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"DEVELOPMENT AND EVALUATION OF A MULTI-HERBAL NUTRACEUTICAL BISCUIT"

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ABSTRACT

Preparation of herbal biscuit is innovative, futuristic research in the field of functional food preparation. During this research wheat flour-based herbal biscuits were prepared using wheat flour, Sorghum flour, milk, white butter/ghee, salt, baking soda, baking powder, Jaggery powder, and herbs containing Orange peel, Tulsi, Cinnamon, Liquorice, flax seed and Ginger. The goal of the Study is to evaluate the quality and qualities of the biscuits using a variety of factors, such as Spread ratio, Thickness, hardness, Volume, Diameter, Moisture content, Ash value, etc. The formulation of this biscuit incorporates potent herbs known for their nutritional and therapeutic properties. These ingredients are efficiently processed into a consumable biscuit form using the various herbs. Evaluation of the biscuit's physical properties provides critical insights into its structural characteristics, which are essential for ensuring both efficacy and consumer acceptability. The research findings contribute to the growing body of knowledge on dietary supplementation and offer potential health benefits by enhancing our understanding of the herbal nutraceutical biscuit formulation and its quality assessment.

- **KEYWORDS:** Orange Peel, Cinnamon, Tulsi leaves, Liquorice roots, Ginger, flexed seed, Evaluation.

INTRODUCTION

Change in lifestyle diminishing the quality of human health. Nowadays, to lead a healthy life, consumers are interested in consuming healthy and nutritious food. In India, the baking industry was one of the main sections of food processing. The consumption of baked products was popularized due to their availability in a ready-to-eat form, availability, and good shelf-life. Cookies are nutritious snacks different from other baked products and contain low moisture content prepared using a hot air oven.[1]

Nutraceuticals is derived from the amalgamation of terms nutrition and pharmaceutical and was coined by Stephen De Felice in 1989. He defined nutraceutical as, "a food (or part of a food) that provides medical or health benefits, including the prevention and/or treatment of a disease".[2]

There is a slight difference between the functional foods and nutraceuticals. When food is being cooked or prepared using "scientific intelligence" with or without knowledge of how or why it is being used, the food is called "functional food". Thus, functional food provides the body with the required amount of vitamins, fats, proteins, carbohydrates, etc. needed for its healthy survival.[3]

Nutraceuticals are bioactive chemicals that are found in everyday foods or botanical sources. They can be consumed as functional foods or dietary supplements and provide additional health benefits in addition to the important nutritional components. Antioxidants, phytochemicals, fatty acids, amino acids, and probiotics are just a few of the bioactive compounds gathered in dietary sources that make up nutritional supplements. Nutraceuticals are well-known for their role in illness treatment and prevention, anti-aging qualities, and cancer prevention, with either previously established effects or potential effects.[4]

The concept of making utility of food as health promoting factor beyond its nutritional value is gaining acceptance within public arena and among scientific community. Nutraceuticals contain health- supporting ingredients or natural components that have an ability health benefit for the body.[5]

Orange Peel, Tulsi (Holy Basil), Cinnamon, Liquorice, flax seed, and Ginger are among the many Herbal treatments that are highly valued for their nutritional value and therapeutic qualities. Numerous civilizations have historically held these plants in high regard due to their

wide Range of health-promoting qualities, which include immune-stimulating, digestive, and

Antioxidant capabilities. Combining several herbal constituents into a single multi nutrition biscuit offers a promising opportunity to improve general health and wellbeing. The goal of this study is to investigate the preparation and assessment of a Nutraceutical biscuit that Contains Ginger, Orange Peel, Tulsi, Cinnamon, flaxseed and Liquorice. The physical characteristics of a biscuit, such as Spread ratio, Thickness, hardness, Volume, Diameter, Moisture content, Ash value, etc. are crucial indications that impact its effectiveness, stability, and consumer acceptance. This study intends to Contribute to the developing field of herbal medicine and nutraceuticals by delving into the Formulation process and evaluating the biscuits quality standards.[6]

1. Statement of Problems or Errors

In recent years, there has been a growing consumer demand for functional foods and nutraceuticals that not only provide basic nutrition but also offer health benefits beyond traditional dietary functions. Lifestyle-related diseases such as obesity, diabetes, cardiovascular disorders, and digestive issues are on the rise globally, prompting a shift toward natural and preventive dietary solutions.

1. **Formulation Challenges**: How to optimize the levels of herbal powders to ensure both health benefits and acceptable sensory properties. Inconsistencies in flour quality can affect dough handling, baking performance and texture.
2. **Consumer Acceptability**: Determining whether consumers will accept the taste and texture of biscuits enriched with multiple herbal ingredients. It consumes by mostly adult due to hardness and it gives only sweet taste without any herbal taste due to jaggery powder.
3. **Shelf Stability**: Evaluating the impact of herbal ingredients on the storage life and safety of the biscuits. Storage maximum for 6 months.
4. **Health Impact Potential**: Investigating whether regular consumption of the biscuits could contribute to improved health markers. Can be use by diabetic patient, can be eat without milk or water.

2. AIM AND OBJECTIVES

Aim: To develop and evaluate a multi-herbal nutraceutical biscuit incorporating orange peel powder, cinnamon powder, ginger powder, tulsi powder, and liquorice powder, with the goal

of enhancing its nutritional value, sensory acceptability, and potential health benefits for functional food applications.

