# DEVELOPMENT OF A GLUTEN FREE SOURDOUGH BAKERY PRODUCT

## Raul Kolinka, Györgyné Kóczán, Zoltán Kókai, Anikó Kovács

Hungarian University of Agriculture and Life Sciences,
Villányi Street 29-43, 1118 Budapest, Hungary,
Kovacs.Aniko94@uni-mate.hu

### Abstract

The population of gluten sensitive people has been gradually rising in the last decades. The food industry especially the bakery industry has to develop more gluten free products to satisfy the consumers demand. However, the quality of these products differ from the quality attributes of a standard glutenious bakery product. Therefore the aim of our research was to develop a good quality gluten free sourdough product with 3 different gluten free flours: millet, brown rice and a commercial available mixture (Belbake). We investigated the differences in moisture content, the bake loss, the texture and the sensory properties of the products. According to our results in the case of the moisture content the brown rice sample had the highest, while the millet gave the lowest value. The bake loss measurement gave reverse results. In the texture analysis the brown rice sample was the softest, but the millet and the Belbake had better results in resilience and in springiness. Also in the sensory analyses the Belbake product was found to be the best by the judges. However there were no significant differences between them. In conclusion the product development of a gluten free sourdough bakery product was successful. Further research is needed to investigate the shelf life of the products.

### Texture analyses

The samples' texture were analysed with Stable Micro System TA-XT2i universal texture measurement device. We applied the Texture Profile Analyses (TPA) method to investigate the bakery products. A 20 mm diameter plate as probe was used. The method imitates the human chewing with 2 compression circles. The initial speed of the measuring probe was 1mm/s, the text speed was 5mm/s. The compression was 40% of the original heights. The measurements were done 5 times, each sample was 25 mm high. From the measured curves the software calculated the hardness, adhesiveness (negative work between the two cycles), cohesion (Area 2/Area 1),
springiness (Distance 2/Distance 1), gumminess (Hardness*Cohesiveness), chewiness (Hardness*Cohesiveness*Springiness) and resilience (Area 4/Area3).
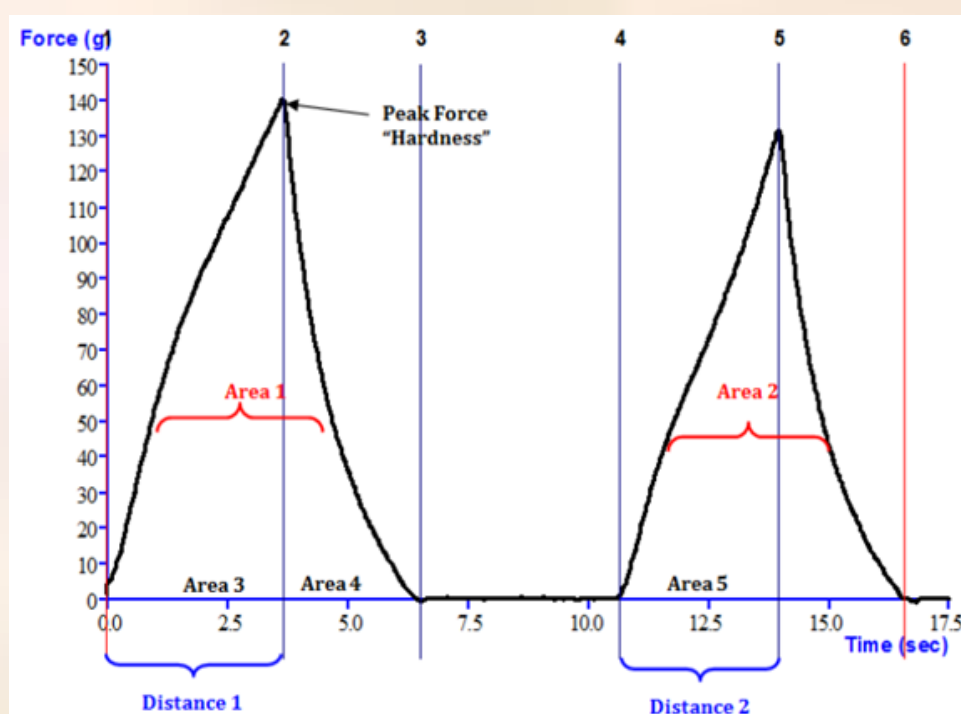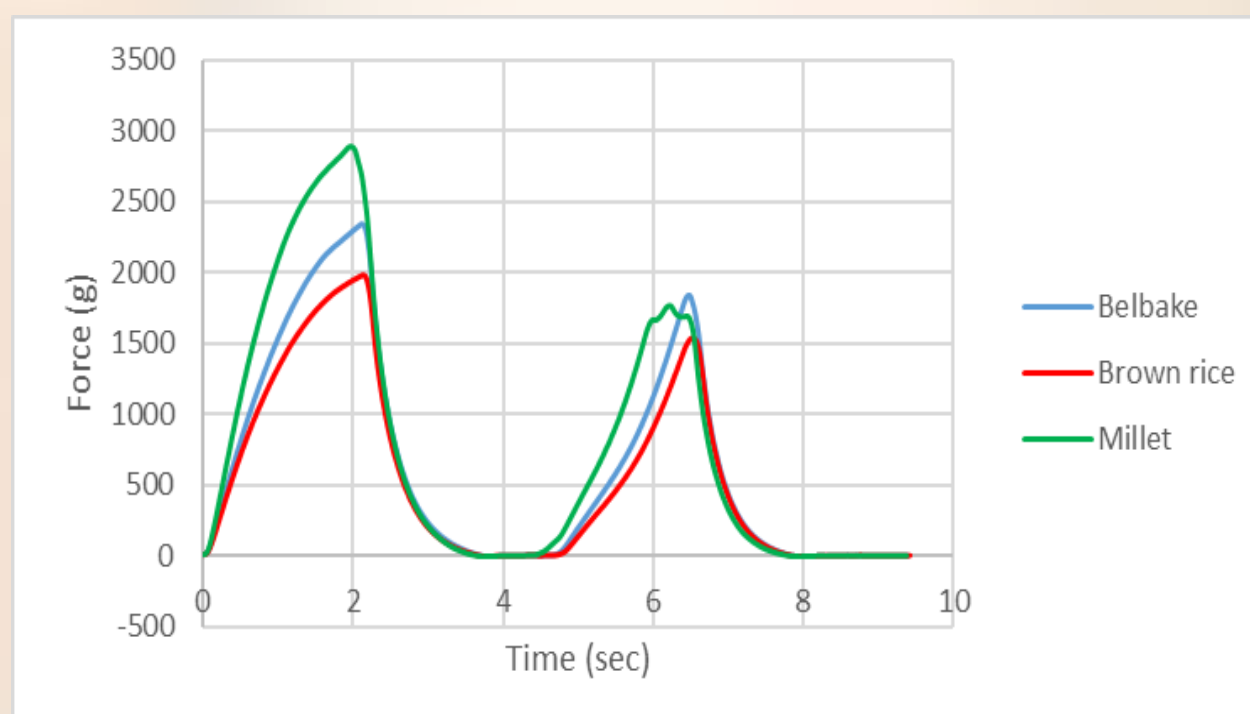


