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Development of Herbal Formulation for Lactation using Alternanthera Sessile

CATHRIEN JOSEPH*

UG Scholar, Vivekananda Pharmacy College for Women
Sankagiri - 637303 Tamilnadu, India
cathrienjoseph075@gmail.com

DEETSHIKA ASHOKKUMAR

UG Scholar, Vivekananda Pharmacy College for Women
Sankagiri - 637303 Tamilnadu, India
deetshukumar200299@gmail.com

VARSHINI ARTHANARIESWARAN

UG Scholar, Vivekananda Pharmacy College for Women
Sankagiri - 637303 Tamilnadu, India
varshini26401@gmail.com

MATHUMITHA VENKATESAN

UG Scholar, Vivekananda Pharmacy College for Women
Sankagiri - 637303 Tamilnadu, India
madhuvenkatesan22@gmail.com

SOWMIYA PALANIVEL

UG Scholar, Vivekananda Pharmacy College for Women
Sankagiri - 637303 Tamilnadu, India
sowmiyapalanivel632@gmail.com

Abstract

India, the preeminent botanical garden globally, is the foremost producer of beneficial plants. Human breast milk and breastfeeding are extensively established for their nutritional, cognitive, emotional, and immunological advantages. Human milk protects against specific pathogens and clinical diseases, including viruses, germs, and parasites. The primary objective of this study is to create and construct a herbal capsule for lactation purposes. Alternanthera sessile (Ponanganni Keerai) is the primary natural component for creating an optimal herbal capsule that fulfils all the criteria for promoting lactation. The formulated herbal capsule possesses antibacterial, anti-inflammatory, and galactagogue properties. The technique employed for the preparation of the herbal capsule is hand capsule filling. The formulated capsule was assessed for its organoleptic and physicochemical attributes, including colour, odour, taste, weight, variability, disintegration, and dissolution

*Corresponding Author.

tests, to confirm it had the requisite qualities for breastfeeding properties. Consequently, the developed herbal capsule enhances lactation relative to traditional treatment and is devoid of adverse effects.

Keywords: Alternanthera Sessile, Herbal Formulation, Lactation, Nutrition, Ponanganni Keerai.

1. Introduction

The term "herbal" denotes a preparation derived from botanical or plant sources. “Herbal medicine” refers to plant-derived medicines that include nutritional, therapeutic, or prophylactic qualities (Aejazuddin, 2016). The research interest centres on several herbs with hypolipidemic, anticancer, antiplatelet, and immune-stimulating activities, which serve as beneficial adjuncts in mitigating the risk of cardiovascular disease and cancer (Anitha et al., 2012). The indications and dosage of plant-derived products differ significantly among countries and continents due to socioeconomic and cultural factors (Bhuyan et al., 2018). The World Health Organization recognizes natural goods, primarily plants, for therapeutic purposes; 80% of individuals in rural regions rely on medicinal herbs as their principal healthcare system. Approximately 20% of persons in the United States indicate that they utilize a herbal product. Composition, regulation, safety, and efficacy of utilizing these goods. An herb encompasses every part of a plant or plant derivative, including leaves, stems, flowers, roots, and seeds. A survey conducted in Australia indicated that 12% of 3000 participants utilized herbal medicines (Carmona & Pereira, 2013). Traditional herbal medicine and its formulations have been extensively utilized in both developing and developed nations for millennia, owing to its natural origin and less adverse effects (Chandrashekhar et al., 2019).



Fig. 1. Picture of *Alternanthera Sessile*

Pain is the primary symptom that prompts the patient to seek medical attention. Analgesics alleviate pain as a symptom without addressing its underlying cause: The release of reactive oxygen species and other radicals can harm proteins, carbohydrates, polyunsaturated fatty acids, and DNA. Moreover, the utilization of synthetic chemicals presents considerable disadvantages, including elevated costs, handling risks, worries regarding food residues, and potential threats to the human environment (Craig et al., 1999). The utilization of traditional medicine is

progressively rising in every nation. The objective of "Health for All" is unattainable without traditional medicine, and the traditional medicine program has been sustained since 1978 (Datta et al., 1979). Alternanthera sessile is a flowering plant known by various common names, including sissoo spinach, Brazilian spinach, sessile joy weed, Jal Jambvo, and Mukunuwenna in Sri Lanka. It is grown globally as a vegetable. Alternanthera sessile is a species within the Amaranthaceae family, found in both wetland and upland environments, capable of thriving in diverse soil types. The Tamil term is widely recognized as Ponnangani keerai (Fazeli-Nasab, 2015).

