FUNCTIONAL FLOURS

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Flour: Micronized sizes of powder procured by grinding of various grains, pseudocereals, legumes, nuts, parts of several plants such as roots, leaves and fruits.

In general, the first product that comes to mind when it comes to flour is;

"WHEAT FLOUR"

Flour means

"Wheat Flour" is understandable.

Wheat is the raw material of some products such as flour, bulgur, bread, cookies and pasta.

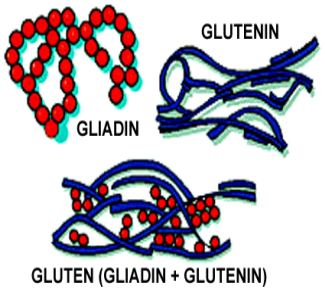
As the main components of wheat flour are: Proteins, carbohydrates, lipids, minerals, vitamins, functional components (such as phenolic compounds, carotenoids, flavonoids, phytosterols, lignans, fibers), enzymes and water.

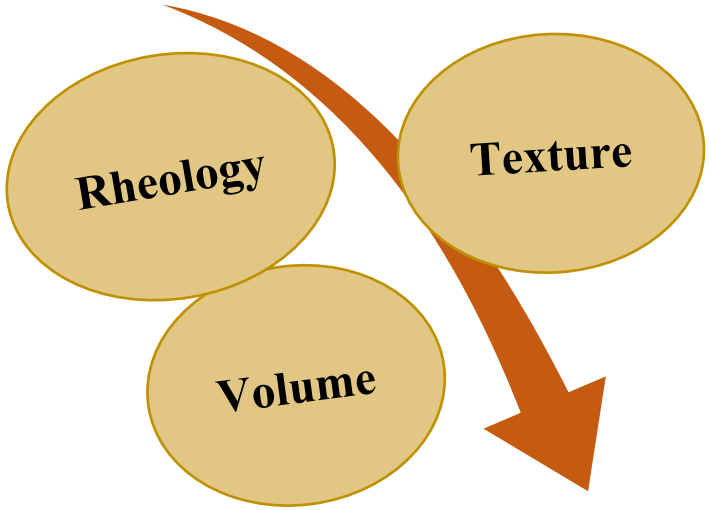
Each of these chemical groups has different functional properties during the processing of foods, as well as their effects on nutrition and health.

Perhaps the most important role during bakery product processing belongs to GLUTEN.

Gliadin and Glutenin, which are gluten-forming proteins, have unique effects on dough development and rheology also product quality such as volume, and texture.

Similarly, it has very important functions such as swelling capacity, foam stability and gelling properties.





Swelling

Foam stability

Gelling

Nutrition is an essential part of health and development. Better nutrition is related to improved infant, child and maternal health, stronger immune systems, safer pregnancy and childbirth, lower risk of non-communicable diseases (such as diabetes and cardiovascular disease) and longevity.

During the recent years, people have started to pay more attention to the relationship between nutrition and health. Depending on consumer demands, the food industry is interested in innovative and nutritious products.

Therefore, one of the products that can be used is FUNCTIONAL FLOURS.

Functional flours has a wide definition range and there is no clear and short definition in the literature.

The functional flours are manufactured and treated to have enhanced nutrient qualities with health related benefits and improved food processing functions.

