placed on a left horizontal surface, with the funnel set perpendicular to the axis of symmetry. After pouring the powder blend down the funnel, the ideal cone height (h) of the powder blend was achieved. The diameter (2r) of the base of the powder cone was determined and the tangent of the angle of Repose was calculated by given equation:

Ɵ= tan -1 (h/r)

4. Compressibility Index (Carr's index)

The poured and tapped density values of a material can be used to calculate the compressibility index, also known as Carr's index. It is theoretically possible to state that a material is more flowable the less compressible it is. It can be determined by substituting the values of poured density and tapped density in the equation given below:

C= (ρt – ρb)/t × 100

Where, ρt is tapped density and ρb is untapped density.

5. Hausner's ratio

Hausner's ratio is an index of powder flow and was measured by the ratio of tapped density to the bulk density.

Hausner's ratio= ρt / ρb

Where, ρt is tapped density and ρb is untapped density.

3.5 Preperation of tablet from granules

- Tablets were formulated as per the formulation is given in table no.1.Each tablet was of 250mg of the drugs and rest excipients.
- The granules were mixed in appropriate quantities of magnesium stearate (as a lubricant & antiadherent) as given in Table no.1.
- These were then compressed into tablets by using Tablet punching machine. Three batches of tablets were obtained and subjected to evaluation.

4. Evaluation of prepared tablets

Prepared tablets were evaluated on the basis of following parameters

1. Thickness

Using vernier calipers, ten tablets at random from each batch can be used to determine thickness. Every reading was made three times.[19]

2. Hardness

Using a Monsanto Hardness Tester, ten tablets at random from each batch can be used to determine hardness. About 3-5 kg/cm2 of hardness is considered as appropriate for uncoated tablets.[20]

3. Friability

A Roche Friabilator was used to test the sample's friability. For four minutes, ten pre-weighed tablets were rotated at 25 rpm. After dusting, the tablets were weighed again. Friability is usually defined as the weight of the tablet decreasing in the container as a result of the surface's tiny particles being removed.[21]

4. Weight variation

Ten tablets were randomly selected from each batch, individually weight; the average weight and percentage deviation from the average were calculated. It is done in order to ensure uniformity in the weight of tablets in a batch.[22]

5. Disintegration time

Disintegration was identified using a USP basket-style apparatus. To examine One tablet was inserted into each of the six basket tubes, covering the tablets with a plastic disk, and the rack holding the tablets was placed in a one-liter beaker of water to allow for disintegration. The water's temperature was constantly kept at 37±20 C. The oscillation was applied to tablets at a frequency of 28–32 cycles per minute. After fifteen minutes, take the basket out of the liquid and check the tablets. When every tablet dissolves after 15 minutes, the test is considered successful. If one or two of the tablets do not dissolve, try the test again with 12 more tablets. The tablets pass the test if not less than 16 of the totals of 18 tablets has disintegrated.[23]

5. RESULT AND DISCUSION

The herbal tablet containing acacia Arabica and moringa powder was prepared and evaluated. The formulation was prepared by wet granulation method were tested for pre-formulation studies for the effective evaluation of tablets. All The evaluated pre-formulation parameters are shown in table 2. Based on the pre-formulation study the flow property of granules was good. The physical parameters of compressed tablets were shown in table 3. The weight variation test, hardness, thickness, friability and disintegration time were shown in table 3.

Table 2: Preformulation parameters for herbal tablet.

Sr. no.	Pre-formulation parameters	Result
1	Bulk density	0.28gm/cm^2
2	Tapped density	0.34gm/cm^2
3	Angle of repose	26.74
4	Carr's index	12.12%
5	Hausner's ratio	1.14

Table 3: physical parameters for herbal tablet.

Sr. no.	Parametes	Result
1	Thickness	1.23 cm
2	Hardness	3.20kg/cm^2
3	Friability	1.03%
4	Weight variation	249.76mg
5	Disintegration time	29min

Table 4: Organoleptic characteristics of herbal tablet.

Sr. no.	Organoleptic characteristics	Observation
1	Colour	Yellowish green
2	Odour	Characteristic
3	Taste	Bitter
4	Appearance	Rough surface

6. CONCLUSION

Herbal products may contain a single herb or combination of several different herbs believed to have complementary/Synergistic effects. Some herbal products, including many traditional medicine formulations, also include animal products and minerals. The acacia pods and moringa powder was used for treatment of joint pain.

Therefore, in the present study, efforts have been made to develop Herbal tablet of Acacia Arabica pods and moringa leaf powder by wet granulation Technique. Acacia arabica and moringa was a traditional medicinal plant which having various medicinal activities but present research was focused on arthritis, analgesic and anti-inflammatory activity. The powder of moringa leaves and acacia pods was used to formulate tablets. Wet granulation was done by using different binders. Preformulation study was carried out and gives good flow properties of prepared granules. The compression of prepared tablets, were evaluated and gives satisfactory results. Based on the results it is concluded that the he formulation and evaluation are good. The pharmacological evaluation is required for the treatment of Arthritis.

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