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Therapeutic Potential of Composite Flour Prepared from *Eleusine coracana* and *Cicer arietinum*

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Abstract

Composite flour is a mixture of wheat and non - wheat flours used for the preparation of bakery products such as, breads, tarts, muffins, biscuits etc that is rich in protein and starch. Finger millet is considered as a special food supplement because of its unique nutritional properties when compared with other cereals. It is also known as poor man's food. Many dishes, both in their natural and malted forms, such as porridge, puddings, pancakes, biscuits, roti, bread, noodles, and other snacks, are made from finger millet. In addition, it is thought to be a healthful meal for diabetics and is used as a nutritious meal for babies when malted. Finger millet (Ragi) inhabits elevated levels of calcium, antioxidants and phytochemicals. It possesses therapeutic properties relevant for patients of cardiovascular disease, cancer, cognitive issues and diabetes. Among pulses chickpeas are considered as an inexpensive and a substantially highly nutritious food. A wide range of non-nutritive phytochemicals, such as oligosaccharides, saponins, tannins, polyphenols, flavonoids, and enzyme inhibitors, are present in chickpeas beyond their basic nutritional value. Chickpeas present varying bioactive constituents with their medicinal properties such as anti-tumour, anti – hypertensive and hypocholesterolemic. In this study, we outline the dietary profile of finger millet and chickpea, as well as the principal biological activities associated with these functional foods.

Keywords: Composite flour, millets, nutritional benefits, therapeutic advantages, bioactive composition

INTRODUCTION

Millet

On top of the three main cereals—wheat, rice, and maize—are millets. Particularly in developing nations, these essential agricultural products serve a major role in the lives of low-income individuals worldwide. Millets grow quickly, are drought-tolerant, and store well for a long time without being harmed by insects. Major and minor millets, which thrive in Australia, China, Malaysia, Sri Lanka, India, and some regions of Africa, are the divisions of the genus Poaceae (real grass) millets. The four main types of millet are Proso millet, often known as white millet (Panicummiliaceum), Foxtail millet (Setariaitalica), Finger millet (Eleusinecoracana), and Pearl millet (Pennisetum glaucum). Small-scale millet includeKodo millet (Paspalumscrobiculatum), tiny millet (Echinochloa spp.), and barnyard millet. Browntop millet (Urochloa ramose/Brachiaria ramose/Panicumramosum), Guinea millet (Brachiariadeflexa), and millet (Panicumsumatrense). Calcium, iron, folic acid, niacin, potassium, magnesium, and zinc are all abundant in all of the grains. India yields extremely little millet in comparison to other cereal grains.

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Small millets, such as Kodo, foxtail, and others, can be acquired all year round. Compared to other notable millets and grains, it is less expensive. Millets are particularly high in dietary fibre, iron, calcium, and B vitamins and low in phytic acid. Moreover, it contains higher percentages of indigestible carbohydrates. The prevalence of nutritional inadequacies is high due to poverty, shifting consumption habits away from a balanced diet, poor intake of nutrient-dense cereals, and other factors [1].

Chickpea

With a high percentage of both necessary and non-essential amino acids, chickpeas are a high-protein food. They are notable for having a higher protein bioavailability than other legumes. Because of their distinct chemical makeup and low glycemic index, chickpeas are thought to lower blood sugar levels by decreasing the rates of absorption and bioavailability of carbohydrates. In fact, because of these unique qualities, chickpeas are frequently referred to as superfoods, and their consumption has been rising dramatically on a global scale [2]. Essential minerals including calcium, iron, phosphorus, magnesium, and potassium additionally exist in it. Moreover, chickpeas embrace dietary fibre, ash, polyphenols, and flavonoids in addition to saturated and unsaturated fatty acids, such as oleic and linoleic acid. Chickpeas are a common food source component due to their inexpensive cost, substantial amount of protein, and high protein digestion. Additionally, chickpea protein can be a good substitute for animal-derived protein in food items (such milk and eggs), which will boost demand for plant-based protein products and encourage the consumption of healthier and more sustainable foods [3].

