

BASIC RAW MATERIALS USED IN PROCESSING OF THE SNACK FOOD (ECOLOGICAL/NON ECOLOGICAL) AND THEIR EXPANDING CAPACITY

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ABSTRACT

The food processing involves changing raw plant or animal materials into safe and tasty products. The snack products represents an area of great interest for the food industry both from the standpoint of technologies used to produce these products, and from the point of view of their high popularity among consumers.

The snacks type food products are produced on the basis of many raw and auxiliary materials. Usual, the raw materials for snacks are maize, wheat, rice, potato, tapioca and oats, but this is not a complete and exhaustive list.

An important ingredient in the production of snacks is the starch content of various raw materials. Starches granules from different sources vary from one another (in terms of size, shape and proportion of amylose and amylopectin), each of which may affect capacity of expanding. Among the raw materials with very good capacity of expanding are included especially potato and maize; on the other hand, the oats has a very little capacity of expanding. For this reason, the oats is used in small doses in the recipes of snacks.

INTRODUCTION

Alimentary behavior is the set of actions and attitudes related to food. Nutrition is the primary factor in the evolution of human health. Notoriety, the publicity campaigns and sensory qualities attractiveness of the packaging are the main reasons why most people buy certain products. But, notoriety does not say anything about the quality of food.

Snack foods are foods which can be eaten in place of, or in between, meals. They are convenient because they are quick and easy to eat. The term "snack food" does not only apply to some of the newer products such as potato crisps, but it also includes many traditional food items. Most snack foods are intended for immediate consumption. In most countries people from nearly all income groups consume snack food products. For example, a recent study revealed that the largest consumer groups in the urban areas were workers and school children (8). All the raw materials and lot of auxiliaries materials used in the production of the snacks are very rich in nutritional standpoint (proteins, vitamins, minerals, amino acids). For example, the maize grains have a high content of raw protein(1).

In Romania, the snacks category is still a young market, with growth potential, both in terms of consumption and the possibility of introducing innovative products with added value. Per capita consumption is still far below the European average, and the market is dominated by basic products less sophisticated, and is therefore space for products differentiation by developing new segments and concepts. However, the chips market in Romania is growing, consumers being attracted by the specially taste and the fact that the snacks are quite nourishing, quickly quieted the hunger or appetite for "something good". This market has become very active especially in recent years, when have made significant investments in promoting brands.

MATERIALS AND METHODS

This documentation study aimed the highlighting of the main raw materials used in processing of the snack food products, considering the reputation that these products they

have particularly among young people. There have been considered the main raw materials for obtaining the snacks, namely: potato, wheat, maize, rice, oat, barley, tapioca.

An important ingredient in production of snacks is the starch. Starch molecules have two molecular structures: a linear structure, known as amylose; and a branched structure, known as amylopectin. Has been described the content in the amylose and amylopectin, for establish the expanding capacity of the raw materials.

RESULTS

The market of the snack food products is very dynamic in terms of the product types. Although most of these products are not consumed mainly as a source of nutrients, many of which are made taking into account the nutritional needs of consumers. Over the past years, demand for snacks worldwide has increased steadily due to changing lifestyle and diet. The manufacturing industry of snacks is highly dynamic in an attempt to provide to consumers the products that they expect. Main consumers are young people who want tasty products, which smell good and look good.

The large scale production of the snack food has significant advantages: most snack foods are obtained from pulses, cereals, milk, fruits and vegetables; they are available all the time, easily obtained and cheap. The technology for obtained these food products is relatively simple and usually well known; the range of shapes, colors, flavors, and sizes of snack foods is almost infinite. This allows producers to develop their businesses; etc. In any case, the raw materials have the great nutritional value but this not excludes that these products should be consumed with moderation to avoid the health problems (because in the recipes of production are commonly used many chemical additives or so called „E” numbers; this reference is for non-ecological snacks).