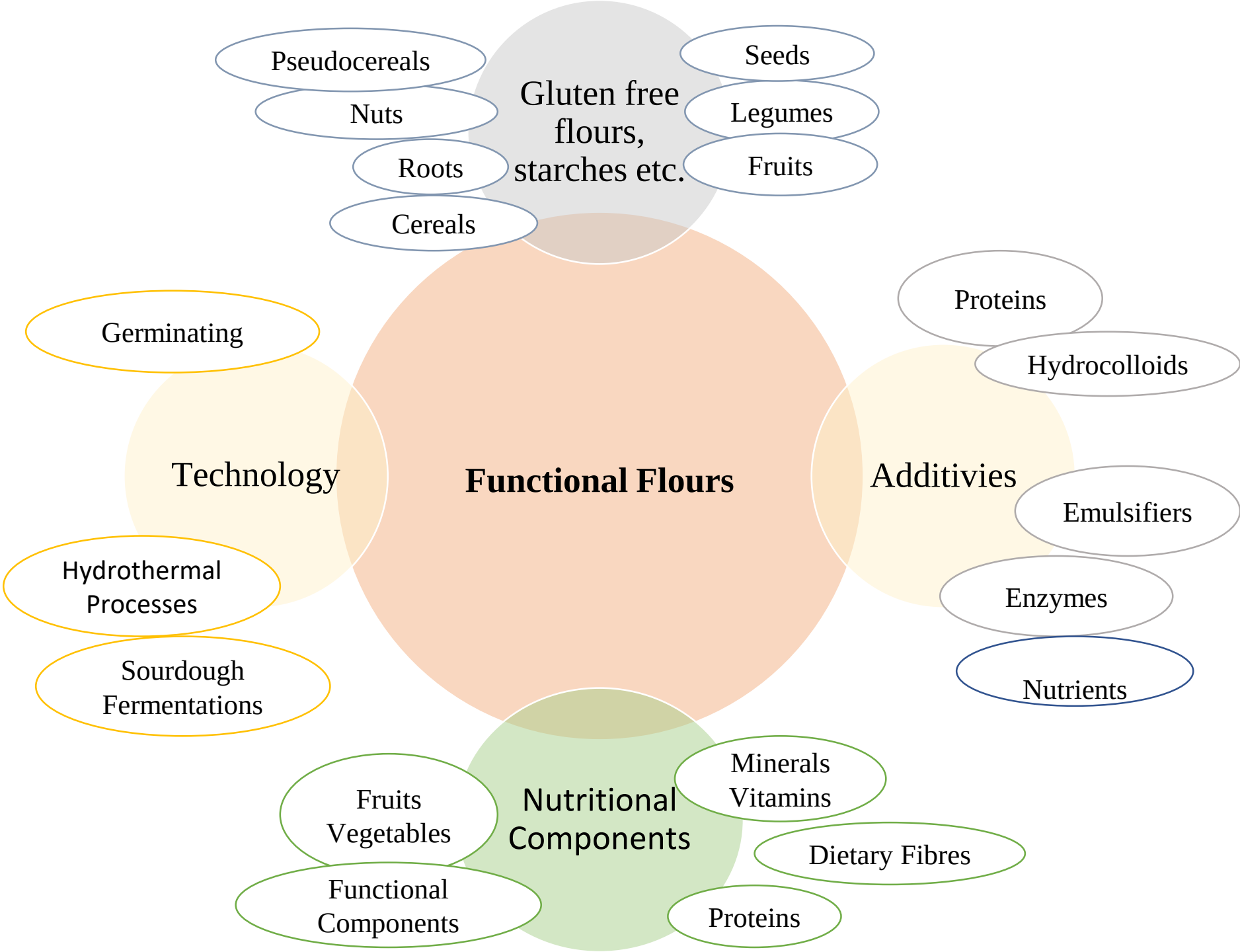
Functional flours have become a growing market in recent years for two main reasons:

- Due to their improving effects on food production,
- Positive effects on human health.

In the production of functional flours, mostly cereals, legumes, pseudocereals, other seeds, fruits and various parts of some plants can be used as raw material.

In addition, products designed to meet the nutritional needs of different consumer groups, such as gluten-free mixtures, are included in this group.

Also, functional properties of flours can be improved by using different pretreatments and flour milling techniques.


Functional Flours
Gluten free flours, starches etc.
Pseudocereals
Nuts
Roots
Cereals
Seeds
Legumes
Fruits
Technology
Germinating
Hydrothermal Processes
Sourdough Fermentations
Additivies
Proteins
Hydrocolloids
Emulsifiers
Enzymes
Nutrients
Nutritional Components
Fruits Vegetables
Functional Components
Minerals Vitamins
Dietary Fibres
Proteins

CLASSIFICATION OF FUNCTIONAL FLOURS

a) Botanical Source

- Cereals
- Pseudocereals
- Others (seeds,herbs, spices,fruits, vegetables)

b) Production Process

- Thermally treated flour
- Hydrothermally treated flour
- Germinated seeds flour
- Mixed flour
- Composite flour

c) Applications

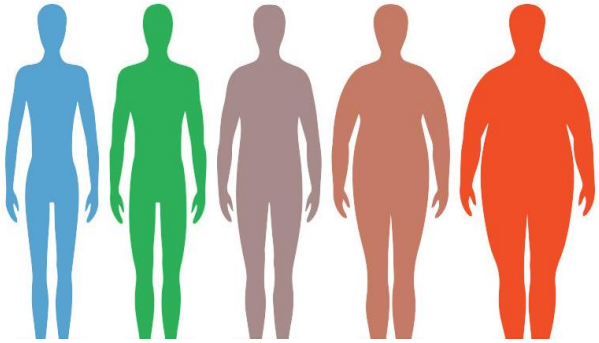
- Bakery and confectionery flour
- For other fields

