FOOD, ITS PACKAGING – FOR A HEALTHIER AND ENVIRONMENTALLY FRIENDLY LIFESTYLE

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Food production is an integral part of Latvian industry. Food industry is one of the most important economic sectors in Latvia. Both in Latvia and around the world, the issue of healthy food made from natural raw materials is becoming more and more topical. Research on the development of new products is important, with a strong emphasis on the use of plant-based products, as well as the introduction of residue-free technologies, thus reducing food waste not only in the final consumer's household, but also preventing potential waste in product development processes, product quality and competitiveness.

In Latvia University of Life Sciences and Technologies, Faculty of Food Technology Centre for Studies and Science, research is carried out at all stages of the chain, from the research of raw materials, development of recipes and technologies, selection of packaging, determination of an optimal sales time and quality testing during the storage of the developed products. The main research areas are:

- new products from plant and animal raw materials, their nutritional studies;
- solutions for the use of food production by-products for the production of high value-added products (niche products);
- food safety and risks analysis;
- research of biologically active substances in food raw materials and products;
- food waste reduction options and packaging optimisation studies.

In the world, and also in Latvia, more and more emphasis is placed on the production of healthier and more environmentally friendly food, including the use of plant-based raw materials specific to each region. In Latvia one of such important materials are legumes (peas and beans). Legumes contain a high level of protein and an adequate proportion of carbohydrates and oil, which make them very valuable as a food source. The combination of proteins and amino acids in leguminous plants makes them interesting also for vegetarians and vegans to ensure a balanced diet. Despite the valuable qualities of local and traditional legumes, there are some drawbacks of legume-based food: a) the preparation is usually time-consuming, so people often prefer to consume cereal products which are available in a much larger range and are faster to prepare, and b) legumes contain antinutritional proteins, such as lectins, protease inhibitors and the non-antinutritional compound, angiotensin I-converting enzyme (ACE) inhibitor, raffinose-series oligosaccharides, tannins and phytic acid. Various deleterious effects may occur following the ingestion of legume seeds or flours, such as hemagglutination, bloating, vomiting and pancreatic enlargement, due to the activity of the antinutritional compounds inside the host. However, antinutritional compounds of legumes have many beneficial properties in the treatment and/or prevention of disease when properly processed. Therefore, the introduction in the market of new food products, such as sweet and salty snacks, muesli mixes, dry pea puree, or legume pate reinforce the driving force of the project. It should be acknowledged that soaking and heat treatment of legumes stop their negative effects.

In Latvia University of Life Sciences and Technologies, the Faculty of Food Technology Centre for Studies and Science has developed pulse spreads with extended realisation time using high pressure technology and *SOUS VIDE* technology, as a result of which the doctoral thesis was developed and defended. Another important study is the development of extruded legumes, where extruded sweet and salty legume products have been developed using peas and beans as raw material. These products have a wide range of usage: they can be used as breakfast cereals, toast in soups, as well as as an additive to salads. The exuded products have been given the taste of fried onions, cheese, chocolate and almonds. This research also resulted in the defense of the dissertation. Continuing the started research of extruded products, both sweet and salty snack bars of extruded legumes have been developed, where research has resulted into a master's thesis. Moreover, the development of innovative products to use legumes, research has been conducted in the advance of pasta.

It is known that methionine is lacking in amino acids in legumes and lysine in cereals, so pasta made to combine the principle of complementarity with wheat and peas is lacking; wheat with beans and wheat with lentils results in pasta with a complete amino acid complex.

With the growing number of vegetarians both in the world and in Latvia, a significant role in Latvia University of Life Sciences and Technologies, Faculty of Food Technology research has the development of vegetarian sausages, sausage masses and burgers using various technological solutions and parameter analysis.

Expanding the usage of legumes also will significantly expand the sortiment of products. Consequently, the development of protein drinks, the use of legumes for enrichment of sugar confectionery and flour products with legume protein, which can significantly expand the range of products produced, were also carried out. Research has also been launched on the use of roasted legumes to enrich the amino acid profile of various foods, which will open up a wide range of legume uses.