Figure 1:TPA curve (Internet 1)



Figure 2: Meausred average TPA curves (n=5)

### Sensory analyses

All of the product resulted in good sensory values in all attributes (Figure 3), the judges found the Belbake sourdough product to be the best according to the overall liking. However there were no significant differences among the products in neither attributes. Based on the used ingredients we calculated the price for each sample. According to that there was also no big differences among the products, the millet rolls would be a little bit more expensive than the others. However, the calculated prices were cheaper than other gluten-free bakery product in the market. This provide a free choice for the bakery industry that which products worth to produce in technological and economical point of view.

### Conclusion

The possibilities of a gluten free sourdough bakery product development were examined. We used brown rice flour, millet flour and a commercially available flour mixture (Belbake). We investigated the differences in moisture content, the bake loss, the texture and the sensory properties of the products. In the case of moisture content after baking the brown rice sample had the highest and the millet had the lowest value. The bake loss showed a reverse result, due to the inverse relationship. According to the TPA results the brown rice sample in all texture attributes gave the smallest values. In the hardness it is beneficial, because it means that this sample had the softest texture, which could be due to the higher water content of the sample. However in resilience and in springiness it is disadvantageous. In these attributes the Belbake and the millet products was better. The sensory result also showed that the judges found the Belbake sample to the best, but there were no big differences between the samples.

