

DEVELOPMENT AND NUTRITIONAL ANALYSIS OF INSTANT IDLY PODI USING *S.TRILOBATUM*, *C.HALICACABUM* AND *M.MADERASPATANA*

PROJECT REPORT

Submitted in partial fulfilment of the requirements for the award of Bachelor of
Science degree in Clinical Nutrition & Dietetics

by

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**DEPARTMENT OF CLINICAL NUTRITION & DIETETICS
SCHOOL OF ALLIED HEALTH SCIENCES**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade A++ by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of ANGALAESWARI D (41736001) AND NITHYA SHREE P (42736010) who carried out the project entitled “**DEVELOPMENT AND NUTRITIONAL ANALYSIS OF INSTANT IDLY PODI USING *S.TRILOBATUM*, *C. HALICACABUM* AND *M. MADERASPATANA***” under our supervision from October 2023 to April 2024.

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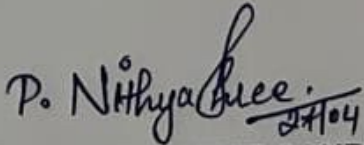
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DECLARATION

We, Nithya Shree P (41736010) and Angalaeswari D (41736001) hereby declare that the project entitled **"DEVELOPMENT AND NUTRITIONAL ANALYSIS OF INSTANT IDLY PODI USING S. TRILOBATUM, C. HALICACABUM AND M. MADERASPATANA"** done by us under the guidance of Ms. Roshni .M at the Department of Clinical Nutrition & Dietetics, Sathyabama Institute of Science and Technology, Chennai is submitted in partial fulfilment of the requirements for the award of Bachelor of Science degree in Clinical Nutrition & Dietetics.

DATE: 27.04.2024

PLACE: CHENNAI


SIGNATURE OF THE CANDIDATES

DECLARATION

We, Angalaeswari D(41736001) and Nithya Shree P(41736010) hereby declare that the project entitled "**DEVELOPMENT AND NUTRITIONAL ANALYSIS OF INSTANT IDLY PODI USING S. TRILOBATUM, C. HALICACABUM AND M. MADERASPATANA**" done by us under the guidance of Ms. Roshni .M at the Department of Clinical Nutrition & Dietetics, Sathyabama Institute of Science and Technology, Chennai is submitted in partial fulfilment of the requirements for the award of Bachelor of Science degree in Clinical Nutrition & Dietetics.

DATE: 27. 04. 2024

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ABSTRACT

Ready to eat food products are very desirable and mostly popular food commodity for consumer due to their ease of preparation, storage, consumption. Majority of the consumers demand for convenience foods which satisfy their hunger, adding bulk to the diet but lacks important nutrients like proteins, vitamins, minerals etc. It can lead to high blood pressure, obesity, diabetes & heart disease. Also there is a higher chance of upper respiratory infection caused by most relevant groups of respiratory viruses include rhinovirus, influenza, etc. Various natural plants said to have medicinal values that helps in treatment of such UR symptoms. Those medicinal plants are of great benefit if taken regular in our diet. This research is an attempt to resurrect South Indian therapeutic herbal recipes which we are fast being forgotten. The main aim of this study to develop and evaluate the nutritional analysis of an instant idly podi using medicinal leaves *Solanum trilobatum*, *C.halicacabum* and *M.maderaspatana*. The macro nutrient composition of the product revealed that it comprises of 353kcal/100g of energy, 61.8g/100g of carbohydrates, and 21.6g/100g of protein and 2.10g/100g of fat. The micro nutrient composition of the product observed that it comprises of 11.7g/100g of dietary fibre, 763mg/100g of sodium, 664mg/100g of calcium and 7.12mg/100g of iron. Using hedonic scale, the overall acceptability of the idly Podi was 8 respectively. Therefore, incorporating underutilized traditional medicinal leaves into daily convenient food in the form of Idly Podi not only prevents higher chance of upper respiratory infection but also proved for its high quality with nutritive value.

Keywords: Ready to eat foods, Medicinal leaves, *S.trilobatum*, *C.halicacabum* and *M.maderaspatana*

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LIST OF ABBREVIATIONS

C. halicacabum	- Cardiospermum Halicacabum
DL	- Detection Limit
G	- Gram
Kcals	- Kilo calories
Mg	- Milligram
MPs	- Medicinal Plants
M. maderaspatana	- Mukia Maderaspatana
RTC/RTS	- Ready to Cook/ Ready to Serve
RTE	- Ready to Eat
S. trilobatum	- Solanum Trilobatum
TC	- Total Carbohydrates
TDF	- Total Dietary Fibre
TF	- Total Fat
URTIS	- Upper Respiratory Tract Infections
WHO	- World Health Organization

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CHAPTER 1

INTRODUCTION

In today's world, the evolving globalization, increasing consumer awareness on education and health and increase in per capita income have an impact on the perception of food among people. This has led to change in the lifestyle and food purchase pattern of people of developing nations like India. Majority of the consumers demand for convenience foods like ready-to-cook, ready-to-eat and ready-to-drink foods which satisfy their hunger, adding bulk to the diet which on the other hand, lacks important nutrients like proteins, vitamins and minerals (Sindhu., 2019). Due to busy life style and work pressure on people, they prefer an easy and low time consuming cooking methods and quick cooked products.

The RTE Foods or Instant food products, which originated in Japan with Instant noodles, had its beginning in India in 1980's, found today in the kitchen shelves. Due to innovation and technology, the people have new foods processing vessels, equipment and tools but still people are in search of new techniques to speed up the cooking process in order to cope up with mechanical life, as they do not have sufficient time to cook food in the conventional methods (KRISHNAKUMAR., 2017).

