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DEVELOPMENT OF INNOVATIVE TECHNOLOGIES FOR A HIGHER LEVEL OF BERRY FRUITS PROCESSING IN SERBIA

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Abstract

*The aim of presented investigation was to develop innovative technology for a higher level of **raspberries** processing to obtain the bulk products and active ingredients for food, confectionery and pharmaceutical industries.*

The concept of food engineering was applied for innovation and key processes scale-up from laboratory to semi-industrial level.

A preliminary economic feasibility for raspberries processing shown positive effects to domestic market capacity and sales prices of competitive bulk products.

The current status of our investigation has provided the basis for technology transfer on industrial level through partnership relations and with the use of development funds, loans and grants.

Introduction

Serbia has a large quantity of natural and acquired raw material in agriculture and food industry. They are exported or used for lower level of processing. In the case of berry fruits, such as raspberries, products of higher processing are mostly imported. Domestic products are poorly represented and carried out to the traditional methods.

The raspberries are natural source of powerful antioxidants, phenolic compound with potential anticancer features. The red raspberries seed oil is superb antioxidant and contains essential fatty acids tocopherols.

The innovative technologies for higher level of raspberries processing enable the production of the bulk products (syrup, jelly, jam, natural colors and aroma) as well as active ingredients (seed, pectin).

Material and methods

The process engineering concept for development of innovative technologies was applied.

The key entities of the product quality were determined by dry material content and pectin concentration.

The preliminary economic affect was defined in relation to the raspberries costs, domestic market capacity and sales prices of competitive products.

The business model based on partnership between Institutes and University was used.

Results

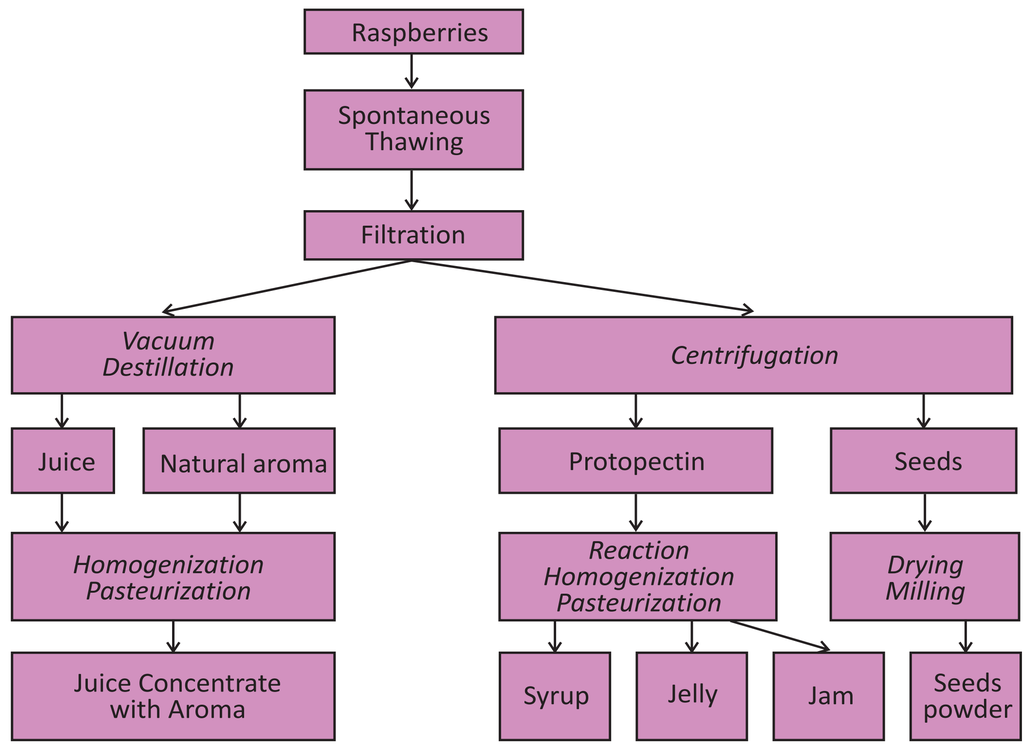
The innovative technologies for obtaining bulk products and active ingredients were developed.

Table 1. Product profiles for the higher level of raspberries processing

Product name	Aroma concen-trate	Juice concen-trate	Juice concen-trate with aroma	Pro-pectin and pectin	Seeds powder
Product category	Final semi-product	Final semi-product	Final semi-product	Semi-product	Final

Processes and technical solutions enable utilization of all active ingredients from raspberries and integrated outcome several semi- and final products. Seed and aroma were obtained as products, not treating as waste. The concept of modular technology was applied.

Figure 1. Flow diagram for higher level of raspberries processing



Spontaneous thawing of raspberries was carried out at the temperature of t=20-30°C with the absent of oxygen and light. At this step, the tannig enzymatic and non enzymatic reaction were carried out under same condition.

During the homogenization and pasteurization, the hydrolysis of propectin to pectin was performed at the value of pH 3,2-3,5.

The technical solution for aroma condensation was design. Thus, the two-stage vacuum distillation at t= 20-25°C of aroma-water mixture evaporation was applied.

According to the achieved material balance for quantities of semi- and final products based on 1 kg raspberries and the selling price of the same categories of imported products, the share of 1-3% of raspberries purchase price in the aggregate selling price was achieved.

Conclusions

- Incremental innovation for raspberries processing was achieved by integral concept of non-waste and energy efficient technologies at semi-industrial scale.
- The modular technological concept was design and additive innovation for the existing equipment was achieved.
- The material balance has shown economically efficient participation of the raspberry price in the selling price of imported products.
- It is possible to produce the pilot samples of the products for domestic market investigation in the aim of the imported products substitution.
- The export of own knowledge could be possible via the mechanisms of international technology transfer.