Composite Flour

The use of composite flour, which blends wheat flour with locally accessible crops, has drawn interest in developing nations because of its benefits, which include promoting locally grown foods and lowering the amount of wheat flour imported. The primary goal of composite flour is to improve the nutritional content of wheat flour by supplementing it with other cereal flours to make up for its deficiencies in important minerals and amino acids [4].

This study focuses on the development of composite flour using finger millet and black chickpea flour, aiming to enhance the nutritional profile of composite flour by leveraging the unique properties of finger millet and the nutritional advantages of black chickpea.

Finger Millet

In the semi-arid tropics, especially in India and East Africa, finger millet (Eleusine coracana G.) is a significant food grain crop. In recognition of its exceptionally high nutritional quality and superiority over other cereals, it is regarded as a repository of nutritious qualities and a possible cure for malnutrition and hidden hunger. With about 60% of the world's production coming from this main producer, finger millet is produced in India. Research on finger millet's numerous medicinal properties for humans is expanding at the same era as the grain is being used more and more as a dietary supplement. It is among the earliest meals that people were ever given and may represent the first cereal grain to be utilised in a home [9].

Nutritional Aspect of Finger Millet

Finger millet is widely known for its high nutritional content, which includes dietary fibres (18%), phenolic compounds (0.3–3), and calcium (0.38%). Beyond from that, finger millet encompasses therapeutic properties such as antiseptic, antioxidant, and anti-tumorigenic traits. Diabetic-based food structure employing finger millets entails 13.0-18.3% proteins, 11.3-11.8% fats, 59.9-67.5% starch, and 13.2-18.0% dietary fibers, and the glycemic index (GI) values were 55.4+/-9, 93.4+/-7, 105+/-6 and 109+/-8. (Tidke, 2020). Ragi is incredibly healthy since it contains calcium, minerals, and fibre, among several other nutrients. Carbohydrate content in cereal grains ranges from 72 to 79.5 percent. The non-starch polysaccharides make for 20–30% of the total carbohydrates in ragi [16].

The percentage of protein in finger millet fluctuates from 4.9% to 11.3%. Glutamin and prolamins are the primary protein components of finger millet. When assessed against others, finger millet has a

nutritious content that is appropriately balanced. About 44.7% of finger millet's essential amino acids are present, which is more than the FAO reference protein's 33.9%. The primary protein found in finger millet, eleusinin, is substantially abundant in cystine, tryptophan, methionine, and other aromatic acids that are essential to human growth and development that are absent from other millet grains or cereals. Finger millet contains a high amount of methionine, which makes up around 5% of the total protein.

The percentage of lipids of finger millets is around 5.2% and is made up of oleic acid, palmitic acid, and linoleic acid. There is 1.3% of fat present as free lipids. since of its tiny germ, finger millet grain has a low fat content and offers an excellent and noteworthy storage system since there is a lower chance of fat turning rancid in this environment.

The ash concentration in finger millet is significantly greater than that of other cereal grains. Finger millet can be supplemented to the diet on an ongoing basis to help cure illnesses caused by a calcium deficit, such as disorders of the teeth and bones and iron-deficiency anaemia. It is discovered to contain between 1.7–4.13% ash. Contrary to other cereals, it is an assortment of nutrients that is higher in calcium. It is an excellent source of potassium, iron, magnesium, sodium, phosphorus, and copper. The germ, aleurone layer, and pericarp of finger millets have the highest concentration of minerals.

Millets are thought to have a possibly high vitamin B content. The vitamin A content of finger millets is roughly six retinol. Finger millets encompass fat- and water-soluble vitamins such thiamine, niacin, riboflavin, and tocopherols, sometimes referred to as vitamin E with vitamin C. Finger millet's germ and aleuronic layer are particularly high in water-soluble vitamin B.