Ready to eat food products is a category of food which comprises of packed food products which is used in direct consumption without any cooking where ready to cook food products need some preparations like heating, thawing, and boiling before consumption. (Kumar P, 2019). Ready to eat food products are very acceptable and a popular food commodity for consumer due to their ease of preparation, storage and consumption.

In the modern days where the life is at fast rapidity with the time very valuable to every person, people desire to save the time and to spare it on the other works.

Consumers are in the main interested in RTE and REC snacks in latest 5 years that is quickest developing meals zone due to their convenience. (Patel D, 2017) Consumer interest was raised in these food products due to their attractiveness, reasonable price, taste, appearance and texture. Different types of food comes

under RTE products such as sweet, salted fried, canned food, Fast food, baked food, dried or preserved food, extruded food, etc.

Now a day's ready to eat/serve, ready to cook product demand is increased among young consumers which are easily targeted by RTE manufacturing companies due to convenience level, texture and pleasant taste during whole shelf life of products.

Also, they capture consumer interest mainly due to its wide availability, convenience and snacking habit of consumer (Patheeparambil, 2020). Different types of convenience food are made from cereals, pulses and millets including puffed and flake millets, pasta, noodles, baked products, extruded product, fermented food and weaning food (Jaybhaye RV, 2014). These types of foods are good for supplying instant energy and nutrient where its main purpose is partially satisfying hunger (Kumar P, 2019).

Chronic administration of these agents may be associated with an increased risk of hypertension, obesity, hyperglycemia, and cardiovascular disease. Also there is a higher chance of upper respiratory infection (Running nose, Sore throat, Cold and Cough) caused by most relevant groups of respiratory viruses include rhinovirus, influenza etc..

Incorporating foods with medicinal properties into the daily diet alongside regular meals can enhance both nutrition and well-being. Medicinal value foods often contain essential vitamins, minerals, and antioxidants that support various bodily functions and may even provide specific health benefits, ranging from improved digestion to strengthened immune function. By consciously adding these nutrient-dense options to the daily diet, can create a more balanced and health-promoting eating pattern.

The holy Bhagwad Geeta says "Annaath Bhavanthi Bhoothani" meaning all beings is evolved from food. Food is one of the basic necessities of man and has been a part of man's existence on this earth. Traditional Indian foods are recognized as functional foods because of the functional components present it, such as body healing chemicals, antioxidants, dietary fibres and probiotics which are healthy and more nutritious and also helps in weight management controls blood sugar and provides enormous amount of immunity to our body (Radha, 2021).

The consumption of such traditional food provides good preventive measure to control many diseases (Choudhary, 2021). Number of medicinal plants, historically used for over a thousand years named rasayana is found in natural arrangements of Indian conventional fitness care systems. In Indian structures of medication maximum practitioners formulate and dispense their very own recipes.

The World Health Organization (WHO) has indexed 21,000 plants, which can be used for medicinal functions across the World. Among those 2,500 species are in India, out of which a hundred and fifty species are used commercially on a reasonably massive scale. (D.Thamayandhi, 2011)

Medicinal plants are a gift from nature since they supply us with a variety of health benefits. These medicinal plants have been utilised in India for millennia for their medical characteristics and are still used today. Ayurveda, siddha, unani, and ethnomedicine are only a few of the traditional medical systems of India. This knowledge of medicine was lost owing to the influence of western culture on us in the past, but is now reappearing as their relevance has been recognised, and the lack of side effects is also an essential factor in traditional medicine. According to a World Health Organization (WHO) research, more than 80% of people in underdeveloped countries rely on traditional medicines derived from plants for their basic health needs (WHO, 2022).

The South Indian traditional foods are considered as Siddha system of medicine, which helps in a natural way to achieve physical and mental wellness (Anbu, 2019). In Tamil Nadu they're the usage of many kinds of conventional recipes like Thuthuvalairasam, Karpuravallirasam, Ponnakannikeeraiporiyal, Nattukozhi soup, vazhathandu soup, Tulsi tea, Ingithuvaiyal, Sukkumalli coffee, Milagupaal etc., to therapy and control the diseases in order to maintain the good health (priyadharshini., 2019)

Vegetables hold significant position in balanced diet. Green leafy vegetables are being used since ancient period as source of food as they contain many nutrients and minerals which are helpful in maintaining human health. Leafy vegetables play important role in alleviating food security and they are very important in the diet of

many people. They contribute protein, mineral, vitamins, fiber and other nutrients which are usually in short supply in daily diets. (Solanke and Awonorin, 2021)

Quercetin, a bioflavonoid found in green leafy vegetables has antioxidant and anti-inflammatory activity, thus displays unique anticancer properties. The high level of vitamin K in greens plays an important role for the production of osteocalcin, a protein essential for bone health. Lutein, lycopene zeaxanthin, and carotenoids found in dark green leafy vegetables are concentrated in the eye lens and macular region of retina and play a protective role in the eye by preventing both cataract and age related macular degeneration. (Craig, 2010)

Traditional medicines must be used in the manufacture of current medical preparations, and 'Phytomedicines' are therefore a link between traditional and modern medicine. Individuals and communities in many underdeveloped nations rely heavily on medicinal plants for their wellbeing. Medicinal plants, on the other hand, are thought to be safer and are used to treat a variety of maladies. (Indumathi D. , 2022).

Consumers today are more concerned about their health; they focus on consuming products that strengthen their immune system. Foods rich in protein and fiber are now preferred primarily by consumers to maintain their health and keep them away from many types of diseases such as cardiovascular disease, diabetes, weight gain, etc. (Kumar, 2015). Traditional foods with medicinal values helps in preventing higher chance of upper respiratory infection (Running nose, Sore throat, Cold and Cough) caused by most relevant groups of respiratory viruses include rhinovirus, influenza etc.. However, there is an absence of readily available food products in the market that incorporates underutilized traditional medicinal leaves into convenient daily dietary form. Therefore, from the above facts the current study aims to develop and analyse the nutrients of new product named “instant idly podi” incorporated with the medicinal leaves such as *Solanum trilobatum*, *Cardiospermum halicacabum* and *Mukia maderaspatana*.