Regarding ecological products, obviously they do not contain any type of chemical additives, and therefore are healthier but more expensive. The raw material is obtained in organic farms and all the ingredients which they contain must be environmentally friendly (3). In addition, some organic auxiliary ingredients (like garden bean) may be improved in terms of yield and the quality by application of some bioactive products, as for example green manure and husks of grapes compost (4).

The range of the snacks includes: chips (potato, tortilla, multigrain); biscuits (sweet, salty, with chocolate, vanilla, seeds, etc.); pretzels (salty, sweet), waffles (simple, with filling); popcorn, puffs, etc. For each product are used technologies relatively different and sometimes different production sections.

The progress achieved about extrusion technology and thorough understandings of the technological process itself have led to the diversification of the recipes for snacks type food products. An important ingredient in production of the snacks is the starch. Starches granules from different sources vary from one another (in terms of size, shape and proportion of amylose and amylopectin), each of which may affect capacity of expanding.

Table 1

The characteristics of the starch granules to several agricultural plant species (9)

| Starch | Granule size (µm) | Shape | Gelatinization (°C) | Expanding power |
|--------|-------------------|-----------|---------------------|-----------------|
| Potato | 15-100 | Oval | 56-66 | >1000 |
| Wheat | 2-35 | Flat | 52-63 | 21 |
| Rice | 3-8 | Polygonal | 61-77.5 | 19 |
| Maize | 5-25 | Polygonal | 62-72 | 24 |

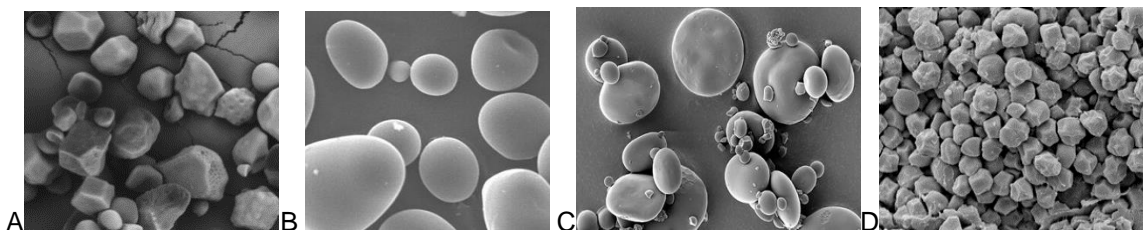


Fig. 1. Illustration of diversity of starch granules to a few agricultural plant used as raw materials in the production of snack: A-maize; B-potato; C-wheat; D-rice (10)

Pure starch is a white, tasteless and odorless powder that is insoluble in cold water or alcohol. It consists of two types of molecules: the linear amylose and the branched amylopectin. Depending on the plant, starch generally contains 20 to 25% amylose and 75 to 80% amylopectin by weight (2).

In general, the use of starch with an amylose content of 5-20% leads to improve the expanding and texture of finished product. Cereals with high fat content are difficult to be expanded because the dough it sticks to the walls of the housing of the extruder. These cereals must be processed at high temperature and humidity before occur a significant expansion.

In order to obtain snack type food products (ecological or non-ecological), the main raw materials used in production are the following:

1. Potato. Are using in the manufacture of snacks in a variety of forms: chips, flakes, flours with different granulation sizes and starches. The granules and potato chips are obtained from sliced and heat-treated potatoes in order to allow the enzymes to soften the cell walls before baking and drying.

Potato starch is commonly used in the recipe of snacks to give an extra swelling effect. Starch granulation size varies greatly, sometimes more than the cereals (15-100 μm). Potato starch contains about 20-25% amylose and has a very low content of lipids. During the extrusion of starch, potato starch increases the viscosity of the extruded mixture. Also, potato starch has very good capacity of swelling and binding properties.

In the snack food products, potato starch has a definite flavor, giving the product a golden color; requires low temperature for the extrusion because the starch granules distorts quickly.