Abundant in nutrients, fibre shortens intestinal transit periods and fosters the maintenance of an optimum gastrointestinal system. This will result in a decline in blood serum lipoprotein cholesterol total value and blood postprandial glucose level. The fibre contained in finger millet accounts for to both immune system maturation and improved calcium bioavailability. It works effectively against colon cancer. Finger millets feature significant fibre levels in the pericarp and endosperm walls [17].

According to reports, finger millets contain 18.6% of fibre and are essentially made up of lignin (7.9%), cellulose (4.7%), and noncellulosic polysaccharides (6.1%), of which 4.7% and 1.5% are water insoluble [18].

Therapeutic Potential of Finger Millet

Millets possess multiple medicinal qualities in addition to nutraceutical assets that aid in safeguard against an assortment of ailments. Studies by scientists have proven that they could assist to refrain from cardiovascular issues, shrink blood pressure, while decreasing the probability of cancer and heart disease. Additionally, millets aid in gastric emptying while delivering fibre to the gastrointestinal system, which promotes digestion and maintains the body's pH equilibrium.

Millet and its Implications on Diabetes

Studies have proven that ingesting millets lessens the likelihood of acquiring diabetes. Phenolic chemicals encompassed in these grains have an impact in the repression of enzymes such as pancreatic amylase and alpha-glucosidase, which lowers postprandial hyperglycemia. Furthermore, inhibitors like aldose reductase isolated from millets can aid in hindering sorbitol formation and lowering the prevalence of cataracts linked to diabetes. Additionally, research has demonstrated that feeding diabetic rats finger millet offers a number of benefits. These include faster healing of cutaneous wounds, better antioxidant status, and improved oversight of blood glucose levels.

Millets and Cardiovascular Well-being

Magnesium has been reported to be associated with heart attacks and migraines, and millets are an excellent supplier of this mineral. They additionally incorporate phytochemicals, which includes phytic

acid, which is well-known to minimise cholesterol. In hyperlipidaemic rats, certain millet varieties, especially finger millet, have been illustrated to potentially lower plasma triglyceride levels, hence reducing the risk of cardiovascular disease.

Gluten Sensitivity and Millets

For individuals who experience gluten sensitivity or celiac disease, millets are an excellent gluten-free substitute. In genetically vulnerable people, millet can help circumvent immune-mediated enteropathy as a viable substitute for wheat and other gluten-containing cereals.

Millets and the Defence Against Cancer

Even though millets contain specific anti-nutrients involving phytate, tannins, and phenolic acids, investigations reveal that these constituents may reduce an animal's potential of developing colon and breast cancer. Research conducted in vitro indicates that millet phenolics may have a potential effect in delaying the onset and spread of cancer.

Millets' Ability to Soothe Inflammation

Millets have potent anti-inflammatory, free radical-scavenging, and antioxidant qualities, especially those that contain ferulic acid. Such antioxidants serve as vital for hindering tissue deterioration and accelerating the healing of scars. For example, it has been noticed that finger millet possesses beneficial antioxidant effects on the healing of cutaneous wounds in diabetic rats, significantly reducing inflammation caused by oxidative stress.

Millets and Longevity in Health

Rich in phenolics and antioxidants, in addition to tannins, phenols, and phytates, millet encounters a capability to regulate metabolic syndrome, elevate health, and slow down ageing. These substances have a potential to inhibit non-enzymatic glycosylation, a chemical process connected to problems related to ageing and diabetes [20]. Millets' antibacterial powers

Millets have been found to have substantial antibacterial activity in some fractions and extracts. Research conducted in vitro has shown that seed protein extracts from different types of millet may successfully prevent the growth of phytopathogenic fungi such as soil-borne Rhizoctoniasolani, seed and soil-borne infections Macrophominaphaseolina, and seed-borne Fusariumoxysporum. Interestingly, pearl millet extracts are highly effective against all three fungus [21].