CHAPTER 2

REVIEW LITERATURE

The review of literature pertaining to the study entitled Development and nutritional analysis of idly powder using medicinal leaves is discussed under the following headings.

2.1. Introduction of Ready to eat food products

2.2. Medicinal leaves and its importance

2.2.1. *S. trilobatum* and its importance

2.2.2. *C. halicacabum* and its importance

2.2.3. *M. maderaspatana* and its importance

2.1. Introduction of Ready to eat food products

Kaviya R, 2023 point out that the Indian cooking and the way of life have experienced huge changes over the last 15 years as India becomes the centre of many multinationals and there's a quick alter in individual's ways of life. Nowadays, due to lifestyle changes and busy schedule, people prefer an easy, fast way of cooking food rather than spending too much time in cooking.

Ready to eat food products are very desirable and mostly popular food commodity for consumer due to their ease of preparation, storage, consumption. Various snacks products are come under RTE food including biscuits, sandwiches, roll, chips, fruits and vegetables salad, breakfast cereals, dairy products, etc. Fruits, vegetables and cereals are most important commodity for development of ready to eat food was defined by Malik T, 2018.

Although these types of food are tasty, convenient and easily accessible yet excess intake can be harmful to our health. It can lead to high blood pressure, obesity, diabetes & heart disease. Also there is a higher chance of upper respiratory infection (Running nose, Sore throat, Cold and Cough) caused by most relevant groups of respiratory viruses include rhinovirus, influenza, etc. Various natural plants said to have medicinal values that helps in treatment of such UR symptoms. Those medicinal plants are of great benefit if taken regular in our diet.

2.2. Medicinal leaves and its importance

For hundreds of years, medicinal plant life was used to deal with human diseases. The value of medicinal plants and traditional health systems in resolving global health issues is becoming more widely recognised. As a result of this renewed enthusiasm, research on medicinal plants is exploding on a global scale. Humans have been using medicinal plants as a source of medicine for thousands of years reported by Akinyemi O., 2018.

Medicinal vegetation is appeared as wealthy assets of conventional drug treatments and from that vegetation a number of the current drug treatments are produced. For lots of year's medicinal plant life were used to deal with fitness disorders, to feature taste and preserve meals and to save you sicknesses epidemics. Medicinal flora was gambling a critical function with inside the improvement of human culture. It has been estimated that more than 400 traditional plants or plant derived products have been used for the management of type 2 diabetes across the world discussed by Smruti, 2019.

Medicinal plants are plants used with the intention health maintenance, to be administered for some specific conditions, or both, whether in traditional medicine or in modern medicine observed by Ahn, 2017.

2.2.1. *Solanum trilobatum*

S. Parasuraman 2018, observed that the *Solanum* is a large and diverse genus of flowering plants of about 1500-2000 different species in the family of Solanaceae. *S. trilobatum* Linn... ("thuthuvalai" in Tamil; climbing brinjal in English) belongs to Solanaceae family and is widely used as a vegetable accompaniment to meals in the regions of Tamil Nadu, India. *Solanum trilobatum* (Fig 2.1) is also called as purple-fruited pea eggplant which is widely distributed in India.

Roots & Leaves are bitter and useful for treatment of cough and respiratory ailments. Berries and flowers are used for treatment of cough, cold and chest pain. The whole plant is useful remedy for all kinds of cough, acute and chronic bronchitis. It is reported that aqueous/alcoholic extract of leaf at 300 mg, two times a day for 3 days may be relief from Bronchial asthma was analyzed by Amudha R.R., 2017.

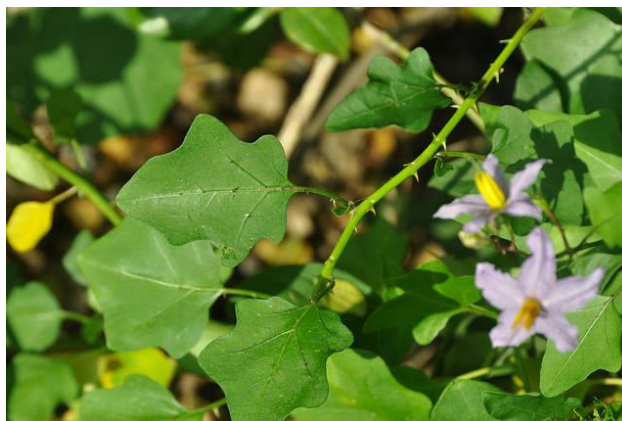


Figure 2.1 Solanum trilobatum leaves

Pharmacological and Microbiological Activity

Anti-diabetic activity

Nartunai Govindarajan 2022 in his research reported that the water extract from the leaves of *S. trilobatum* causes a notable decrease in glucose levels in diabetic rats induced by alloxan.

Anti-cancer Activity

The chloroform extract of *S. trilobatum* leaf was reported to possess anti-cancer activity against MCF-7 and Hep G2 cell lines and useful for the treatment of breast cancer was defined by Amudha, 2017. The methanolic extract of plant material reported to have antitumor effect against diethyl nitrosamine induced hepatocarcinogenesis in Wister rats was studied by Jahan, 2018. The saponin fraction isolated from *S. trilobatum* is reported to inhibit the proliferation of Hep-2 cells through cytotoxicity and apoptosis induction in the human larynx carcinoma was proposed by Kanchana, 2017.