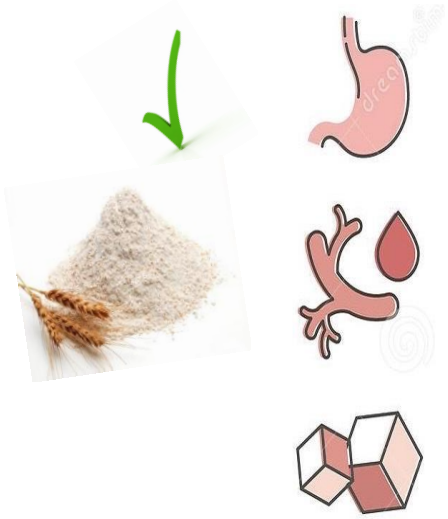
BOTANİCAL SOURCES

CEREAL/GRAİN FLOURS

Grains are rich by nutrients such as proteins, carbohydrates, lipids, mineral substances, vitamins, functional components (phenolic compounds, carotenoids, flavonoids, phytosterols, lignans, fibers).

However, most of the healthy components are found in the embryo and bran fractions that have been removed to some extent from the flour during processing.





Whole wheat flours are a much better source of vitamins, minerals, soluble/insoluble dietary fiber and phytochemicals than low grade white flour.

Regular consumption of whole wheat products has a protective effect against some health problems: Body-mass index control, blood pressure and cardiovascular disease risks decrease with the consumption of foods containing cereal fibers.

It’s beneficial for health to use whole meal flours of various cereals.

Phytates in whole grain flours and bran have antinutrient effects.

Studies to eliminate the harmful effects of phytates have also become popular in functional flour productions.

Also use of brans, which is a by-product of grinding, in the production of dietary fiber and germ oil is a popular production.

Wholemeal production

Use of brans in dietary fiber and germ oil production very popular

Purple, Blue and Black (Wheat) Flours

While the white and red genotypes of wheat are the most common, other colored genotypes such as the purple, blue and black types also exist.

Purple wheat seeds are a good source of anthocyanins. Their unique color and potential to contribute health benefits to consumers attracts the attention of food product developers.

Anthocyanins are flavonoid pigments that are responsible for red, purple, and blue colors in diverse organs in a wide array of plants. Anthocyanins also act as antioxidants, for example by scavenging free radicals.

In wheat, anthocyanins can be present in the pericarp (purple anthocyanins) or aleurone (blue anthocyanins) layer of the grain.

Purple and blue wheat grains, therefore, can be processed into innovative whole wheat (wholemeal) products that are rich in both dietary fiber and antioxidants.

Pseudocereals Flours

With the effects of high levels of proteins, fatty acids, dietary fibers, antioxidants, flavonoids, anthocyanins, carotenoids vitamins, and minerals in the structures of pseudocereals such as quinoa, amaranth, chia, buckwheat, have a protective effect on «obesity, cardiovascular diseases, diabetes, some types of cancer, hypoglycemia, etc.».

Pseudocereals are good sources for Omega 3 and 6, they are effective in lowering blood sugar and reducing risk factors for heart disease.

Also, protein ratios of pseudocereals are high comparing to grains and well balanced in essential amino acid sources.

They don’t contain prolamins, which are toxic for celiac patients, and could be used in a gluten-free diet.

Pseudocereals have been used locally for many years in different geographies of the world.

After understanding their importance in terms of nutrition, they have become popular all over the world.

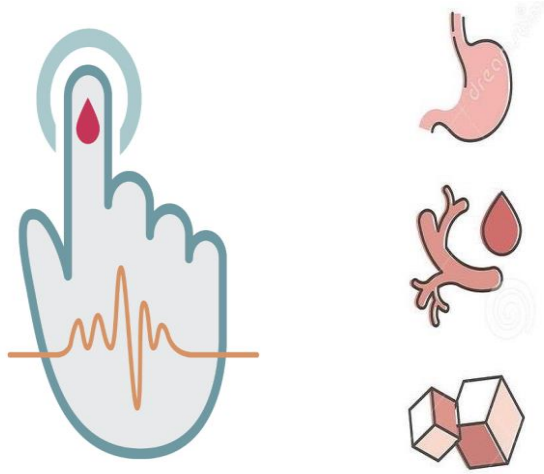
Especially flour forms should be stabilized due to their high lipid content and lipolytic enzymes activities. Or freshly grounding on site is another solution.

Legume Flours

Besides to their high protein content, they are also very rich as a source of fiber, iron, zinc, magnesium, folate, phosphorus, selenium and potassium.

Legumes have antioxidant and anticarcinogenic effects originating from phytochemicals, saponins and tannins in their contents.