Bioactive Components of Finger Millet

The nutritiousness of food is dictated by its nutritive constituents and bioactive chemicals which encourage longevity. Wheat, rice, and maize have been thoroughly researched for their phenolic percentages and bioactive traits. These grains encompass health-promoting aspects such vitamins, minerals, and phytochemicals. Millets serve a vital purpose because their seed sheath comprises polyphenol, which has a chlorogenic dosage ranging from 0.09 to 2.44 mg per 100 grammes. Finger millets encompass hypoglycemic attributes, hypocholesterolemic and anti-ulcerative characteristics. Phenolic compounds are prevalent in any assortment of millet and have a relation to numerous aspects of the cell wall by glycosidic implications, like arabinoxylans and protein. Bioactive phenolics are especially noticeable in a wall bound constitute in finger millet seed coat. Finger millet possesses numerous phytochemicals, notably phenolic compounds, which could assist in averting progressive diseases such as diabetes, cancer, and heart ailments. It is highly esteemed for its therapeutic benefits, encompassing both micro- and macronutrients. Polyphenols incorporate flavanols (catechin and epicatechin), flavonoid glycosides (quercetin, apigenin), and proanthocyanidins. Finger millet's antioxidant assets derive primarily from phenolic constituents, notably hydroxybenzoic acids (protocatechuic, p-hydroxybenzoic, and syringic) and hydroxycinnamic acids (caffeic, p-coumaric, and ferulic). Finger millet boasts a dark brown seed exterior and a substantial polyphenol content, distinguishing it from rice, wheat, maize, and barley. Phenolic compounds reside in the outermost

Table 1. Bioactive agents and their therapeutic upsides.

Bioactive ingredient	Illustrations	Primary millet yield	Positive aspects	References
Polyphenols	Hydroxycinnamic acids: protocatechuric, vanillicacid. Coumaric, snapic, and ferulic acid are hydroxybenzoic acids.	Finger millet (BRAN LAYER).	Averts osteoarthritis, inflammation, epithelial neoplasms, and dementia.	(Priya et al., 2023).
Flavonoids	Quercitin, catechin, trichin, luteolin, and myricetin.	Pearl millet, Finger millet, Sorghum (SEED COAT)	Cyro-protective, anti-inflammatory, and anti tumour activity	(Sang et al., 2020)
Phyto-sterols	B-Sitosterol, Campestrol, and Stigmasterol	Proso, foxtail millet	Prevents arterial disease, heart attack, stroke.	(Sanjana et al., 2021).

sections of the bran split, spanning the aleurone layer, testa, and pericarp, in both free and bound configurations. Ferulic acid (64–96%) and p-coumaric acid (50–99%) are the most ubiquitous confined phenolics in finger millets. Finger millets exhibit proanthocyanidins, also known as condensed tannins.

Chickpea

One important plant that gives the world's expanding population wholesome nourishment is the chickpea (Cicer arietinum L.) [10]. The need for sustainably produced proteins is increasing because to the growing global population, which is driving a dietary shift towards plant-based proteins. Biological value and digestibility of vegetable proteins are lower than those of their equivalents generated from animals [11]. Chickpeas are a popular meal and ingredient in modern and ethnic cuisines all over the world. They are an abundant source of dietary protein and phenolic bioactives which encourage human health. For this reason, chickpeas are a valuable source of functional food ingredients for high-value, health-focused culinary and nutraceutical applications [12]. Pulses such as chickpeas are widely consumed worldwide and are rich in protein, fat, fibre, and other carbohydrates. The need for the protein component of this pulse is increasing along with the global population, and many extraction techniques have been developed and suggested [13]. The incorporation of pulse flours in place of conventional staples (such bread and pasta) is evolving [14].

Nutritional Aspect of Black Chickpea

An excellent supplier of macro- and micronutrients, chickpeas are known for their high protein content and other beneficial health properties, including anti-inflammatory, anti-diabetic, and anti-tumor effects. Chickpeas range in protein levels from 18 to 22%.

Chickpeas provide more superior protein than other pulses. Its protein digestibility, protein conversion ratio, and biological utility are all higher. It is abundant in arginine and lysine but lacking in sulfur-based amino acids. When eaten with cereal, pulses provide complementary protein and help sustain an appropriate equilibrium of amino acids.