Objectives

1. To formulate a biscuit incorporating varying levels of selected herbal powders.
2. To assess the sensory characteristics (appearance, taste, texture, aroma, and overall acceptability) of the developed biscuits.
3. To evaluate the functional properties, including antioxidant activity and total phenolic content.
4. To determine the shelf life and microbial stability of the biscuits over a defined storage period.
5. To evaluate the physicochemical properties of the biscuits, such as texture (hardness, brittleness), color, spread ratio, and pH.
6. To compare the developed herbal biscuit with a control (non-herbal) biscuit in terms of health benefits and consumer acceptability.

3. Literature Review

I. **Sonu Sharma, et al., 2024:** This review serves as a valuable resource for researchers, healthcare professionals, and policymakers, providing a thorough understanding of the current landscape of nutraceuticals. By addressing key aspects such as classification, roles, safety, and future directions, the article contributes to the ongoing discourse on the integration of nutraceuticals into modern healthcare practices.

II. **Bala Adamu Thliza, et al., 2021:** This study showed that flours can be produced from sweet orange peel and the pulp. An acceptable biscuit can be manufactured with it. Acceptable biscuits were produced from wheat flour supplemented with 10 % orange peel flour and 10 % orange pulp flour, respectively. The biscuits contained high amounts of crude fibre, flavonoids and minerals (calcium, copper, iron, zinc, sodium and potassium) etc. Baking reduced the antinutrient contents of the biscuits. Ethanol extracts of the flours and biscuits had higher antioxidant activities than the water extracts. The biscuit containing orange peel flour had higher antioxidant activity than that containing orange pulp flour.

III. **Marwa Hanafy Mahmoud, et al., 2017:** In the present study, proximate composition, physical characteristics, color, total phenolic content, thiobarbituric acid (TBA) and

sensory quality attributes of biscuit with orange peel additives at different levels. The addition of orange peel was resulting in decreased TBA value, which indicates that the orange peel incorporated into biscuits exhibited antioxidant properties and suppression the lipid peroxidation of biscuit samples. Highly acceptable biscuits could be obtained by incorporating T3 (15%) orange peel in the formulation. Therefore, 15 % orange peel powder supplemented biscuits could be recommended to be produced as biscuits with good quality and acceptable sensory quality attributes.

IV. **Yachita Jokhi, et.al. 2023:** Herbal biscuits are a delicious and healthy snack option that offers a range of benefits for both the body and mind. They are easy to make at home and can be customized to suit individual tastes and dietary needs. Three samples of herbal biscuits were prepared with variation in the quantity of ragi and wheat flour. After preparation of three samples, it was found that composition of 28.5% wheat flour, 28.5% ragi, 11.4% oats, 19.9% Jaggery powder and 11.7% of other ingredients (ghee, dill seeds, sesame seeds, fennel seeds, coconut, cinnamon powder, baking powder, salt, milk) was found highly acceptable. For flavour enhancement ghee and jaggery powder were used. After.

4. Plan of Work

1. Literature Review: Conduct a comprehensive review of existing research on:

- Nutraceutical foods and functional biscuits.
- Health benefits and nutritional profiles of orange peel, cinnamon, ginger, tulsi, and liquorice.

2. Preparation of Raw Materials:

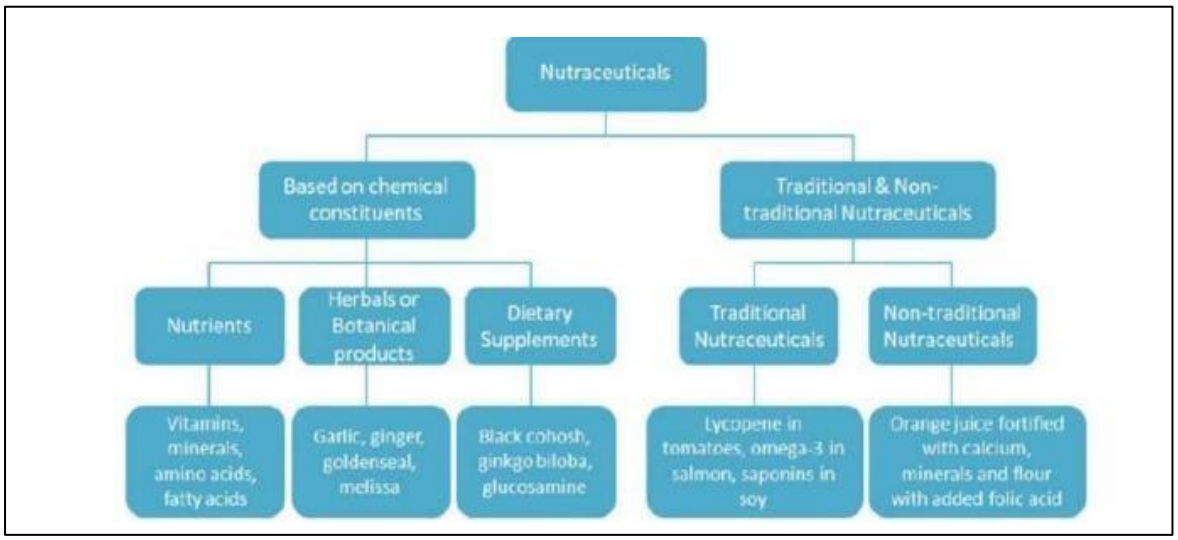
Source ingredients: wheat flour, sugar, butter, milk, jaggery powder, baking powder, and herbal powders(direct in powder form).