Alternanthera sessile is referred to as matyakshika in Ayurvedic medicine. The leaves are boiled and used as a treatment for hypertension (Gupta et al., 2012). Alternanthera sessile is sometimes referred to as a dwarf copper leaf. They possess anti-mutagenic, carcinogenic suppression, anti-ulcer, hepatoprotective, cardiac depressant, and cholinergic properties. Alternanthera sessile has been selected for phytochemical screening due to its prevalence as a pan-tropical weed in shaded, damp soil within both arable and wasteland areas (Kanagarasu et al., 2017). This study identified twenty-five essential and trace elements in Alternanthera sessile, including Na, Mg, K, Ca, Cr, Mn, Fe, Ni, Cu, Zn, Co, Cd, Se, Al, Pb, Ba, Hg, As, B, Si, Br, Li, Mo, Te, V, and Th. It is founded on physical attributes or other established artificial and traditional traits. This species of plant predominantly inhabits aquatic environments such as reservoirs and ponds. Phenolic chemicals are recognized inside it, and various colors result from distinct pigments.

2. Description

The morpho-anatomical characteristics of the leaves, stem, and root are examined. It is a leafy vegetable used as a folk medicine in Southeast Asia for various treatments (Walter et al., 2020). Sixty-five genera, eight-five genera, and eight-fifty species are there worldwide, and there are seventeen genera and more than fifty species in India (Kondala et al., 2014). Potassium is important to maintain metabolic processes like enzyme activity, photosynthesis, Stomata movement, protein synthesis, and ironic balance. Nitrogen plays a significant role in increasing the length of plants' vegetative parts. Phosphorous helps in the rapid growth of plants (Witkowski-Zimmy et al., 2017).

3. Uses of Ponnanganni Keerai

- Impoverished individuals utilize it as a vegetable.
- Leaves are utilized for application on blemishes (Lawrence et al., 2004).
- The herb possesses diuretic, cooling, tonic, and laxative effects.
- It is utilized for the management of dysuria and haemorrhoids.
- The plant is also thought to be advantageous for ocular health (Walker, 2010).
- It is utilized in the formulation of therapeutic hair oils and kajal.

- In regions such as Karnataka, Andhra Pradesh, Tamil Nadu, and Sri Lanka, blossoms and young stems are ingested as vegetables.
- Alternanthera sessile is utilized for minor gastrointestinal ailments, diarrhea, and dysentery, as a poultice for afflicted or injured skin areas, and for the treatment of fever.
- The herb leaves can enhance lactation in breastfeeding women and serve as a galactagogue (Mahaliyaana et al., 2016).

4. Cultivation

Alternanthera sessile is distributed widely in India. It is well grown in loamy alkaline soil, rich in total nitrogen, and low in exchangeable calcium. Both wind and water disperse the fruits, and the flowers are self-pollinated (Newman et al., 1995).

5. Phytoconstituents

The phytoconstituents are Stigmasterol, Campesterol, Palmitates of sterol, Lupeal Carotenoids, Terpenoids, Alkaloids, Tannins, Flavonoids, Saponins, Cardiac glycosides, Polyphenols, Quinones, Phenolic acid, β-spinasterol, and β-carotene (Parkash et al., 2018).

6. Formulation

Ingredients

- Alternanthera sessile
- Starch
- Ghee
- Hard Gelatin capsule (Rao et al., 2018)

7. Methodology

7.1. *Step 1: Plant collection*

Specimens of Alternanthera sessile were gathered from Avalur, Kanchipuram district, Tamil Nadu, India. The leaves were meticulously rinsed with tap water to eliminate contaminants and subsequently cleansed with distilled water on multiple occasions.

7.2. *Step 2: Drying*

The leaves were detached from the stalk. The plants were desiccated in the shade over two weeks. Shade drying safeguards the retention of active elements in the plant and necessitates meticulous oversight to prevent contamination and

contaminants. The leaves were desiccated to eliminate all moisture content until they became crushable.

7.3. *Step 3: Frying*

Ghee is used as a raw material to fry Alternanthera sessile. The ghee is preheated with the help of a Bunsen burner and wire gauze in a saucepan. The dried and crushable leaves were added gradually to the preheated ghee and then fried to get golden brown. Then, the fried leaves were dried again on filter paper.