In conclusion our product development was successful. Our results indicate that there were no huge differences among the products in all attributes and this provide a free choice to the bakery industry that which production worth it in technological or economical point of view. Further research is needed to investigate the self-life of the products.

### Material and Methods

In our research, we used 3 different kinds of flour, millet, brown rice and a commercially available gluten free flour mixture (Belbake: mixture of rice flour and starch). Our products contained 350 g flour, 85 g sourdough, 4 g sugar, 8 g salt, 5 g yeast, 75 g sour cream, half egg, 30 g olive oil and 100 ml water. All the ingredients were commercially available. The only difference between the products were the type of the used flour.

For making our products first we needed to make the sourdough, which was spontaneously fermented at 25-27 °C and only made from flour and water (1:1 ratio). It was fed for 4 days. In the 5th day we kneaded together our ingredients. After the dough was ready we divided it to achieve around 115 g products. The dough was leavened for 40 minutes in a controlled environment (at 32°C and 80 % of relative humidity). Then the samples were baked for 16 minutes at 180°C. After cooling in room temperature for a half hour the moisture content, bake loss, texture and sensory properties were measured.

#### Moisture content, bake loss

Moisture content was measured with Sartorius MA 50 automatic moisture content measuring device. We put 2,5 g sample into the device which is than drying the samples at 105°C till achieving the weight equilibrium. All samples were measured 3 times.

For calculating the baking loss we measured the weight of the formed dough before baking and after the baking when it was cooled down. Than we used the following equitation:

$$Bake\ loss\ (\%) = \left(\frac{Dough\ weight}{Baked\ product\ weight} - 1\right) * 100$$
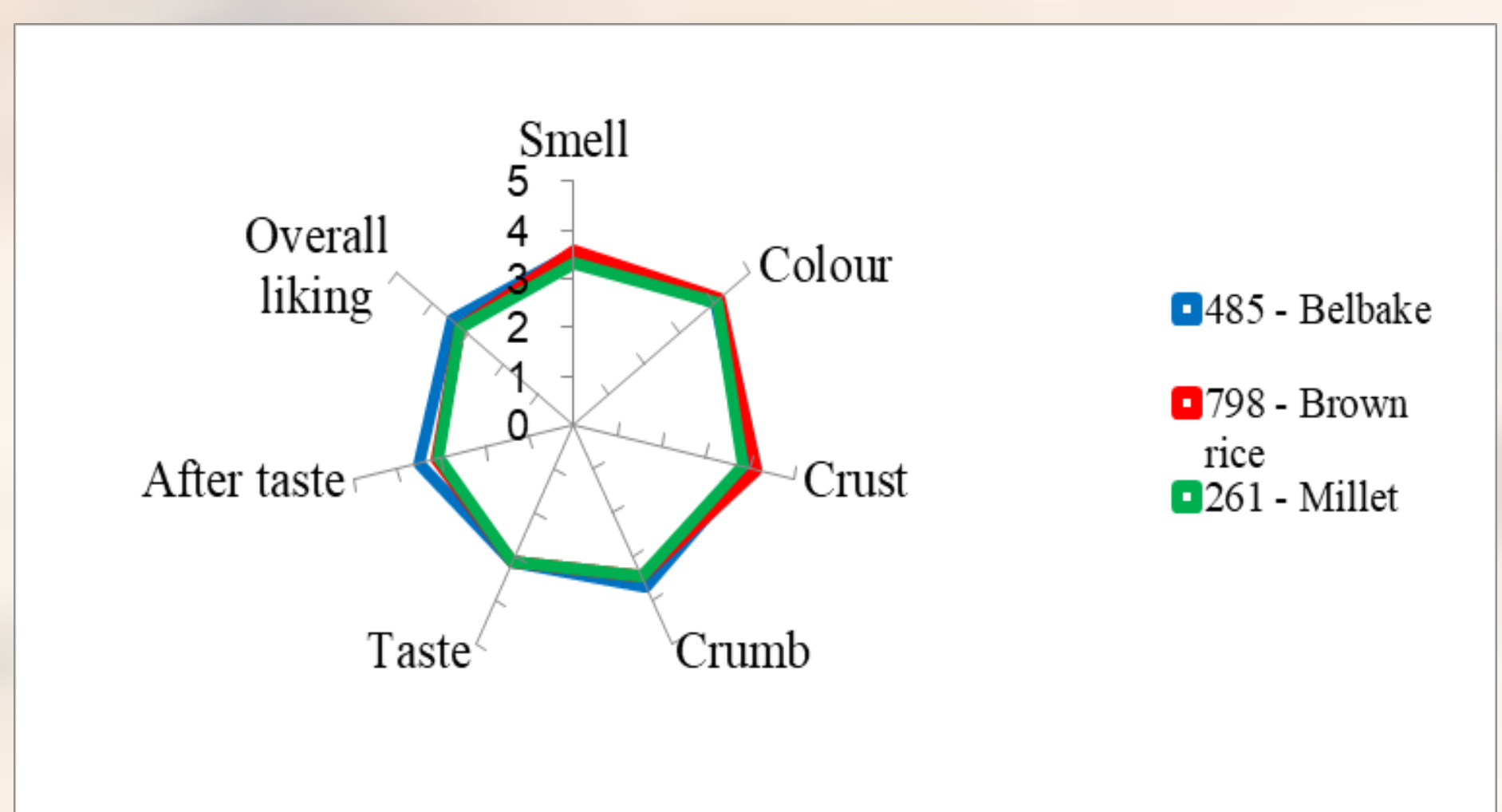