Carbs make up the majority of the content of chickpea beans. It has both accessible and inaccessible carbs. Because chickpea seeds have a relatively low glycaemic index—a result of their resistant starch and high amylose content—they extend medicinal benefits against diabetes.

The predominant oligosaccharide that exists in chickpeas is ciceritol. Chickpea seed fat content shifts from 3 to 10%. The fatty acid content of chickpea seeds fluctuates based on the cultivar and external conditions. The primary lipid composition of chickpeas is unsaturated linoleic acid, which is subsequently followed by oleic acid. Iron, calcium, zinc, and magnesium are the essential micronutrients that chickpeas are a valuable source of. One hundred grammes of chickpeas may present all the iron and zinc demanded each day. It also incorporates significant levels of vitamin B complex and tocopherol, or vitamin E.

Table 2. Composition of chickpea (per 100gm) (Kaur & Prasad, 2021).

Component	Chickpea (whole)
Moisture (g)	6.64–10.42
Protein (g)	17.1–22.6
Ash (g)	2.23–4.2
Fat (g)	2.7–7.42
Fiber total (g)	7.8–12.7
Carbohydrate (g)	50.64–66.9

Chickpeas boast multiple medical benefits, which are primarily attributed to their bioactive components. The predominant phenolic chemicals found in chickpeas are called isoflavones. Carotenoids stimulate the body's capacity utilisation to absorb iron, which boosts iron's permeability.

Therapeutic Potential of Black Chickpea

Efficacy as Antioxidants

- Two retrieved peptides (P3 and P8) possess a substantial ability to scavenge free radicals, thus rendering them useful as natural antioxidants to stop the oxidation of functional foods. Antioxidant characteristics were greater in the P8 peptide than in the P3 peptide.
- Likewise hydrolysates of chickpea protein have revealed the presence of four antioxidant peptides that are segment of the legumin protein and contain sequences of ALEPDHR, TETWNPNHPEL, FVPH, and SAEHGSLH. These peptides are homologous to butylated hydroxytoluene (BHT) due to their abundance of amino acids and potent antioxidant traits. Chickpeas possess one of the most abundant doses of α-tocopherol amid legumes (8.2 mg/100 g).

Anti-inflammatory Attributes of Chickpeas

Bifidobacterium detected in the colon ruptures down and metabolises raffinose offered by chickpea, thus yielding butyrate, a short chain of fatty acid recognised as an inflammation suppressor. On top of that, it strengthens periodicity in the intestines and perhaps safeguards in opposition to colon cancer by hampering apoptosis. The equivalent procedures have been uncovered when bacteria decompose resistant starch. Byproducts include acetic, propionic, and valeric acids. Chickpeas possess resistant starch as well, implying that they confer comparable amenities. Chickpea polyphenols have been implicated in anti-inflammatory benefits in an assortment of disorders, including T2D and obesity, since they minimise the generation of reactive oxygen species (ROS), which are free radicals formed by oxidative stress in the cell.

Restrains Angiotensin I Conversion Enzyme (ACE-I)

Hypertension is an integral contributing factor for arterial disease and stroke. The renin-angiotensin system supervises arterial pressure. The angiotensin I-converting enzyme, a metallopeptidase, utilises angiotensin I to angiotensin II. Angiotensin II is a vasoconstrictor molecule which triggers arterioles to shrink quickly, leading to an elevated arterial pressure.

- Numerous investigations suggest that bioactive chemicals isolated from legumes, notably chickpeas, may mitigate ACE-I activity.
- An investigation concluded that bioactive peptides derived from the dissolution of chickpea proteins (pepsin, trypsin, and α-chymotrypsin) can suppress ACE-I at a concentration of 140-229 μg/mL.

Effectiveness Against Cancer

Carcinogenesis is a multi-stage phenomenon involving epigenetic and genetic changes that turn normal cells into cancerous cells. Cancer cells exhibit excessive growth, making blocking of this process a viable treatment option.