7.4. *Step 4: Mixing*

The fried leaves were ground in Mortar and pestle into fine powder. One portion of fine powder is mixed with five portions of maise starch. The ratio of (1:5) fine powder of Alternanthera sessile and starch is used. Starch is added to increase the flow property of the mixture.

8. Procedure

Upon initiating the machine, the vacant capsules in the hopper are vertically conveyed into the magazine slot. With each stroke, the machine's appendages dispense one row of capsules into the rectifier raceway. The horizontal fingers adjust the orientation of the capsules, while the vertical fingers propel the capsules into the segment's aperture with all caps in the elevated position. The capsules within the apertures, together with the sporadic rotation of the turntable, constitute operational stations.

- At the initial and subsequent stations, the vacuum system segregates the capsules in place.
- At the third station, the lower piece of the capsule body protrudes, prepared for filling.
- The fourth station is designated for pellet filling.
- At the fifth station, the tamping pins compress the powdered medication into the capsule body.
- Sixth station for rejoining cap and body segments.
- At the seventh station, a non-segregated capsule is expelled.
- At the eighth station, vertical pins insert the capsule body into the cap for reassembly and sealing of the filled capsules.
- The ninth station is designated for the expulsion of completed capsules.
- At the tenth station, a vacuum cleaner and compressed air cleanse the segments' apertures. Subsequently, the segments are prepared for the subsequent operational cycle.

9. Quality Control Test

- Finished products
- Size And Shape
- Content Uniformity
- Moisture Permeation Test
- Weight Variation Test
- Disintegration Test

10. Result and Discussion

10.1. *Physical Examination:*

Table 1. Number of parameters and their observations.

PARAMETERS	OBSERVATION
Color	Greenish brown
Oduor	Odourless
Taste	Bland taste
Size	#5
Shape	Cylindrical

10.2. *Physiochemical Evaluation*

10.2.1. *Weight Variation Test:*

Table 2. Weight of each number of capsules.

SI.No.	CAPSULE WEIGHT(g)
1.	1.80
2.	2.80
3.	3.40
4.	3.25
5.	3.00
6.	3.20
7.	3.05
8.	3.55
9.	3.35
10.	3.45
11.	3.18
12.	3.22
13.	3.38
14.	3.25
15.	2.33

16.	3.44
17.	3.16
18.	3.63
19.	3.12
20.	2.55

$$\text{Weight variation} = \frac{\text{Total weight of 20 capsules}}{20} \quad (1)$$

$$= 3.10\text{g}$$

10.2.2. *Content Uniformity*

Table 3. Net mass of capsules based on number of capsules and percentage deviation.

SI.NO	NET MASS (mg)	PERCENTAGE DEVIATION (%)	NUMBER OF CAPSULES
1.	Less than 300	±10%	Minimum 16
		±20%	Maximum 04
2.	More than 300	±7.5%	Minimum 16
		±15%	Maximum 04

10.2.3. *Disintegration Test*

Table 4. Result of parameter test and their observations.

PARAMETER TEST	OBSERVATION (min)
Batch 1	25
Batch 2	27
Batch 3	26
Average	**26**

The disintegration time of the capsule = 26min

11. Discussion

This chapter discussed the physical and physiochemical evaluation, weight variation, content uniformity, and disintegration test to develop and formulate a herbal capsule using Alternanthera sessile (Rio-Aige et al., 2021). We presented briefly the capsule formulation procedure and focused on its significant uses. Finally, we formulated the capsule using a manual capsule-filling method.

From the characterization of the drug, we conclude that our formulation can induce lactation in breastfeeding mothers (Sharma et al., 2021). This may vary from person to person. This formulation can also be processed using an automatic capsule-filling machine (Shehzad et al., 2018). A clear direction for future research is to determine this capsule's dissolution time and UV absorption spectroscopy (Singh et

al., 2009). Hence, the formulated capsule can be further detailed and researched in future studies.

12. Conclusion

All the marketed herbal and natural products are not entirely herb-based. It also contains certain chemical compounds in formulations. However, the formulated herbal capsules contain various herbs that can induce lactation (Sivakumar et al., 2016). Evaluation test performed. The test was carried out according to the standards specified by Indian pharmacopoeia. The herbs added to this formulation are very effective and contain multiple medicinal properties (Subhashini et al., 2009). It can be used for indigestion, Hepatitis, Antihypertensive, and Asthma; it keeps eyes healthy and brings a natural glow to the skin. Hence, the formulated herbal capsule was of good quality (Umate et al., 2018). It is economical and affordable, and it is of good quality. The dissolution test of this capsule may be determined in further studies.

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