Anti-hyperlipidaemic activity

Ganesan, 2019 his study shows that the aqueous extract of dried leaves of *S. Trilobatum* in doses of 200mg/kg frame weight suggests large antihyperlipidaemic impact in streptozocin precipitated diabetic rats.

Anti-bacterial Activity

The antibacterial activity of aerial parts of *S. trilobatum* was assayed under in vitro conditions by agar disc diffusion and well diffusion method against four bacterial species. All the solvents, ethanol, acetone, ethyl acetate used for the extraction of

leaves, flower and culmination have been proven large antibacterial hobby besides acetone and ethyl acetate extracts of flower against *K. pneumonia*. Gram–positive bacteria *S. aureus* was more susceptible to inhibition when compared to the Gram-negative bacterial species test was proposed by Krishna k., 2018.

2.2.2. *Cardiospermum halicacabum* and its importance

Manju Shree, 2019 observed that in India thousands of species are known to have medicinal value and the use of different parts of several medicinal plants to cure specific ailments has been in trend for the reason that historic instances and *C. halicacabum* L (Fig 2.2). Belonging to own circle of relatives Sapindaceae is one such plant extensively utilized by conventional practitioners to treatment diverse ailments. *Cardiospermum* is the aggregate of the Latin phrases *cardio*, which means coronary heart and *sperma*, which means seed and refers back to the white coronary heart-fashioned sample at the seed. It is a small delicate, smooth, climber and the whole plant has been used for several centuries in the treatment of many diseased conditions.



Figure 2.2 *Cardiospermum halicacabum* leaves

Antibacterial activity

In recent years, the rate of infection and resistant against antibiotics has been increased. The presence of antibacterial materials with inside the plant display

correct antibacterial interest without generating any aspect effects. Antibacterial activity of *C. halicacabum* Linn was investigated by well diffusion technique (SAVITHA G, 2017) against the selected human pathogens.

Antidiabetic activity

Diabetes mellitus is a metabolic disorder which is characterized by a loss of glucose homeostasis with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion or insulin action or both. Management of diabetes without any side effect is still challenge to the medical community was reported by Surapaneni KrishnaMohan 2017.

2.2.3. *Mukia maderaspatana* and its importance

M. maderaspatana (Fig 2.3) Linn... Belongs to the own circle of relatives call is Cucurbitaceae. It is a prostrate herb or tendril climber found throughout India. *M. maderaspatana* is a medicinal plant. It occurs in wild areas as well as cultivated in Kitchen gardens. It is traditionally used as a leafy vegetable and to cure several ailments in South India. It is used in vertigo and biliousness reported by S. Kiruthika, 2018.



Figure 2.3 *Mukia maderaspatana* leaves

Anti-diabetic activity

Antihyperglycemic interest turned into proved with the aid of using the ethanolic and aqueous extract of complete plant of *M. maderaspatana*. Ergosterol is an active compound extracted from the methanolic extraction of whole plant of *M. maderaspatana* exhibits antidiabetic activity was point out by Jamuna S, 2015.

Anti-inflammatory activity

Sujeethasai, 2022 observed that the inflammation is caused by the denaturation of protein. The *Mukia maderaspatana* extract shows positive effect on inhibition of protein denaturation and proteinase activity. Proteinase hobby is inhibited through extract of *M.maderaspatana*. Leucocyte proteinase plays a vital role in development of tissue damage in course of inflammatory reaction. Study at the methanol extract of *M, maderaspatana* proved immoderate proteinase inhibitory activity. *Coccinia grangis* species of Cucurbitaceae own circle of relatives own comparable impact as *M.maderaspatana*.

Antioxidant activity

According to reports published by Agata Rolnik., 2020, Oxidative stress is an imbalance between pro-oxidants and antioxidants. Oxidative stress leads the body to diseases such as cancer and obesity. Compounds present in curcubits such as cucurbitacins B and E, belonging to family of tannins exhibits antioxidant activity and also possess free radical scavenging tendency.

Considering the above points this study aims to develop and investigate the nutritional health benefits of incorporating medicinal leaves into the idly powder.

CHAPTER 3

AIM AND OBJECTIVES

AIM

This study aims to develop and investigate the nutritional health benefits of incorporating medicinal leaves into idly podi.

OBJECTIVES

- To examine the presence of bioactive phytochemicals in *S. Trilobatum*, *C. Halicacabum* and *M. Maderaspatana*.
- To develop the instant idly podi using *S.trilobatum*, *C.halicacabum* and *M.maderaspatana*
- To analyze the micro-nutrient composition of idly podi and its potential health benefits.
- To assess the macronutrient composition of the idly podi.
- To evaluate the specific sensory attributes of the idly podi.

CHAPTER 4

MATERIALS AND METHODS

4.1 Locale of the study

The major part of the present study has been carried out in the Department of Clinical Nutrition and Dietetics at the Sathyabama Institute of Science and Technology. The nutritional analysis was performed in the nearest lab.

4.2 Procurement of raw materials

Medicinal leaves (*S.trilobatum*, *C.halicacabum* and *M.maderaspatana*) was purchased from the local areas of villages and the other ingredients for the preparation of the idly podi were purchased from the local markets of Chennai.

4.3 Examine the presence of bioactive phytochemicals in *S. trilobatum*, *C. halicacabum* and *M. maderaspatana* leaves

4.3.1 Alkaloids

One gram of each leaf powder sample was dissolved in 10 ml of methanol and filtered through Whatmann No.1 paper. After that 3 ml of filtrate was mixed with 10 ml of 1% aqueous HCl. Mayer's reagent was then added with the reaction mixture. Appearance of buff-colored precipitate indicates the presence of alkaloids.