- Discovering novel anticancer drugs from nature's assets, such as chickpea seed, might offer an alternate approach to combating cancer and therapy.
- An investigation uncovered that chickpea protein extracts, high in albumins, effectively inhibited MMP-9 metalloproteinases and cellular migration in colon carcinoma (HT-29) cells by 95% and 63%, respectively. Inhibiting metalloproteinases, reportedly played an aspect in the progressing propagation of colorectal cancer in both model organisms and individuals which may be an effective therapy for cancer prevention or progression shrink.

Hypocholesterolemic and Hypoglycemic Activity

The contemporary lifestyle's increased intake of saturated fats and insufficient ingestion of dietary fibre has been correlated with elevated blood lipid levels and cholesterol levels, which can be deleterious to health. Hyperlipidemia has been implicated to a broad spectrum of cardiovascular and metabolic difficulties, including obesity, atherosclerosis, fatty liver, pancreatitis, and coronary cardiopathy. Research demonstrates that devouring chickpeas could potentially lower blood cholesterol levels partly because of their plentiful fibre and diminished lipid content.

- The adverse effects of a 10% chickpea diet on mice who had previously had a high-fat diet was assessed. The study acquired that the chickpea diet diminished visceral adiposity, dyslipidemia, and insulin resistance.

Antifungal Properties

The scarcity of curative measures for fungi-related ailments has led to a sanitation concern. Additionally, commercial antimycotics might have negative effects. Plants have traditionally been utilised to prevent and treat infectious disorders. Recently, antimicrobial vegetal proteins have been acquired to hinder the propagation of germs.

- Investigation was done whether extracts from chickpea seeds have antifungal activity against Candida albicans (ATCC10231) at 8 µg/mL concentrations.
- Chickpea seeds boast two peptides, cicerin (8.2 kDa) and arietin (5.6 kDa), each of which that exert fungicide properties against Mycosphaerellaarachidicola, Fusariumoxysporum, and Botrytis cinerea. However, arietin outperformed cicerin in this regard [22].

Bioactive Components of Chickpea

Food integrates bioactive constituents, which can have a beneficial and detrimental impact on the body beyond nourishment. Pulses incorporate dietary minerals and antinutritional ingredients that can have beneficial implications on welfare. Pulse proteins embody bioactive peptides with antioxidant, antihypertensive, and curative properties. Polyphenols possess antioxidant effects, and oligosaccharides and polysaccharides trigger short-chain fatty acids which nurture bowel wellness. Bioactive peptides that inhabit dietary proteins can be synthesised by potentially endogenous or exogenous enzymes, notably papain and alcalase. Bioactive peptides furnish profound therapeutic benefits and can be exploited for crafting functional meals. The amino acid dispersion of pulses fluctuates based on their kind, interpreting execution, and circumstances. Pulses have more profound nutritional security ratings than other plants due to their substantial protein sum, protein purity, slowly digested starch, and dietary fibre concentration. Additionally, pulses exhibit greater qualitative protein ratings [27].

Chickpeas are exceptionally rich in leucine, isoleucine, and arginine, whereas lentils exhibit phenylalanine and serine, cowpeas have methionine and threonine, and faba beans embody arginine and leucine [28].

Chickpeas are abounding in flavonoids and polyphenols, which function as antioxidants. The proportion of flavonoids and polyphenols in chickpeas diverges based on colour, with deeper colours implying higher elevations. Chickpeas have inferior dosages of anthocyanins and polyphenols, but major instances of phenolic acids such hydroxycinnamic, anise, caffeic, cinnamic, p-coumaric, chlorogenicisoferulic, and piperonyl. Chickpea's phenolic acids have potent anti-oxidant capabilities,