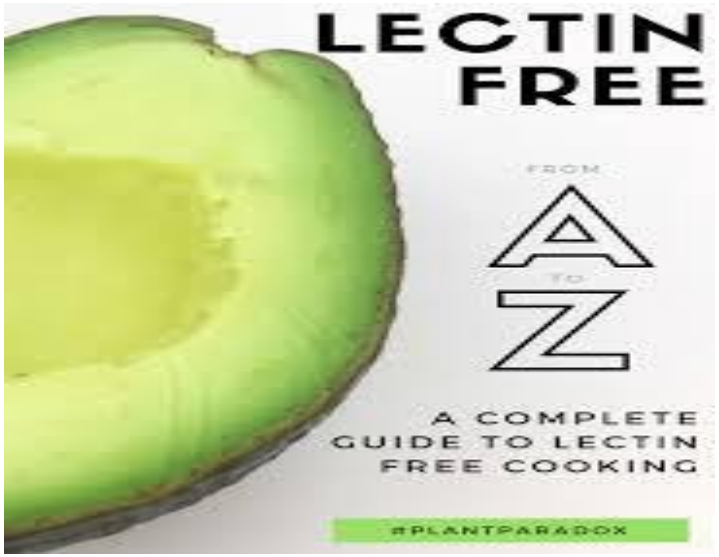
Regular consumption improves the serum lipid profile and positively affects many other cardiovascular disease risk factors such as blood pressure and inflammation. Legumes are high in fiber and have a low glycemic index, making them particularly beneficial for people with diabetes as they help maintain healthy blood sugar and insulin levels.



Although legumes contain various minerals and vitamins, they also contain antinutrients such as lectins and phytates.

Removing the negative effects of phytate and lectin is among the interests of the functional flour industry.

Some products are stabilized due to their high lipid content and lipolytic enzyme activities.



Seeds and Plants Flours

- The interest of consumers in plants and seeds flours has increased in recent years. Main sources of them are flaxseed, hemp seed, sesame, turmeric, ginger, red carrot, purple cabbage.
- In addition to have a good sources of soluble and insoluble fibers, seeds are rich in alpha-linolenic acid, Omega 3 and 6, antioxidants, lignan, iron, zinc, magnesium and many other nutrients.
- Particle size particle size distribution and grinding process should be applied carefully for absorption of bioavailable nutrients by the human body and some products should be stabilized due to their high lipid content and lipolytic enzyme activities.
- Especially purple carrots and cabbage flours rich in phenolic compounds, which have an important trend in recent years. They have many benefits such as reducing cholesterol, blood pressure, chronic inflammatory symptoms and oxidative stress.
- They are not consumed alone but they have been used in the composition of many formulated flours in recent years.

TREATED FLOURS

Thermally Treated Flours

Various seeds and cereals (especially wheat) can be used as raw materials. The purpose of thermal processing in flours is to reduce moisture content, increase nutritional and dusting properties, improve microbiological qualities and facilitate processing into foods.

Moisture of flour is should be reduced to the range of 3% to 10% without affected properties of gluten and starch components by short-term and low temperature applications.

Hydrothermally Treated Flours

They are characterized as flours whose properties have been improved by thermokinetic processes. Flour properties could be changed or improved by extrusion and other heat treatments. Generally, the extrusion process is cheaper and effective compared to other cooking methods.

Hydrothermally process causes changes in the behaviors of the flour components against water and oil, taste and aroma are improved, microbiological load is reduced. Hydrothermally treated flours are successfully used in instant soups, sauces, baby foods and various bakery applications.

Sprouted Flours

Consumption of sprouted products has become popular in different parts of the world.

Sprouting process leads to significant changes in the chemical and biochemical composition of seeds.

With sprouting process, the activity of enzymes changes, avalibility of nitrogen containing fractions (such as oligopeptide and free amino acids) and bioactives (such as phenolics, phytosterols, folates and gamma aminobutyric acid) are increases, amount of antinutritional factors (eg. Phytate, trypsin inhibitor, tannin) decreases.

The selection of varieties are suitable for germination should be made by considering important criteria such as suitable germination conditions, suitable drying conditions, and appropriate particle size when adding to flour. In addition, the effects of microbiological development to be caused by the germination process must be taken into account. It should be taken into account that there may be **"INCOMPATIBLE"** components, which (assuming that they are natural) may contain components that may react undesirably with each other and may have harmful interactions should take care.

Mixed Flours

In order to improve nutritional qualities and processing properties in bread making, some natural ingredients and different types of flours can be mixed with different ratios. For example, the addition of different fiber sources, ground flaxseed for Omega 3 and 6 supplementation and purple carrot flour to enrichment phenolic components etc.