4.3.2 Flavonoids

One gram of each leaf powder sample was dissolved in 10 ml of 50% methanol and slightly warmed. After that the solution was filtered and added with metal magnesium and followed by few drops of conc. HCl. Formation of red to purple color indicates the presence of flavonoids.

4.3.3 Saponins

About 0.5gram of each leaf powder sample was boiled gently for 2 minute with 20 ml of water and filtered while hot and allowed to cool. 5ml of the filtrate was then diluted with water and shaken vigorously.

4.3.4 Tannins

Five gram of each leaf powder sample was mixed with 100 ml of sterile double distilled water and then heated at 60° C for 10 minutes. The aqueous extract was

then filtered with Whatmann No.1 filter paper. 1% ferric chloride solution was added to 5 ml of extract in a test tube. Formation of a blue-black or blue-green precipitate in the reaction mixture indicates the presence of tannins.

4.4 Development of instant idly podi using *S. trilobatum*, *C.halicacabum* and *M.maderaspatana*

Medicinal leaves (*S.trilobatum*, *C.halicacabum* and *M.maderaspatana*) were cleaned and washed under running tap water. Then, they were Sun-dried until completely dehydrated. 75g each of black urad dal and Bengal gram, 8g of *Cardiospermum halicacabum*, 12g each of *Mukia maderaspatana* and *Solanum trilobatum*, 8g of curry leaves and red chili were roasted. Subsequently, all roasted ingredients were cooled at room temperature for 10 minutes. Garlic (optional) was added according to taste. Finally, all ingredients were ground together. Following grinding asafoetida and salt were added to taste and mixed thoroughly.