Figure 3: Sensory analyses result

### References
Biró, B., Fodor, R., Szedljak, I., Pásztor-Huszár, K., Gere, A. (2019) Buckwheat-pasta enriched with silkworm powder: Technological analysis and sensory evaluation, LWT - Food Science and Technology 116 (2019) 108542
Di Cagno, R., Barbato, M., Di Camillo, C., Rizello, C. G., De Angelis, M., Giuliani, G., ... Gobetti, M. (2010) Gluten-free Sourdough Wheat Baked Goods Appear Safe for Young Celiac Patients: A Pilot Study. Journal of Pediatric Gastroenterology and Nutrition, 51, 777-783. DOI: 10.1097/MPG.0b013e3181f22ba4
Internet 2: Nemzeti Agrárgazdasági kamara Élelmiszeripari kézikönyv 2. Gluténmentes élelmiszerek (2018) http://nak.hu/kiadvanyok/kiadvanyok/2613-glutenmentes-elelmiszerek/file
Internet 1. Overview of Texture Profile Analysis Chapter 4. What does TPA measure? https://texturetechnologies.com/resources/texture-profile-analysis
Léder, F. (2013) A köles „reneszánsza". A köles hagyományos és új élelmiszeripari technológiái, előadásjegyzet. Bp.
Moroni, A. V., Bello, F. D., & Arendt, E. K. (2009) Sourdough in gluten-free bread-making: An ancient technology to solve a novel issue? Food Microbiology, 26, 676-684. DOI: 10.1016/j.fm.2009.07.001
Mustalahti, K., Catassi, C., Reunanen, A., Fabiani, E., Heier, M., McMillan, S., Murray, L., Metzger, M. H., Gasparin, M., Bravi, E., Mäki, M., & Coeliac EU Cluster, Project Epidemiology (2010) The prevalence of celiac disease in Europe: results of a centralized, international mass screening project. Annals of medicine, 42(8), 587–595. DOI: 10.3109/07853890.2010.505931
Picozzi, C., Mariotti, M., Cappa, C., Tedesco, B., Vigentini, I., Foschino, R., & Lucisano, M. (2016) Development of a Type I gluten-free sourdough. Letters in applied microbiology, 62. DOI: 10.1111/lam.12525
Różyło, R., Rudy, S., Krzykowski, A., & Dziki, D. (2016) Gluten-Free Bread Prepared with Fresh and Freeze-Dried Rice Sourdough-Texture and Sensory Evaluation. Journal of Texture Studies, 47. DOI: 10.1111/jtxs.12180
Singh, P., Arora, A., Strand, T.,Leffler,D., Catassi, C., Green, P., Kelly, C., Ahuja, V., Makharia, G. (2018) Global Prevalence of Celiac Disease: Systematic Review and Meta-analysis. Clinical Gastroenterology and Hepatology. DOI:16. 10.1016/j.cgh.2017.06.037.
Szedlják I. (2018) Gluténmentes élelmiszerek, előadásjegyzet. Budapest
Zorzi, C. Z., Garske, R. P., Flôres, S. H., & Thys, R. C. (2020) Sunflower protein concentrate: A possible and beneficial ingredient for gluten-free bread. Innovative Food Science & Emerging Technologies, 66.