3. Formulation of Biscuits.

4. Evaluation: Av.wt., Volume, Diameter, Moisture Content, etc.

5. Result and Discussion.

5. Classification of Nutraceuticals



Nutraceuticals, an emerging area at the intersection of food science and medicine, can be classified according to their source, chemical structure, and intended uses. Natural nutraceuticals cover a wide range of bioactive compounds sourced from plants, animals, or microorganisms in nature. Contrary to natural nutraceuticals, synthetic nutraceuticals are created using chemical synthesis or biotechnological methods to mimic natural compounds or develop new bioactive. Semi-synthetic nutraceuticals are natural compounds with chemical modifications to improve effectiveness or stability. Nutraceuticals have a diverse chemical makeup, with phytochemicals - bioactive compounds from plants - being common. Marine-based nutraceuticals, derived from marine organisms, often contain exclusive nutrients and bioactive substances. Vitamins and minerals, which are important for human health, are compounds, both inorganic and organic, that have critical functions in different physiological processes. Moreover, probiotics and prebiotics are live microorganisms and compounds that promote gastrointestinal health and overall wellness. Nutraceuticals are used to manage a range of health issues. Omega-3 fatty acids and antioxidants are commonly included by individuals focusing on maintaining good cardiovascular health. Nutritional supplements for bone and joint health include calcium, vitamin D, and glucosamine. Probiotics, prebiotics, and dietary fiber can help with digestive health. Nutraceuticals with omega-3 fatty acids, antioxidants, and B vitamins are linked to cognitive health. In conclusion, nutraceuticals can assist with managing weight by promoting metabolism, controlling appetite, or increasing energy expenditure.[7]

Table No. 01: Classification Of Nutracutical.

TABLE 1 – Various Classifications of Nutraceuticals with Examples

Classification Criteria	Subcategory	Description	Examples	Intended Uses
Source	Natural	Derived from plants, animals, or microorganisms.	Phytochemicals, Marine-based compounds	Cardiovascular health, bone and joint health
Source	Synthetic	Created through chemical synthesis or biotechnological methods.	Artificial vitamins, synthesized omega-3s	Cognitive health, general wellness
Source	Semi-synthetic	Natural compounds modified chemically for improved efficacy or stability.	Modified flavonoids, semi-synthetic vitamins	Enhanced absorption, stability
Chemical Structure	Phytochemicals	Bioactive compounds derived from plants.	Flavonoids, carotenoids	Antioxidant activity, anti-inflammatory effects
Chemical Structure	Marine-based	Nutraceuticals derived from marine organisms.	Fish oil, algae-derived omega-3s	Cardiovascular health, cognitive function
Chemical Structure	Vitamins and Minerals	Essential nutrients for physiological functions.	Calcium, Vitamin D, B vitamins	Bone health, metabolic processes
Intended Uses	Cardiovascular Health	Nutraceuticals supporting heart health.	Omega-3 fatty acids, antioxidants	Reducing cholesterol, improving circulation
Intended Uses	Bone and Joint Health	Supports bone density and joint function.	Calcium, Vitamin D, glucosamine	Preventing osteoporosis, reducing joint pain
Intended Uses	Digestive Health	Promotes gut health and regularity.	Probiotics, prebiotics, dietary fiber	Improving digestion, enhancing gut flora
Intended Uses	Cognitive Health	Supports brain function and mental clarity.	Omega-3s, antioxidants, B vitamins	Enhancing memory, reducing cognitive decline
Intended Uses	Weight Management	Assists in regulating metabolism and appetite.	Green tea extract, fiber supplements	Weight loss, appetite control

6. Types of Biscuits

The minor ingredients used in biscuit manufacture, always give names to the biscuit Popular types of biscuit include.

Sweet biscuit: The sugar content in such biscuits is high making them taste very sweet.

Sweet and sour biscuit: Combination of salt and sugar makes the biscuit quite tasty.

Salty biscuit: Salt content is higher than sugar.

Sandwich biscuits: These are cream biscuit which are sandwiched in shells and are found in various flavours like vanilla, mango, milk, etc.

Crackers biscuit: These are puffy biscuits which are leavened by certain chemicals and are soft.

Chocolate biscuit: Chocolate is put into the biscuit as chips.

7. Ingredients in biscuit making

Flour: This is the powder obtained from grinding a cereal grain. Wheat flour is by far the most common. All flours are composed largely of starch and protein, but wheat flour is distinctive in that it has very high levels of a class of proteins known collectively as gluten. When dough is made from wheat flour and water, the gluten develops into a thick, cohesive, elastic mass, when placed in an oven, it puffs up to many times its original volume and sets with a light airy texture.

The characteristics and general quality of flour depends on.

1. The wheat variety and conditions under which the wheat has grown. This affects the quality and quantity of gluten in the grain.
2. The milling process: This determines the degree of separation of the bran and endosperm, as well as the particle size of the flour.
3. Additives and special treatments used by the miller to produce flour mixes with special characteristics.

Fat: Fat has five major roles in baking. How well it will perform each of these functions depends largely on the slip point, the temperature at which the fat just begins to melt. In general the slip point should be at least 5 ^{0}C above the proving temperature of the dough. The roles of fat are as follows: Shortening: Fat weakens or shortens a dough by weakening its gluten network, resulting in the baked product being soft, breaking easily and having a more tender mouth feel.