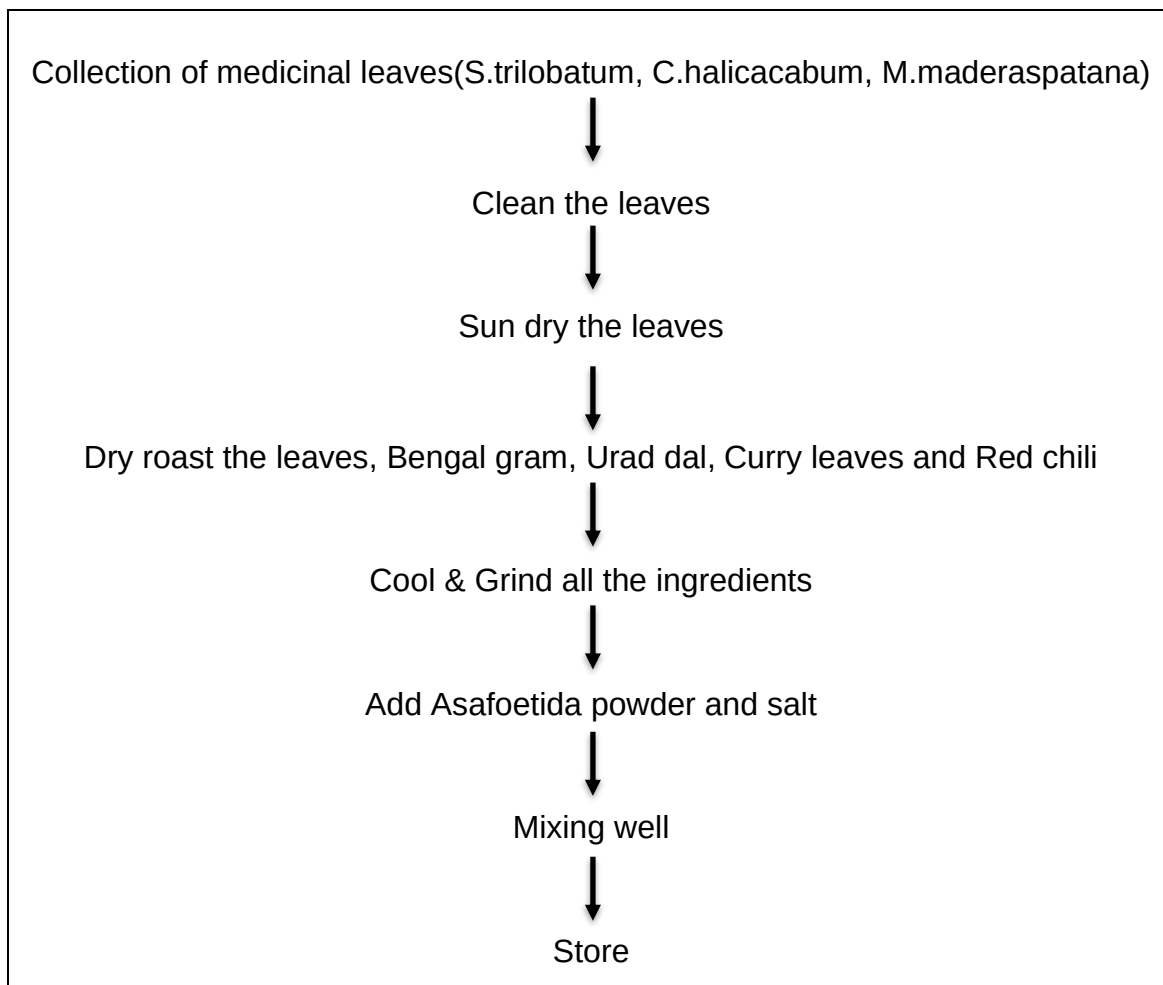


Figure 4.1 Steps in preparation of Instant Idly podi

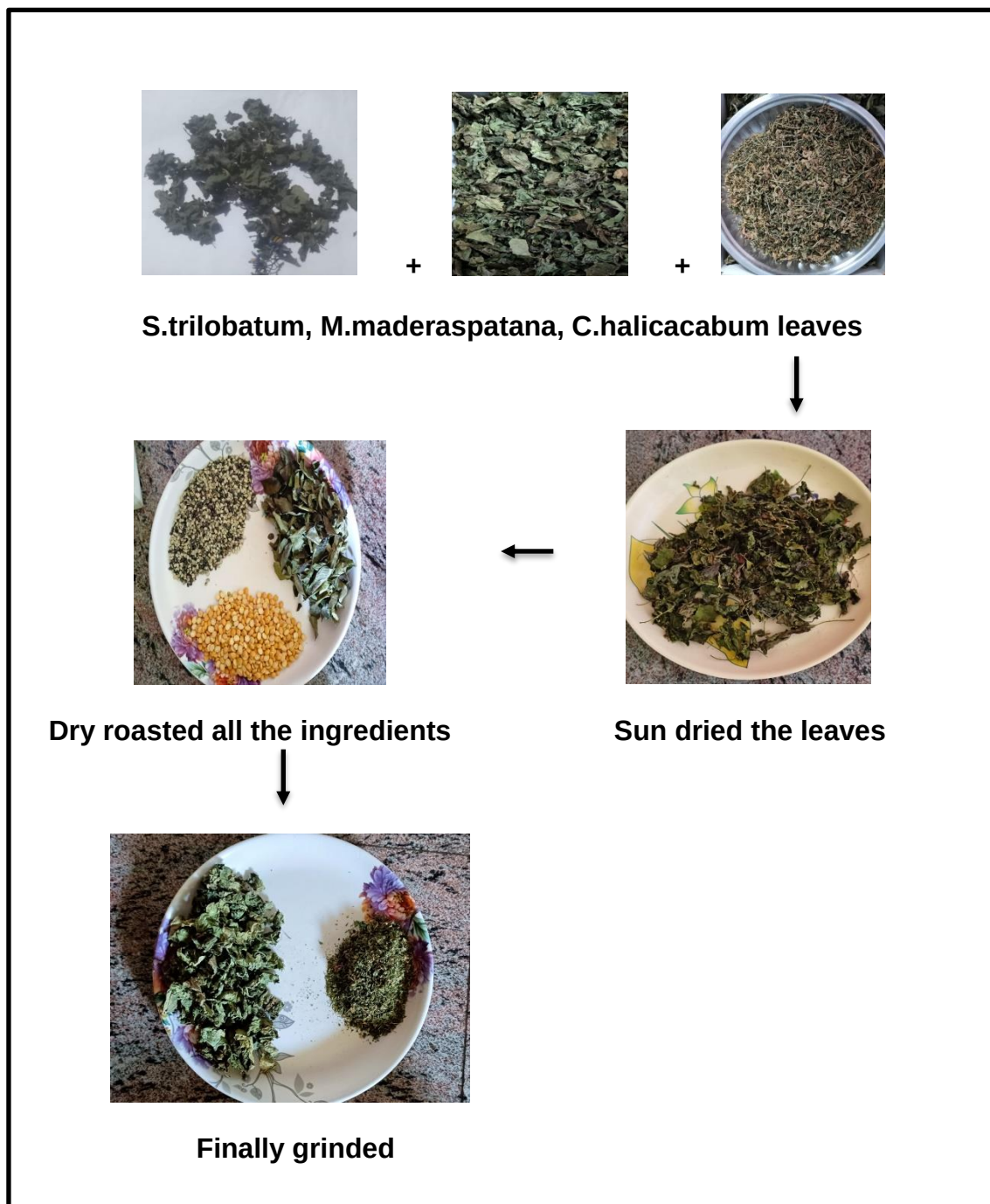


Figure 4.2 Flow chart of pictorial representation in preparation of instant idly podi

4.5 Analysis the micro-nutrient composition of idly podi

4.5.1 Dietary fibre

The dietary fibre was determined by the method of AOAC 20th Edn.2016, 985.29

Procedure:

Weigh duplicate 1g test portion, accurate to 0.1mg into 400ml tall-form beakers. Add 0.1ml tetramethyl solution. Cover the beaker with Al foil and place in boiling water bath for 15mins. Add 5mg protease. Incubate 30 mins at 60°C with continuous agitation and cool down. Add 10ml 0.325M HCl solution. Measure pH and dropwise and add acid if necessary. Add 280ml 95% ethyl alcohol preheated to 60°C. Wash residue successfully with three 20ml, portions of 78%ethyl alcohol and two 10ml portions of acetone. Time for filtration and washing will vary from 0.1h to 6h. Dry crucible containing residue overnight in 70°C vacuum oven. Cool in desiccator and weigh to nearest 0.1mg.

Calculations:

Determination of blank:

$B = \text{blank, mg} = \text{weight residue} - P_B - A_B$

Where,

Weight residue = average of residue weights (mg) for duplicate blank determination; and

$P_B - A_B = \text{weights (mg) of protein and ash}$

Calculate TDF as follows:

$\text{TDF (\%)} = [(\text{weight residue} - P - A - B) / \text{weight test portion}] * 100$

Where,

Weight residue = average of weights (mg) for duplicate blank determination

P and A = weights (mg) of protein and ash;

Weight test portion = average of two test portion weights (mg) takes.

4.5.2 Sodium

The sodium were determined by the method of AOAC 20th Edn.2016, 969.23

Procedure:

Weigh 4g test portion into the crucible, and char on electric hot plate or over low flame. Place on cold furnace and bring to 525°C and 2h to white ash. Add 15ml dil. HNO₃ (1-4) to the crucible, breaking up ash with a stirring rod if necessary. Filter through acid-washed quantitative paper into a 100ml volumetric flask. Wash residue and paper three times with H₂O. Dilute to volume.

For flame emission- Read directly

For flame absorption- Dilute for direct readout as follows: Place 1ml aliquot in 100ml volumetric flask and dilute to volume with H₂O for Na; place 1ml aliquot in 25ml volumetric flask and dilute to volume with H₂O for K.