In case of need, some nutrients (ie: iron, folic acid, etc.) can be added. For preperation of such kind of premixes microbiological and toxicological compositions, heavy metals and residue contents, pharmacokinetics and pharmacodynamics interactions must be well known.

Composite Flours

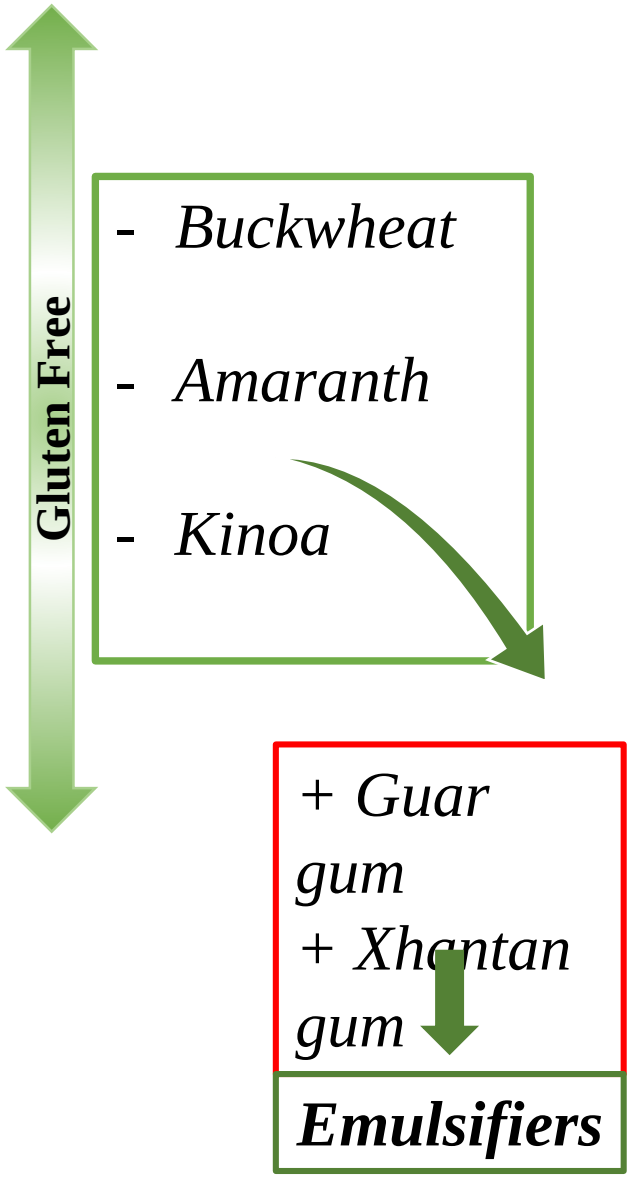
Incorporating one or more features for the nutrition of individuals who require special conditions in nutrition; Products such as gluten-free, diabetic, low glycemic index, high protein content, low protein flour mixtures can be evaluated in this category.

As a result of the increase in negative campagain against wheat gluten all over the world, gluten-free product types and segmentation have increased on the market.

It is estimated that the global gluten-free market size will reach $8.3 billion by 2025.

While composite flours were produced with a mixture of hydrocolloids and corn starch, interests of consumers in gluten-free functional products has increased in the last 10 years.

For example, buckwheat, amaranth and quinoa flours are formulated by adding various hydrocolloids as binders. Seeds and other nutrients are also added when necessary.



DİFFERENT APPLICATIONS

Flours for Bakery and Confectionery Industry

Flour based products are generally the most consumed foods worldwide. Even small changes in the flour particle size causes during the baking industry; changes mixing properties of dough, water absorption kinetics, dough processing properties, oil absorption properties and end product quality. For this reason, flour production in different particle structures for bakery products that will be served for fresh consumption or ready for packaged consumption, cold and frozen chain, has become a interested subject in recent years. In the production of snack products and extruded cereals, functional flours are used to increase the quality by providing ease of processing and to enrich them with nutrients.

Other Sectors

Functional flours, which are mainly used in the field of bakery products in the food industry, have started to be used in the preparation of products such as sauces, soups and cream spreads. Especially gelatinization properties are modified by hydrothermal processes are used for this purposes.

Pregelatinized flours are also a good alternative in 'CLEAN LABEL' productions that don’t contain E code, due to their water-retaining, oil-reducing and staling-retarding properties.

In the fields of pharmacy and additive preparation, flours with reduced microbiological load and improved flow properties are accepted through heat treatments.

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