Creaming: Fat can trap air during beating and mixing producing a batter that consist of masses of tiny air bubbles trapped within droplets of fat.

Layering: In puff pastry, fats which are soft over a wide temperature range are used. These can be spread between pastry layers and will separate them during cooking giving a layered pastry.

Flavour: Usually, the fats used should have a bland flavour to prevent them from changing the flavour of the finished products.

Sugar: Sugar is most commonly thought of as a sweetener, but in baked goods it is also involved in several other processes. Sugar undergoes a series of complex browning reactions

above 160 ºC, and the products of these form the brown crust of many baked goods. The reactions are known as Maillard reactions and are essentially amino acid catalysed caramelisation reactions in which a sugar aldehyde or ketone is converted to an unsaturated aldehyde or ketone. In non-fermented goods such as biscuits, large quantities of sugar can be added. This improves the keeping quality of the biscuits as well as sweetening them. The sugar usually used is pure sucrose such as castor sugar. Occasionally impure forms such as golden syrup, honey and brown sugar are used to give the baking a particular flavour.

Baking Powder: Baking powder is essentially a mixture of NaHCO3 (sodium bicarbonate) and a weak solid acid or acid salt. When the mixture dissolves in water and the temperature is raised, CO2 is released.

When baking powder is used rather than baking soda, the by-products are less alkaline and thus they have no undesirable effects on the taste of the product.

Salt: Salt is added to enhance the flavour of baked goods and to toughen up the soft mixture of fat and sugar that is to make dough more elastic.[8]

8. Nutraceuticals and disease

It has been suggested that nutraceuticals offer physiological benefits or offer protection against several ailments, including cancer, allergies, osteoarthritis, cardiovascular disease, diabetes, obesity, Parkinson's disease, eye disorders, immune system problems, and inflammations.

Cardiovascular disease

Chronic heart and blood vessel abnormalities are the basis of cardiovascular diseases (CVD), which include high blood pressure (hypertension), heart attacks (heart attacks), strokes (cerebrovascular disease), heart failure, peripheral vascular disease, and others. Atherosclerotic plaques, which restrict the lumen and lower blood flow, develop on the inside surface of arteries in coronary heart disease. It would also be the main cause of death in underdeveloped nations. Most of these illnesses would be avoidable and under control. Antioxidants, dietary fibers, omega-3 poly unsaturated fatty acids, vitamins, and minerals are examples of nutraceuticals utilized in the treatment and prevention of cardiovascular disorders. Gamma linolenic acid (GLA), found in milk and eggs, offers several advantages, including the management and prevention of cardiovascular illnesses. Grape polyphenols are known to prevent and regulate vascular disorders.

Diabetes

Diabetes mellitus is a condition marked by excessively high blood glucose levels that is brought on by either insufficient or poor insulin synthesis. Type 1 diabetes, which affects 5% of people, is an autoimmune disease. Type 2 diabetes, which affects 95% of people, is linked to obesity. It is anticipated that there will be 366 million diabetics worldwide in 2003, up from 171 million in 2000. The cornerstone of managing gestational diabetes mellitus is diet therapy. Few adequately planned randomized trials have demonstrated the beneficial effects of herbal dietary supplements on type 2 diabetes mellitus, despite their widespread usage. An antioxidant called lipoic acid is utilized in nutraceuticals to treat diabetic neuropathy in people with diabetes. For diabetic people, n-3 fatty acid ethyl esters may be helpful. Insulin resistance is modulated by docosahexaenoic acid, which is also essential for neurovascular development. Pseudosylvian dietary fibres have been utilized to lower cholesterol in hyperlipidaemia and to help diabetic people control their blood sugar levels. Green tea, chitosan, ma hang-guarana, ephedrine, and caffeine are examples of herbal stimulants that aid in weight loss. Individuals with diabetes are more vulnerable to free radical-induced blood vessel damage. The flavonoids in the quercetin class, also referred to as flavanols, act as antioxidants by scavenging harmful molecules in the body called free radicals.

Obesity

An unhealthy amount of body fat is called obesity, and it is now a global public health concern. Obesity is linked to several conditions, including angina pectoris, congestive heart failure, hypertension, hyperlipidemia, respiratory issues, renal vein thrombosis, osteoarthritis, cancer, and decreased fertility. The WHO defines obesity as affecting 315 million people, and the main reason for this sharp increase in obesity rates is the increased availability of high-fat, high-energy foods. These foods, which include burgers, drinks, snacks, and pizzas, can promote weight gain and should be limited in addition to sugar and salt in the diet. Large-scale research is now being conducted on nutritional interventions as possible therapies for obesity and weight control. When it comes to obesity, nutraceuticals are the crop buckwheat possesses unique biological properties that include decreasing cholesterol, preventing hypertension, and relieving constipation and obesity by functioning similarly to dietary fiber found in food. Green tea extract and 5-hydroxytryptophan have been shown to aid in weight loss, and formar illness hunger later in life raises energy expenditure. Green tea, ma huang-guarana, ephedrine, and caffeine are examples of herbal stimulants that aid in weight loss. The nutritional supplement's combination of glucomannan, chitosan, fenugreek, G Silvestre, and vitamin dramatically

decreased body weight. Momordica Charantia (MC), capsaicin, and conjugated linoleic acid (CLA) have possible anti-obesity qualities.