Prepare blank solution by diluting 2ml HNO₃ to 100ml with H₂O.

Calculation:

For flame emission photometers:

$$Na (100g) = 100 \times F$$

Where,

$$E = (\text{percent T of unknown}) - (\text{percent T of blank})$$

$$E = (\text{percent T of standard lower concentration than test solution}) - (\text{percent T of blank})$$

$$E = (\text{percent T of standard of higher concentration than test solution}) - (\text{percent T of blank})$$

$$C = \text{mg in Na/ml in standard of lower concentration than test solution}$$

$$C = \text{mg in Na/ml in standard of higher concentration than test solution}$$

$$F = \text{dilution factor}$$

For flame absorption photometers: Convert percent absorption to absorbance.

$$Mg \text{ in Na}/100g = (\text{concentration unknown} \times F \times 100) / g \text{ test portion.}$$

4.5.3 Calcium

Calcium was determined by titration method (IS 5949:1990 (RA.2010))

Procedure:

Take a suitable aliquot of the sample solution prepared as prescribed in the material specification and expected to contain approximately 5 to 20 mg of calcium as CaO, in a 500 ml conical flask, Add 25 ml of triethanolamine solution, 10 ml of hydroxylamine hydrochloride solution and 2 ml of potassium cyanide solution. Dilute to about 150 to 200 ml with water and adjust the pH to 12.5 to 13 with 20 per cent sodium hydroxide solution (4.6) using a pH indicator paper or preferably a pH meter. Add approximately 0.1 g of Patton and Reeder's indicator mixture and stir to dissolve. Titrate with 0.01 M EDTA solution from a burette, till the colour changes from red to pure blue free from any violet tinge. Towards the endpoint, the colour turns a violet which on further drop-wise addition gives the pure blue endpoint. It is easier to note the endpoint by comparing the colour with that of a previously titrated solution having a pure blue endpoint, where a slight excess of EDTA has been added.

Calculation:

Calcium (Ca) per cent by mass = $V_1 \times 0.04008/M$

Where V_1 = Volume in ml of EDTA solution used in titration; and

M = Mass in g of the sample in the solution for the test

4.5.4 Iron

Iron was determined by the method of AOAC 20th Edn.2016, 999.11

Procedure:

Homogenize the product if necessary, using non-contaminating equipment. In a crucible, weigh 10-20g test portion to nearest 0.1g. Dry in a drying oven or water bath at 100°C. Place dish in the furnace at initial temperature not higher than 100°C. Increase temperature at a maximum rate of 50°C /h to 450°C. Let dish stand for at least 8 hours or overnight. Wet ash with 1-3ml water and evaporate on water bath. Put crucible in furnace at no more than 200°C and raise temperature (50°C -100°C /h) to 450°C. Proceed with ashing at 450°C for 1-2 hours or longer. Repeat the

procedure until the product is completely ashed. Add 5ml 6M HCl to crucible ensuring that all ash comes into contact with the acid. Evaporate acid on water bath and dissolve residue in 10-30ml, to the nearest 0.1ml of 0.1M HNO₃. Cover with watch glass and lid for 1-2 hours. Then, it is determined by atomic absorption spectrometry (AAS).

Calculations:

Calculate the detection limit (DL) for Fe:

DL= 3 * standard deviation of the mean of the blank determination (greater than or equal to 20)

Calculate the concentration, c, of the metal in the test sample according to the formula:

$$c = (a-b) * V / m$$

Where,

c = concentration in the test sample (mg/kg)

a = concentration in the test solutions (mg/L)

b = mean concentration in the blank solution (mg/L)

V = Volume of the test solution (mL)

m = weight of the test portion (g)

If (a-b) is lower than the DL, then (a-b) is substituted with DL for calculation of the limit of detection in the test portion.

4.6 Assess the macronutrient composition of idly podi

4.6.1 Energy

Energy is calculated by the FAO method.

It is calculated by the following formula:

$$\text{Energy (kcal/100g)} = (\text{Carbohydrate} \times 4) + (\text{Protein} \times 4) + (\text{Fat} \times 9)$$

4.6.2 Carbohydrates

The total carbohydrate content in the porridge powder was calculated by difference method. This methodology separately assesses the quantities of various other constituents present in the food, including protein, fat, fibre, moisture, and ash. These values are then aggregated and subtracted from the overall weight of the food. This method is represented by the following formula:

$$\text{Carbohydrate (g/100g)} = 100 - [\text{Moisture (\%)} + \text{Ash (\%)} + \text{Total fat(g)} + \text{Protein(g)} + \text{Fibre(g)}]$$

4.6.3 Total fat

The total fat was determined by the method of AOAC 20th Edn.2016, 920.39

Procedure:

Weigh accurately about 2g of sample in a fat extraction tube; add 2.0ml of alcohol to prevent lumping on addition of acid, and shake to moisten all particles. Add 10ml HCl (25+11), mix well and set tube 30 to 40 mins in water bath at 70°C and 80°C, shaking frequently. Cool to room temperature and add alcohol. Add 25ml diethyl ether to the flask and shake for 1.0 mins. Then add 25ml petroleum ether to the flask and shake 1min. Decant ether layer into the pre-weighed dry flask through anhydrous sodium sulphate. Then, Decant ether layer into a pre-weighed dry flask through anhydrous sodium sulphate. Then add 25ml of 1:1 diethyl ether, and petroleum ether to the flask and shake for 1.0min. Ether layer can be evaporated under a water bath. Keep the flask into the oven for further evaporation of ether residue. Remove the flask from the oven and place in desiccators to cool to room temperature. Record the weight of the flask plus fat.