2. Maize. Market demand for extruded maize snacks is growing. Maize is the main raw material for produce the snack type pellet and type puffs. So, the maize snacks come in "puffed" and "crunchy" varieties. They include: popcorn, cheese puffs, puff corn, corn chips, tortilla chips, corn nuts, etc.

Maize is the main raw material for the production of starch. For example, in 2013, 48.2% of the total starch production of the European Union was obtained from maize (7). Of the total production of starch from EU, about 30% is used in the processed food.

Starch granules from maize have medium size (5-25 μm) and swells and expanding very well. High amylose starch from maize has a higher gelatinization temperature than other types of starch from other cereals and retains its resistant starch content through mild extrusion and other food processing techniques. Generally, in the snacks industry is used the maize semolina of various granulations. The choice of particular granulations of the product depends on the snack and on type of extruder used. For example, for the production of a snack with a fine structure and small pores should be used maize semolina with a smaller granulation. On the other hand, for a crispier and aerated snack, it takes a bigger granulation of the maize semolina. During extrusion, the maize starch is baked at medium to high temperature. The role of starch in snacks is to give texture.

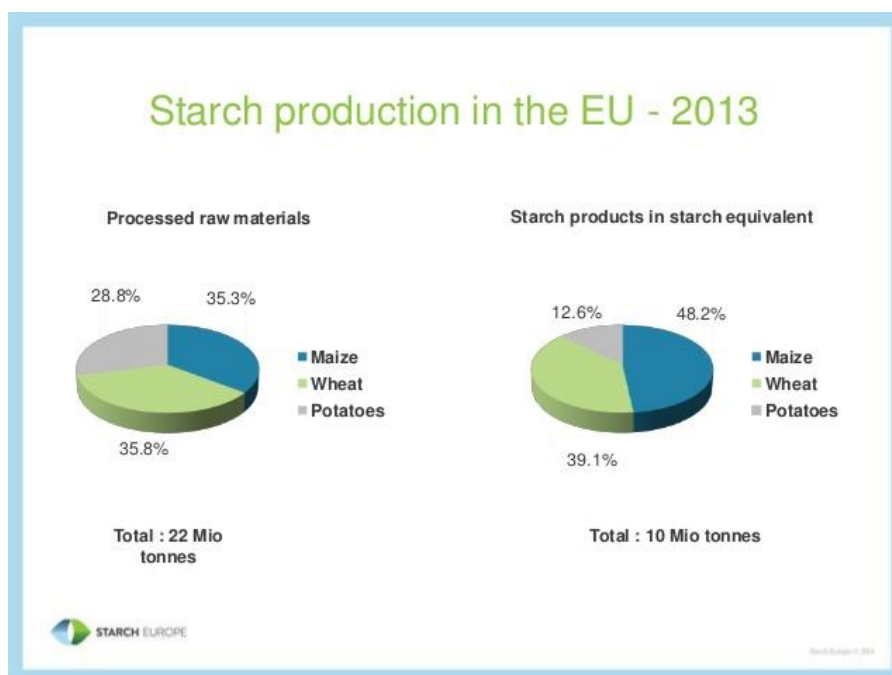


Fig. 2. Starch production in the European Union (7)

3. Wheat. The wheat flour is used in the production of baked or fried snacks, flavored crackers, cakes type snacks, pretzels, etc. Wheat starch granules vary widely in dimensions (2-35 μm) but are relatively large compared to other cereal starches (rice, maize). In starch of the wheat amylose represent about 20-25% (75-80% is amylopectin) which leads to a very good expansion.

In the extruded snacks, gluten is what gives nutritional value, crispness and texture. In general in the production of snacks is used an addition of 1-2% of wheat gluten. The varieties of wheat with lower content of gluten (soft wheat) lead to obtaining products finer than hard wheat varieties.

Usually, the snacks made from wheat have a moderate flavor and a color close to white. Requires moderate cooking temperatures. The by-products from grinding, ie bran, can be used with soy protein and other ingredients to manufacture of some snacks with high nutritional value and high fiber content.