Parkinson's disease

Parkinson's disease is a brain ailment or motor disorder that often manifests in mid- to late-life adulthood and is caused by nerve loss in certain brain regions, resulting in muscle rigidity, shaking, and difficulty walking. Although early research on nutritional supplements has produced some encouraging findings, it's vital to keep in mind that there is currently insufficient scientific evidence to support their use for Parkinson's disease. Several of these supplements, known as nutraceuticals, have had encouraging outcomes in early research on Parkinson's disease. Proteins like creatine, glutathione, and vitamin E appear to guard against Parkinson's disease. A decrease in the clinical symptoms of Parkinson's disease indicates how creatine alters its characteristics.

Alzheimer 's disease

Progressive dementia is the hallmark of Alzheimer's disease (AD), with memory loss serving as the primary clinical sign. Dementia with Alzheimer's disease (AD) is the most prevalent type. The illness has no known treatment and ultimately results in death. The majority of AD diagnoses are made in those over 65, while early-onset Alzheimer's can happen considerably earlier and is less common. In 2006, there were 26.6 million sufferers worldwide, and by 2050, it is expected to impact 1 in 85 individuals. Nutraceuticals such as βCarotene, curcumin, lutein, lycopene, and turmeric, among others, may be used to treat Alzheimer's disease by counteracting the deleterious effects of oxidative stress, mitochondrial malfunction, and several types of brain degeneration.

Cancer

A significant public health issue in arising nations is cancer. The peril of habitual inflammation is identified with an increased threat of cancer. also connected to vulnerable repression, a known carcinogen, is habitual inflammation. Free revolutionaries and aldehydes, which are created during prolonged inflammation, have the molecular capacity to beget dangerous gene mutations and alter important proteins linked to cancer. nasty excrescences reckoned for 12 of the roughly 56 million global deaths in 2000 due to allcauses. The World Cancer Report estimates that there will be 15 million new cases of cancer in 2020, a 50 increase in cases. Lycopene, which has cancer- preventative attention in the skin, testes, adrenal glands, and prostate, is one of the nutraceuticals employed in cancer treatment. Lycopene, a prominent

carotenoid in Western diets, is nearly only present in tomatoes, watermelon, papaya, guava, and pink grapefruit. also, phytochemicals attained from sauces and spices may haveanti-mutagenic andanti-carcinogenic parcels. It's advised to use a variety of" phytoestrogens" with purported hormonal exertion to help bone and prostate cancer. Citrus fruit flavonoids appear to serve as antioxidants to help cancer. Curcumin from curries and soy isoflavones could help cancer through chemotherapy. Soy foods are a source of isoflavones. Among theanti-carcinogens set up in walnuts, cranberries, and strawberries is ellagic acid. At the top of the game, it has been observed that turmeric rhizomes, spinach leaves, cucumber fruits, and beet roots haveanti-tumor parcels. Blackberries, blueberries, cranberries, grapes, lentils, tea, wine, and other foods include tannins, which have the capability to scavenge dangerous free revolutionaries and detoxify carcinogens. Turmeric's polyphenol curcumin, also known as diferuloylmethane, Hasanti-inflammatory, Anti-carcinogenic, and antioxidative rates. Pectin, set up in apples, stops prostate cancer cells from attaching to other body cells.

Allergy

typically, the result of the immune system of an individual reacting to a normally harmless substance. The excessive activation of specific white blood cells known as mast cells and basophils by a kind of antibody known as immunoglobulin E is what makes allergic reactions unique. An inflammatory response is the result of this reaction and can be either uncomfortable or harmful. Using nutraceuticals to treat allergies is Quercetin (QR) is a member of the flavonoid class of polyphenolic compounds. Onions, red wine, and green tea all contain quercetin, a natural antihistamine that acts against the body's histamine production.

Immune system

astragals stimulate development and metamorphosis of stem cells in the gist and lymph towel to active vulnerable cells. Phytoestrogens substantially are recommended for forestallment of colorful conditions related to hormonal imbalance. There's a special interest in soy isoflavones as implicit superior to the synthetic picky oestrogen receptor modulators, which are presently applied in hormone relief remedy. Garlic and morphine also are good illustration of the nutraceuticals, which independently stimulate and suppress vulnerable system. Nutraceuticals and probiotics have gained fresh support in clinical settings due to their impact on the vulnerable system and intestinal epithelial cell function, as well as the goods of bacteria and herbal drugs. Probiotics work well for affections including recreating infections caused by Clostridium difficile and contagious diarrhea in youths. Probiotic supplements, which include

live, living microorganisms, may help balancepro- andanti-inflammatory cytokines and give lymphoid towel maturationalcues. Probiotics work by altering the microbiota in the gut to keep the rate of pathogenic tonon-pathogenic bacteria in check. The capacity to treat certain conditions with these substances has led to a veritably high indicator of safety, a drop in the operation of antibiotics, and a favourable public print of" indispensable" or" natural" remedies. One or further lactic acid bacteria can be set up in the maturity of probiotic phrasings. The most frequently employed strains in this group are those of Lactobacillus, Bifidobacterium's., and sporadically Streptococcus.[9]

9. MATERIALS AND METHODS

Herbs used

- Orange Peel
- Tulsi leaves
- Flaxseed
- Liquorice roots
- Cinnamon
- Ginger

Other

- Wheat flour, Sorghum flour
- Honey
- Milk or Milk Powder
- Butter
- Salt

Apparatus

- Weighing balance
- Blender
- Standard sieve
- China dish
- Oven

1) Orange Peel Powder

- **Biological name:** Citrus sinensis (Sweet orange)

- **Part used:** Dried outer peel

- **Major active compounds**
  - **Flavonoids:** Hesperidin, naringin
  - **Essential oils:** Limonene, linalool
  - **Vitamin C**, pectin, polyphenols

- **Biological activities**

Antioxidant, Anti-inflammatory, Antimicrobial, Cholesterol-lowering, Supports digestion.