mitigating oxidative stress and chelating metal ions. The exploration uncovered that darker coat pigmentation led to spikes in indices of flavonoids, total phenolics, and anthocyanins in conjunction with lighter coats. Black and brown chickpeas had substantially higher levels of carotenoids (36.4mg/kg and 35.2mg/kg, respectively) than beige chickpeas. Theorists revealed that the desi chickpea has a more profound carotenoid saturation than the Kabuli chickpea due to its more luminescent seed coat tint. The beige kind possesses a higher anthocyanin concentration in contrast to brown. The concentration of black chickpeas ranged from 23.3 to 159 mg/kg. There was no discernible variation in total the phenolic molecules amid brown and black chickpeas, with 0.8mg/g and 0.7mg/g, respectively. Utilising dark and black chickpeas may elevate the daily allowance of beneficial chemicals and fibre. Chickpeas have a low glycemic index, curbing the prospect of diabetes and heart disease (25.3mg/kg) [29]. Zhao et al. assessed cumulative flavonoids, phenolics, and anthocyanins in 6 chickpea variations [30].

Bioactive Compounds that Inhabit in Pulses that are Both Beneficial and Detrimental

Table 3. Bioactive compounds that inhabit in pulses that are both beneficial and detrimental (Acquah et al., 2021).

Bioactive constituents	Overview	Ramifications	Detrimental effects
Alkaloids	Biological amines possess an imperative function in pulse structures.	Encompasses antioxidant, antibacterial, anticancer, and anti-inflammatory traits.	Can induce digestive, reproductive, and immunological ailments, as well as impact the central nervous system.
Oligosaccharides	Pulses entail α-galactosides, for instance raffinose, stachyose, and verbascose, as the predominant oligosaccharides.	Bonuses embrace optimised stool passage, diminished amounts of potentially carcinogenic N-nitroso compounds in the gut, and a prebiotic impression which fosters proliferation of lactobacilli and bifidobacteria while curbing enterobacteria in the colon.	Fermentation in the lower intestine renders methane, prompting gastric distress and flatulence in recipients who do not possess bacteria that migrate oligosaccharides to short chain fatty acids.
Polyphenolics	The chief extracellular metabolites of plants that inhabit food. Chemical frameworks fluctuate between elementary (phenolic acids) to extensively polymerized (proanthocyanidins).	The possibilities embody antioxidant, anti-hypertensive, anti-atherosclerotic, anti-thrombotic, anti-allergic, anti-bacterial, and anti-cancer traits. Alpha-amylase inhibition curbs glucose assimilation.	Diminishes mineral bioavailability, protein digestibility, and bioactive peptide assimilation.
Saponins	These triterpene glycosides possess a basic harsh texture and emit stable foams in water treatments.	Restrain utilisation of dietary fats, cholesterol, and bile acids.	Recruits to petite intestinal cells, hindering nutrition acquisition and effectiveness.
Phytosterols	Plant sterols have a molecular outline reminiscent of cholesterol. Since the body can barely reconcile them, they must be retrieved from meals.	Negates blood cholesterol levels and intestinal utilisation of cholesterol (both nutritional and innate).	Scientific inquiry implies that the oxidative degradation of phytosterols during food preparation could escalate the probability of heart ailments.
Gammaaminobutyric acid (GABA)	Non-protein amino acid molecular structures.	Minimises blood pressure in hypertensive individuals, has anti tumour properties, and influences blood cholesterol scales.	High GABA accumulations might trigger excessive sleeping.
Lectins	They're sugar-binding structures	They have antioxidant and anti-tumor implications, impede carbohydrate synthesis and	Diminish efficacy of polysaccharides and elements. It may also provoke blood clotting,