4. Rice is one of the cereals grown on large areas worldwide. For example, in Japan, most of the snacks are made of rice or rice flour. Chips made with 100% rice flour retain with 20-30% less oil during frying. The granules of rice starch are the lowest of all cereal grains and are easily digested. In fact, rice starch granules are the smallest known to exist in cereal grains, with the size reported in the range of 2 to 7 μm (6) or 3 to 8 μm (9).

Flours derived from different varieties of rice have different physical and chemical properties which influence greatly expanding and the porosity of snacks. For example, the flour from long grain rice increase the snacks crispness, while waxy rice flour can reduce the hardness of snacks and simultaneously improve the texture.

5. Oat. A few years ago, the oats was not widely used in the manufacture of snacks. As recent research has shown that dietary fiber from oats contribute to lower of blood cholesterol, it determined the snacks producers to use increasingly more oats in the snack recipes. Among the snacks fabricated with oats, the most popular are the cookies and granola. The main problem of the oats is its high lipid content (7-9%). It is recommended that before using oats in the production process should be inactivated the lipases. Otherwise, the lipase will catalyze the hydrolysis of fats which lead to a bitter taste, due to free fatty acids. The starch granules of oats have a relatively small size (2-12 μm) as

compared to other cereals. The extruded snacks with oats starch it expands very little. For this reason, the oats is used in small doses in the recipes. The morphology and granular properties of oat starch during germination were investigated by scanning electron microscopy (5).

6. Barley is used in small quantities in the manufacture of snack products, along with other cereals. Its aroma and taste are moderate. The starch of barley flour has less expanding and water absorption capacity than others cereals (wheat, for example). From a nutritional standpoint, it is very similar to wheat, although it has a higher content of fiber.

7. Tapioca. It is used as a raw material for snacks with low calorie or as a supplement for the cereals. Tapioca starch granules vary in size within the range 5-35 μm . Amylose content is about 17%. Tapioca starches form highly viscous gels and they have very good binding properties. They are almost devoid of flavor.

Besides the basic raw materials, for the production of snacks is used other auxiliary materials, with taste and nutritional special properties, such as peanuts, dried fruit, oilseeds, some vegetables, etc. Without additives, many every day and popular foods would simply cease to exist. Some foods would suffer from a short shelf-life leading to significant wastage, whilst other foods might suffer from defects in appearance, texture or taste. However, over the recent years many European manufacturers have responded to increasing consumer demands for additive free and additive-reduced products. The savory snacks industry uses additives responsibly; only where specific technical functionality is required and only at the minimum level necessary to achieve the desired effect (11).

CONCLUSIONS

Currently, the ecological or non-ecological snacks are produce from many raw and auxiliary materials. The raw and usual materials for snacks are wheat, potatoes, corn, barley, oat and tapioca, all coming either from conventional farming or from organic agriculture, but this is not a complete and exhaustive list. There are several other ecological or non-ecological raw materials all over the world, which can be used to manufacture ecological or non-ecological snacks.

An important ingredient in the production of snacks is the starch content of various raw materials. Starches from different sources vary from one to another each of which may affect performance of expanding. Among the raw materials with very good capacity of expanding are included potato, corn and wheat; on the other hand, the oats has a very little capacity of expanding. For this reason, the oats is used in small doses in the recipes of snacks.

In general, use of starch with an amylose content of 5-20% leads to improve the expanding capacity and texture of finished product. Cereals with high fat content are difficult to be expanded because the dough it sticks to the walls of the housing of the extruder. These cereals must be processed at high temperature and humidity before occur a significant expansion.

In the recipes of non-ecological snack are many chemical additives, colorings or flavorings. Therefore, these snacks should be eaten in moderation, especially by the children. Anyway, eating healthy do not necessarily mean giving up snacks. In fact, any snack can be an excellent way to reduce the craving for crunching, as long as is smart snack.

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