- **Nutraceutical use:** Digestive health, immunity boosting, flavor enhancer

Orange peel is a rich source of dietary fiber and antioxidants. In current life style scenario, people are becoming more aware of functional key ingredients and thus the demand of functional foods is increasing.[10]

Fig. No. 01- Orange Peel Powder.

2) Tulsi leaves

- **Biological name:** Ocimum sanctum (also Ocimum tenuiflorum)
- **Part used:** Leaves (fresh or dried)

- **Major active compounds**

Eugenol, ursolic acid, rosmarinic acid, flavonoids.

- **Biological activities**

Adaptogen (stress-relief), Anti-inflammatory, Antioxidant, Antibacterial and antiviral

- **Nutraceutical use:** Stress relief, respiratory support, immune booster

The herb tulsi is called an "Elixir of Life." Tulsi has historically been used in thousands of formulations to treat conditions affecting the digestive, metabolic, reproductive, and neurological systems, as well as the mouth and throat, lungs, heart, blood, liver, and kidney.

Tulsi is a highly promising plant in managing oral illnesses and dentistry since it is so helpful in treating various medical conditions. Common mouth infections can be effectively treated with tulsi leaves. Strong antibacterials such as carracrol, terpene, and sesquiterpene b caryophyllene are present in tulsi leaves. Tulasi leaves can be chewed to maintain good dental hygiene.

Tulsi has a highly complex chemical makeup. There are several phytochemicals in it. Antioxidant, adaptogenic, anti-inflammatory, antibacterial, and immune-enhancing qualities are among the many chemicals in the plant.[11]

Fig No. 02- Tulsi Powder.

3) Flaxseed

- **Biological name:** Linum usitatissimum L.
- **Part used:** Seeds.

- **Major active compounds**

Omega-3 Fatty Acids, Phenolic acids (ferulic, p-coumaric), vitamins (B1, E), minerals (Mg, Zn, P).

- **Biological activities**

Hypolipidemic, Anti-inflammatory, Anticancer (potential), Antidiabetic.

- **Nutraceutical use:** Heart Health, Hormonal Balance, Diabetes Support, etc.

Flaxseed (Linum usitatissimum), also known as common flax or linseed, has a place in the family Linaceae. In subcontinent it is known as "Alsi", "Jawas", and "Aksebija". This valuable annual herb has widely grown throughout the world. The Latin title of flaxseed implies "very useful" and it has two fundamental varieties: brown and yellow or brilliant. Both have comparative wholesome characteristics and significant quantities of short-chain ω− 3 fatty acids. The special case is of a yellow flaxseed called Solin (exchange title Linola), which features a distinctive fatty acid profile and is exceptional in ω− 3 fatty acids. seed, which contains lignans, digestible proteins with vital amino acids, and oil rich in omega-3 fatty acids, the shell yields high-quality fibre with low density and mechanical qualities.[12]

Fig No. 03- Flaxseed.

4) Liquorice roots

- **Biological name:** Glycyrrhiza glabra
- **Part used:** Root (dried and powdered)

- **Major active compounds**

Glycyrrhizin (sweet-tasting compound), Liquiritin, glabridin, flavonoids, saponins.

- **Biological activities**

Anti-inflammatory, Antiviral, antimicrobial, Gastroprotective (soothes ulcers and acidity), Immune-modulatory.

- **Nutraceutical use:** Cough relief, digestive aid, immunity tonic

Liquorice root (LR), also known as sweet root, is one of the most widely used medicinal herbs in traditional oriental medicine, where it has been used to treat bronchitis, coughs, arthritis, adrenal insufficiency, and allergies. Liquorice helps to regulate fat metabolism in the liver possess glycaemic moderating effects and supports the healthy function of kidney, liver and bladder it is rich in essential elements for hair health.[13]

Fig. No. 04- Liquorice Roots Powder.

5) Cinnamon

- **Biological name:** Cinnamomum verum (true/Ceylon cinnamon) or C. cassia
- **Part used:** Bark (dried and ground)

- **Major active compounds**

Cinnamaldehyde, eugenol, coumarin, cinnamic acid.

- **Biological activities**

Antioxidant, Anti-diabetic (improves insulin sensitivity), Antimicrobial, Anti-inflammatory.

- **Nutraceutical use:** Blood sugar regulation, flavoring, metabolic booster

Bark of various cinnamon species is one of the most important and popular spices used worldwide not only for cooking but also in traditional and modern medicines. Overall, approximately 250 species have been identified among the cinnamon genus, with trees being scattered all over the world.

Cinnamon is mainly used in the aroma and essence industries due to its fragrance, which can be incorporated into different varieties of foodstuffs, perfumes, and medicinal products.

In addition to being used as a spice and flavoring agent, cinnamon is also added to flavor chewing gums due to its mouth refreshing effect and ability to remove bad breath.

