

## OPPONENT'S REVIEW OF THE DISSERTATION THESIS

***Téma:* Effect of specific hydrocolloids and hydrocolloid blends on gluten-free bread quality/ Vliv vybraných hydrokoloidů na směsi hydrokoloidů na kvalitu bezlepkového pečiva**

*PhD student:* Ing. Petra Dvořáková

*Opponent:* prof. Ing. Jozef Golian, Dr., Department of Food Hygiene and Safety, FBP SPU Nitra

The thesis deals with the current issue of the use of gluten-free flours and hydrocolloids and their mixtures on the quality of gluten-free pastry. The work gives answers to the possible use of hydrocolloids and their mixtures in the production of gluten-free pastry. The current state of the solved problem was divided into 4 chapters. In the first subchapter, the author describes the disease of celiac disease, its history, pathology and its causes. The second sub-chapter is devoted to gluten-free foods and their labelling, that is important for consumers. In the third subchapter, the production of raw materials for the production of gluten-free pastries, especially the group of pseudo cereals is described. The last subchapter is devoted to the description of selected hydrocolloids, which are most commonly used to improve the properties of gluten-free pastry. Among these, agar, alginates, cellulose, gelatine carrageenans, xanthan gum, and others are most commonly used. I consider the number of sub-chapters to be optimal and appropriately structured in relation to the objectives of the work.

The objectives of the thesis are formulated into 4 points and are based mainly on practical experience. As the most important I consider the effort to improve the quality of gluten-free pastry using gluten-free flour alone or in double and three-component mixtures. Another important objective was to verify eight hydrocolloids applied to rice flour alone or in two-component mixtures.

The methodology of the thesis is detailed on seven pages. Material described includes 6 kinds of gluten-free flours (amaranth, buckwheat, chickpea, pear, merlot and rice) and 8 kinds of hydrocolloids. In the methodological part, the chemical analyzes and the given formulas of their calculations are described. The procedures of texture measuring and breadcrumb humidity of the products, 24 and 72 hours after baking are briefly described. The chapter also contains a section on the statistical evaluation of results, using ANOVA. The

methodology of the work is written at the appropriate level, in a clear and comprehensible manner.

The results of the work and the discussion are detailed on 49 pages, 24 tables and 5 pictures. They are divided into 8 subchapters. In the first part of the results, the water content of the gluten-free flour samples was determined using a farinograph. In the second part, the quality of the gluten-free pastry was determined, differences are shown in Fig. 3 on p. 49. Similarly, in the third part of the results, the quality of two-component flours for the production of gluten-free pastry was examined. The basis of the mixture was 50 % of rice flour and 50 % of one of the six flours studied. The differences of each combination are detailed in Table 7.

In the fourth phase of the experiment, the objective was to determine the properties and quality of three-component mixtures, where 60 % of the rice flour was used, 20 % of amaranth flour and 20% of buckwheat flour, and other combinations. Their characteristics and statistical differences are shown in tab. 8. The monitoring of parameters at buckwheat-rice gluten-free products deals the fifth part of the results, where the properties of the products from the buckwheat, rice and their 9 combinations were evaluated in different proportions (Table 9).

In the most extensive part of the results are included subchapters 6 and 7 on the impact of 8 hydrocolloids on gluten-free pastry properties, which were applied separately to the rice flour and in the two-component mixtures in the amount of 0.5-1 %. Baking experiments were performed in all products, including hardness and humidity of the breadcrumb examination, 24 and 72 hours after baking. The best results were obtained with a combination of agar-cellulose 0.5 %, cellulose alginate 0.5 %, alginate xanthan gum 1.0 %, and gelatin-tragacanth 0.5%. It would be suitable to specify for which properties the remaining mixtures did not have suitable properties for finished products. Combinations with positive properties were also tested in samples of 40 % buckwheat and 60 % rice flour, where added hydrocolloids improved the specific volume of loaves, increased the yield of dough and pastry but significantly worse hardness, 24 and 74 hours after baking. From this point of view, it is also necessary to look for combinations that will have a minimal impact on the sensory properties of gluten-free pastry that will be acceptable to consumers.

Benefits for science and practice are clear and structured into specific points, I appreciate their sententiousness.

The conclusions of the thesis are formulated into specific points and describe the answers to the given hypotheses. Conclusions also have a practical significance for the production of gluten-free pastry.

The list of literature used consists of 177 references of predominantly foreign and current literature. All resources used, including legislative links, are closely related to the issues addressed. Literary sources originate from scientific journals, scientific conferences, and they are up-to-date.

The technical level of the thesis fulfils the required criteria for this type of work; I appreciate the list of tables, pictures, abbreviations and marks used that provide better orientation in the work. By the scope, content, technical and graphical design of the thesis it can be concluded responsible and purposeful approach of the author to the problem solved, ability to orientate in the problems, methodologies and analyzes.

I have got the following questions regarding the thesis:

1. Which of your factors most affect the quality of gluten-free pastry?
2. Which of the hydrocolloids added most affect the texture of gluten-free pastry?
3. Is it possible to affect the content of acrylamide in gluten-free pastry by adding hydrocolloids?

### **Conclusion**

The presented thesis was processed from the field of technology of gluten-free pastry production with the addition of various hydrocolloids, that is particularly demanding for the accuracy of scientific approaches, following methodical procedures in the laboratory. It can be concluded that the author has managed the technical and professional issue, the orientation on the scientific benefits of the work has been sufficiently exploited.

Based on the above, I recommend thesis to the defense and, after defending it, I recommend Ing. Petra Dvořáková to be awarded by the Ph.D degree in study program P2901 Chemistry and Food Technology.

Nitra, 12.07.2018

prof. Ing. Jozef Golian, Dr.,