Calculation:

% of Fat = (Weight of flask + fat) – Empty weight of the flask ×100 / Sample weight

4.6.4 Protein

The protein (N×6.25) was determined by the method of AOAC 20th Edn.2016, 986.25

Procedure:

Weigh a suitable test portion of the sample into digestion flask. Add 10g of potassium sulphate or anhydrous sodium sulphate, about 0.4g CuSO₄ and 25mL or more, if necessary, of Conc.H₂SO₄ to the flask. Heat the flask for 90min for complete digestion. Cool, cautiously add 250mL H₂O and cool to room temperature. Add 100ml of 4% boric acid to the beaker, condenser tip will be sufficiently immersed. Add 3-4 drops of mixed indicator. Connect flask to distillation apparatus, add sufficient 45% NaOH solution, mix completely, such that mixture will be strongly alkaline and distil until 150ml distillate is collected in titration beaker. Titrate against 0.1N HCl solution. Correct for blank determination on reagents.

Calculation:

$\%N (w/w) = (TV_s - TV_b) * \text{Normality of standard HCl} \times 1.4007 / \text{Sample weight}$

Where,

TV_b = Titer value of blank; TV_s = Titer value of sample

4.7 Evaluate the specific sensory attributes of idly podi

Instant Idly Podi using *S.trilobatum*, *C.halicacabum* and *M.maderaspatana* was served only podi and food with podi to evaluate for sensory attributes (Appearance, consistency, aroma, mouthfeel, flavour and overall acceptability) through a panel of 10 subjects using a 9-point hedonic scale of scores from 1-dislike extremely to 9-like extremely.

CHAPTER 5

RESULT AND DISCUSSION

5.1 Phytochemical analysis

Table 5.1 phytochemical analysis of instant idly podi

S.NO	TESTS	SOLANUM TRILOBATUM	CARDIOSPERMUM HALICACABUM	MUKIA MADERASPATANA
1	Alkaloids	+	+	+
2	Flavonoids	+	+	+
3	Saponins	+	+	+
4	Tannins	+	+	+

Phytochemical analyses for alkaloids, Flavonoids, Saponins, Tannins were screened in water and methanolic extracts of the selected medicinal plants of *S.trilobatum*, *C.halicacabum* and *M.maderaspatana*. The screening of the extracts indicated the presence of Alkaloids, Flavonoids, Saponins, and Tannins in the methanolic extract (shown in table 5.1.)

5.2 Micro-nutrient composition

Table 5.2 Micro nutrient composition of Instant Idly podi

S.NO	PARAMETERS	RESULTS
1	Dietary Fibre	11.7g
2	Sodium	763mg
3	Calcium	664mg
4	Iron	7.12mg

Table 5.2 represents the micro minerals like Dietary Fibre, Sodium, Calcium and Iron content from 100g Instant Idly Podi is contain 11.7g of Dietary Fibre, 763mg of Sodium, 664mg of Calcium and 7.12mg of Iron.

5.3 Macro-nutrient composition

Table 5.3 Macro nutrient composition of Instant Idly podi

S.NO	PARAMETERS	RESULTS
1	Energy	353kcal
2	Carbohydrates	61.8g
3	Total Fat	2.10g
4	Protein	21.6g

From the Table 5.3, it is observed that the macro nutrient composition of 100g of Instant Idly podi using with medicinal leaves (*S. trilobatum*, *C.halicacabum* and *M.maderaspatana*) had 353 kcals of Energy, 61.8g of Carbohydrates, 21.6g of Protein and 2.10g of Total Fat.

5.4 Sensory evaluation of Instant idly podi

Table 5.4 Sensory Evaluation of Instant Idly Podi

ATTRIBUTES	AVERAGE SCORES	
	ONLY PODI	FOOD WITH PODI
Appearance	8	8
Texture	8	8
Aroma	7	8
Mouth feel	7	8
Flavour	7	8
Taste	8	8
Overall acceptability	8	8

It is evident from the Table 5.4 that the Instant Idly Podi was highly acceptable for only podi and also with food by the members. The scores recorded for appearance range between only podi and Food with Podi was 8. Texture range between only podi and Food with Podi was 8. Aroma, Mouth feel and Flavour of only podi range was 7 and Food with Podi was 8. The overall acceptability of only podi and Food with Podi was 8.

CHAPTER 6

SUMMARY AND CONCLUSION

The globalization, commercialization and consumer awareness has led to change in the lifestyle and food purchase pattern of people in developing nations like India. Ready to eat or ready to cook food are also referred as fast food which are easy to prepare and consume. It commonly includes frozen dinner, packed snack food, bread, pasta, breakfast cereals, fruit snacks, sauces, processed meat, protein bars, etc. These food products are processed or ultra-processed which improves its quality or sometimes decreases nutritional quality and microbial quality. While these food items offer palatability, convenience, and accessibility, their excessive consumption has been linked to adverse health outcomes such as hypertension, obesity, diabetes mellitus, and cardiovascular diseases. Additionally, these dietary choices may be associated with an increased susceptibility to upper respiratory tract infections (URTIs) caused by common respiratory viruses like rhinoviruses and influenza viruses. Interestingly, various plants with purported medicinal properties have been shown to alleviate URTI symptoms when incorporated into the regular diet. Considering the above facts this study aimed to develop and analyse the nutritional value of instant idly podi. The product found to be high in its nutritive value with good overall acceptability with idly and rice. Therefore, incorporating underutilized traditional medicinal leaves into daily convenient food in the form of Idly Podi not only prevents higher chance of upper respiratory infection but also proved for its high quality with nutritive value.

Further recommendation of this study would be exploration of these same ingredients in the development of a soup mix and other products. Also investigating potential therapeutic and medicinal benefits of idly podi can be promising.

CHAPTER 7

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