Fig. No. 05- Cinnamon Powder.

Cinnamon can also improve the health of the colon, thereby reducing the risk of colon cancer. Cinnamon is a coagulant and prevents bleeding.[14]

6) Ginger

- **Biological Name:** Zingiber officinale Roscoe
- **Part Used:** Rhizome (the underground stem)

- **Major active compounds**

Volatile oils: Zingiberene, β-bisabolene, camphene, cineole, citral

Phenolic compounds: Gingerols (mainly 6-gingerol), shogaols, paradols, zingerone.

- **Biological activities**

Anti-inflammatory, Antioxidant, Antiemetic, etc.

- **Nutraceutical use:** Digestive Health, Anti-Nausea Support, Antioxidant Properties, etc.

Gingerols are the major pungent compounds present in the rhizomes of ginger (Zingiber officinale Roscoe) and are renowned for their contribution to human health and nutrition. Medicinal properties of ginger, including the alleviation of nausea, arthritis and pain, have been associated with the gingerols. Gingerol analogues are thermally labile and easily undergo dehydration reactions to form the corresponding shogaols, which impart the characteristic pungent taste to dried ginger. Both gingerols and shogaols exhibit a host of biological activities, ranging from anticancer, antioxidant, antimicrobial, anti-inflammatory and anti-allergic to various central nervous system activities. Shogaols are important biomarkers used for the quality control of many ginger-containing products, due to their diverse biological activities.

Ginger (Zingiber officinale) is widely recognized as a potent nutraceutical due to its rich content of bioactive compounds such as gingerol, shogaol, and zingerone. These compounds contribute to a variety of therapeutic effects, including anti-inflammatory, antioxidant, antiemetic, and digestive benefits. As a natural remedy, ginger is used to alleviate nausea, support digestion, reduce muscle pain, and potentially lower blood sugar and cholesterol levels. When formulated into nutraceutical tablets or capsules, ginger offers a convenient way to harness its health-promoting properties for dietary supplementation and preventive healthcare.[15]

Fig No. 06- Ginger Powder.

Table No. 02: Properties of Herbs.

Common Name	Botanical Name	Key Constituents	Biological Activities
Orange Peel	*Citrus sinensis*	Hesperidin, Limonene	Antioxidant, Digestive aid, Antimicrobial
Licorice	*Glycyrrhiza glabra*	Glycyrrhizin, Flavonoids	Anti-inflammatory, Gastrointestinal (GI) health, Immune booster
Cinnamon	*Cinnamomum verum/cassia*	Cinnamaldehyde, Eugenol	Anti-diabetic, Antioxidant, Antimicrobial
Tulsi (Holy Basil)	*Ocimum sanctum*	Eugenol, Rosmarinic acid	Adaptogen, Anti-inflammatory, Immunomodulatory
Ginger	*Zingiber officinale*	6-Gingerol, Shogaol, Zingerone	Antiemetic, Anti-inflammatory, Antioxidant, Digestive aid, Antimicrobial
Flaxseed	*Linum usitatissimum*	Alpha-linolenic acid (ALA), Lignans (SDG), Fiber	Hypolipidemic, Antioxidant, Antidiabetic, Laxative, Cardioprotective

Formulation: (500gm)

Table No. 03: Formulation.

Sr.No.	Ingredients	Quantity (gm)
1	Orange peel Powder	5
2	Cinnamon Powder	2
3	Ginger Powder	2
4	Liquorice Powder	1
5	Tulsi Leaves	1
6	Flaxseed	5
7	Wheat, Sorghum Flour	250
8	Salt	2
9	Butter	100

10	Jaggery Powder	50
11	Honey	20
12	Baking Soda	2
13	Milk Powder	50

Procedure

Dry ingredients (herbs) were mixed together and then combined with others (flour, baking soda, salt, etc.).

This mixture add into butter, jaggery powder and honey with slowely adding milk(q.s.) to form dough.

The dough was mixed for 10 min to obtain a homogeneous consistency and then placed for cool period of 30 min.

The dough was sheeted to a thickness of about 3 mm using rolling machine or by hand.
The sheeted dough was cut into round shape using a 45 mm diameter cutter and baked on an aluminium tray in an electric oven at 160-170 ºC for 10-12 minutes with preheated oven with 170 ^{0}c.

The biscuits are cooled without delay after baking and kept in air tight container and store at room temperature.[16]

Fig. No. 07- Product.

10. Formulation Evalution

Physical Analysis on formulated herbal biscuit

Physical parameter is computed from following formula

- **Average weight:** The weight was measured in gram by analytical balance machine.

Fig No. 08- Av.Wt.

Av. Wt. =5.25+5.50+4.55+5.30+5.40/5

=26/5

=5.2gm

- **Thickness:** The thickness was measured in mm by digital vernier caliper.

Fig. No. 09- Thickness.

- **Diameter:** The diameter was measured in mm by digital vernier caliper.