When developing innovative foods, the issue of their delivery from the place of production to the consumer is very important, therefore the choice of packaging plays an important role. Food packaging has an essential role in ensuring safe delivery of food products from "farm to fork". Food packaging is used to protect food from the influence of external factors, which can deteriorate the product and reduce its shelf life, to contain food, to provide a convenient use of the product and to inform the consumer. More often than before packaging is becoming the main factor affecting consumer purchase choice, perception and food acceptance, therefore, packaging innovations aid in selling products in this

competitive environment. Consequently, identifying consumer expectations of food packaging design and concept is important in order to avoid negative attitudes and lower sales.

Each year, the quantity of packaging materials raises, and accordingly the waste and the need for recycling of the used materials increases. Food packaging accounts for almost two-thirds of total packaging waste by volume and approximately 50% by weight of total packaging sales. Today, only 14% of the global plastic packaging materials are recycled (>60% in the EU), and based on the composition of materials it is expected that around 30% of plastic packaging materials may fail to be recycled or reused.

Nowadays, it is especially important to educate consumers on the advantages of environmentally friendly (bio-based, biodegradable, recyclable) packaging, based on the current issues on marine plastic pollution. Up to 13 million tonnes of plastic is dumped in oceans every year, leading to engenderment of a large number of marine animals. In recent years, the issue of the amount of packaging waste that is closely related to consumer products is becoming more urgent, therefore it is very important to ascertain consumer opinion on the amount of packaging. The Latvia University of Life Sciences and Technologies, Faculty of Food Technology is conducting surveys annually to oversee the situation in Latvia. According to survey data, Latvian citizens are concerned about the issue of packaging use and tend to greener lifestyle, but it should be noted that much remains to be done in order to achieve the EU objective, by year 2035 to reduce waste going to landfill to 10% of the output.

EU documents set stricter minimum requirements for packaging:

- reduce the amount of (excessive) packaging and packaging waste;
- stimulate the creation of reusable and recyclable packaging;
- consider reducing the complexity of packaging materials, including the number of materials and polymers used.

Looking at the packaging industry, it is important to note that the term 'more environmentally friendly packaging' is not perceived in a narrow sense, but rather more closely related to the circular economy and the principle of sustainability (raw materials; design; production; distribution; consumption, collection; recycling).

Packaging material that looks natural will not always be the most environmentally friendly. It is always necessary to take into account the resources and technologies used throughout the packaging process, from the extraction of raw materials to the potential processing costs and resources required. The volume of packaging must definitely be reduced, but it must be done wisely in order to maintain the quality and competitiveness of food products, and packaging must be optimised. It is important to choose packaging for food and beverages that can

be reused or that has recycling options. Moreover, it is important to avoid using too much and unnecessary packaging, because it is often seen in shops that the volume of packaging is large, but it contains a very small object. Packages are often used where the product is packaged in apackage, which is placed inside another one, which is not necessary at all, since it does not perform any strategically important function. Another important issue that has to be addressed is the amount of print on the packaging. Yes, it is important to place the necessary information on the packaging, but there are often large colored areas of stickers. The amount of paint and varnish used can significantly complicate packaging recycling processes. Of course, another alternative is to use biodegradable packaging materials, but they have two major drawbacks – they have weaker barrier properties (gas and moisture permeability) and are currently more expensive than conventional packaging materials. The issue of the cost of biodegradable materials is to some extent addressed by changes in natural resource tax rates. When choosing biodegradable materials, it is also important to pay attention to which biodegradable materials to choose – biopolymers are divided into four large groups, with different conditions for their ability to degrade. Some of them would decompose in the environment at a certain pH, with the participation of microorganisms, but most of them decompose only industrially. This means that they must be collected, sorted and distributed under industrial conditions at a temperature of 60 °C. It is also important to follow the biopolymer labels on the packaging, since in order to claim that the packaging is environmentally friendly it must have a specific label. Such hazardous packaging are those on which information is found to be oxo-biodegradable packaging. In order to reduce the amount of packaging, the Faculty of Food Technology laboratories are conducting packaging optimisation experiments for various foods, reducing the amount of packaging, the number of layers and looking for alternatives to biodegradable packaging. Nowadays, healthy food and environmentally friendly packaging solutions are becoming more and more important issues not only in Latvia, but all over the world, and we in Latvia have the potential and efforts to successfully solve these issues.