		absorption, and stabilise circulating glucose homeostasis.	feelings of fullness, and digestive distress.
Phytic acid	Also designated myo-inositol hexakisphosphate. Phosphorus is primarily retained in seeds.	It boasts both anticarcinogenic and antioxidant abilities.	Negates the assimilation of little-known minerals such calcium, copper, iron, zinc, magnesium, and manganese.
Oxalic acid	Furthermore referred to as oxalates. These are physiological byproducts.	Minimal medicinal properties.	Excessive consumption can hinder the utilisation of minerals and eventually result in kidney calculi.
Vicine and convicine	These are pyrimidine glycosides detected in the genus Vicia. They are unreliable in acidic environments and deteriorate at elevated degrees.	Initial analysis implies vicine, convicine, and divicine could minimise cardiac arrhythmia, impede malaria parasite progression, as well as possess anti-tumor and anti-inflammatory attributes.	Triggers mild hemolytic anaemia (favism).
Tannins	These are composed of substantial molecular weight polyphenols.	Incorporate antioxidant pursuits.	Minimises energy and protein breakdown, and competes with iron and zinc assimilation.
Trypsin and chemotrypsin inhibitors	These secondary metabolites are thermal receptive.	Features anti-carcinogenic qualities.	Complexed proteins have impaired digestibility and sulphur-amino acid ratios.

Composite Flour

A blend of flours made from cereals, roots, tubers, legumes, or other raw materials is known as composite flour. It can be classified as both wheat and non-wheat flour. One can create both conventional and novel items such as vermicelli, chakli, cupcakes, and muffins. Because of their benefits in terms of functional qualities and organoleptic acceptability, composite flours have been widely employed in the production of baked and extruded goods. Products with high nutritional content are usually favoured by customers so they could offer high health advantages. Whole grain is primarily utilised for the production of products manufactured from composite flour so that customers have the greatest nutritional benefits. Additionally, they improve the flavour and texture of goods. These products also have a significant quantity of crude fibre and the recommended amounts of calcium, zinc, copper, niacin, and thiamin. Additionally, they have biological properties that include anti-inflammatory, antiseptic, antiviral, anti-carcinogenic, and anti-oxidant capabilities [5].

When compared to conventional flours, CF offers superior nutritional qualities. It is also well-suited for use in food items, perhaps resulting in the appropriate nutritional composition. In addition to these benefits, food manufacturers may be encouraged to create “healthier” items by substituting CF for regular flour in their product formulations. This is because CF offers superior nutritional value than normal flour. This might lead to a marketing advantage when people view “healthier products” as superior choices, giving them a competitive edge over competing goods [6].

In compliance with Divakar and Prakash's (2021) analysis, composite flour that comprises both whole grain and millet-based flour is a rich source of nutrients, including dietary fibre, protein, fat, and bioactive components. High levels of protein, essential amino acids, polyunsaturated and monounsaturated fatty acids, and bioactive substances including total phenols and total flavonoids were all present in composite flour. As a result, this type of flour is utilised to create wholesome goods for consumers of all ages.

Because composite flours have a credibility for reducing a variety of lifestyle disorders when used frequently over time, they are currently gaining popularity in the commercial food and nutritional industries. This is because people are becoming more conscious of their health as a result of leading busy lives and finding themselves pressed for time. The market for confections and the need for

healthier food are expanding, which will eventually lead to the replacement of wheat flour in product manufacturing.

The FAO declared that if the importance of wheat flour could be reduced or even eliminated and the demand for the production of bread and pastry products could be satisfied by the regular use of domestically grown products in place of wheat, then the use of composite flour for the fabrication of various food products would be economically advantageous. The production of bakery goods using composite flour had positive qualities and had certain characteristics with bread made with wheat flour; nevertheless, the texture and other qualities of the flour are distinct and have higher nutritional and aesthetic value.

The protein content of wheat ranges from 8 to 15%. Bakery goods such as cookies, noodles, bread, cakes, and pastries are refined with wheat flour. The functional characteristics of the combined samples are likely to change when various flours are blended with wheat to form composite flour for baking items. Traditionally used in diets, legumes such as soybean, chickpea, and lentil are an excellent source of proteins, vitamins, carbs, and minerals. Millets used to make flour are abundant with lipids, dietary fibres, vitamin B, and minerals including calcium, phosphorus, iron, and polyphenols. Since millets exclude gluten, those with celiac disease may be able to eat them. Millets are an outstanding option for future product development since they contain strong nutritional and sensory qualities as well as underlying hypoglycemic capabilities [8].

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