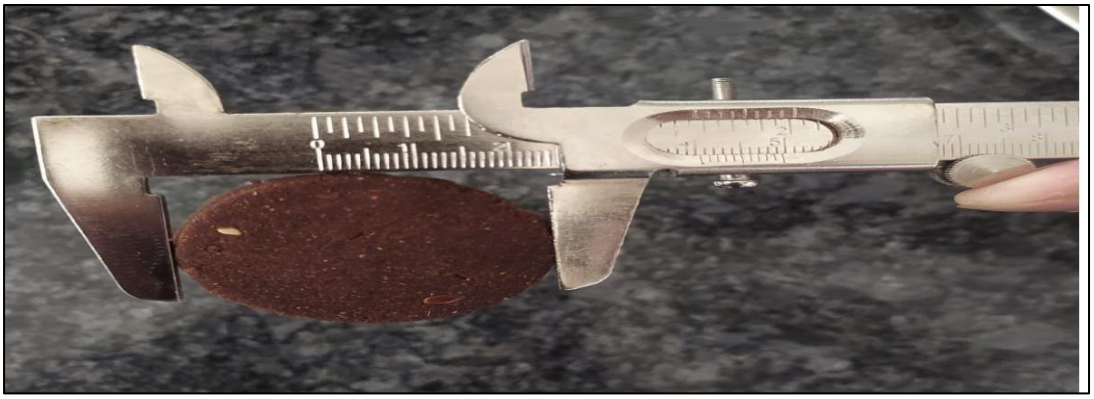


Fig. No. 10- Diameter.

- **Spread ratio:** The spread ratio was determined by using this formula.

Spread ratio = diameter(mm) / thickness (mm)

=44/4.6

=9.5mm

- **Volume** = The volume of biscuits is defined as the area of the biscuit multiplied by thickness.

Volume (cm3) $=d^2\pi T$

T = Average thickness of biscuit (mm) d = Radius of biscuit (mm).

Volume= $(22)^2 \times 3.14 \times 4.6$

$=6993mm^3$ $=6.93cm^3$

- **Density:** After calculating volume, density was obtained by the ratio of the weight of volume.

Density (g /cm3) =mass of sample (g)/volume of sample (cm3)

=5.2/6.93

$=0.744g/cm^3$

- **Hardness/Crispness:** Measured using a hardness meter or texture analyzer to evaluate chewiness and texture.

Fig. No. 11- Hardness Tester.

1kg=9.81N

5.6kg=54.9N i.e. Harder, More Compact

Moisture content

Detection of amount of water in the sample is called moisture content. 6- cookies are prepared from which 1 is taken out for calculating initial weight, and after air-drying of this same cookie the final weight is calculated.

Moisture content in sample can determine by Oven drying method. Moisture content (%) = [(X+Y)-Z / Y] 100

Where, X=Weight in gram of empty dish.

Y=weight in gram of sample.

Z= weight of in gram of the dish with material after drying to constant weight.

=5-8%

- **Ash value**

Ash value is important for detecting purity and quantity of total amount of the minerals and thier concentration in formulated samples.

Total ash content was determined by Muffle furnace.

Total ash content (% by weight) = (weight of ash / total weight of sample) 100[17]**=1.5-2.5%**

11. RESULT

Average Weight: The sample has an average weight of 5.2 grams, indicating it is relatively

lightweight. This value can be relevant when assessing material use, transportation efficiency, or product design specifications.

Thickness: The measured thickness is 4.6 millimeters. This suggests a moderate level of compactness or layering, which could impact durability and structural integrity.

Diameter: With a diameter of 44 millimeters, the sample is circular and moderately sized. This dimension plays a critical role in determining surface area and fitting into designated assemblies or molds.

Spread Ratio: A spread ratio of 9.5 millimeters indicates the extent to which the sample spreads under specific conditions (often related to dough or soft material testing). A higher spread ratio generally implies a softer or more pliable material.

Volume: The sample occupies a volume of 6.93 cubic centimeters (cm^3). This metric, combined with weight, is essential for calculating density and understanding the bulk of the sample.

Density: The calculated density is 0.744 grams per cubic centimeter (g/cm^3). This suggests the material is relatively less dense than water (1 g/cm^3), implying it might be porous or aerated.

Hardness: The sample has a hardness of 54.9 Newtons (N), which reflects its resistance to deformation or penetration. This value points to a moderately firm structure, which could be relevant in mechanical or quality evaluations.

Table No. 04: Result.

Sr. No.	Test	Result
1	Average Weight	5.2gm
2	Thickness	4.6mm
3	Diameter	44mm
4	Spread ratio	9.5mm
5	Volume	$6.93cm^3$
6	Density	$0.744g/cm^3$
7	Hardness	54.9N

12. CONCLUSION

In the end, we can conclude that the extracts used for formulating the biscuits are rich in antioxidants and flavonoids, and act as a flavour enhancer along with a medicinal benefit. These nutraceutical biscuits containing barley-wheat formulations are also rich in dietary fiber

content (8.4%) as compared to the normal wheat biscuits which have 1.5-2% dietary content. This product has come up with the goodness of basil in providing DNA protection and anti-bacterial properties, liquorice for the treatment of coughs, colds, and other bronchial irritations.

The major active constituents called flavonoids found in basil provide protection while the enzyme-inhibiting effect of the eugenol, present in it, provides an anti-inflammatory property that enables its potential application in treatment of rheumatoid arthritis or inflammatory bowel conditions. Powdered liquorice is also well thought-out in ayurvedic medicine as an excellent remedy for hyperacidity and clinical tests has proven its significance in relieving pain, discomfort and other symptoms caused by acid reflux in the stomach. Thus, this amalgamation of a number of health benefits in the form of a nutraceutical biscuit can tickle the taste buds of the consumers and influence them for consuming it for a healthy well-being.

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