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# Effect of kneading on Mixolab performance of gluten free products

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Due to the numerous opportunities that wheat presents in terms of innovation and economics, interest in products made from wheat has been, is, and always will be in the public eye. However, demand for gluten-free grains and goods has risen significantly during the past ten years. This is a result of an increase in gluten sensitivity and intolerance cases, an increase in the popularity of gluten-free diets, and persuasive marketing of this diet as a means of leading a better and healthier lifestyle.

The industries struggle to produce goods with the same qualities as gluten-based products, since the product is gluten free, which means the removal / or not usage of the protein responsible for elasticity, chewiness, and many other sensory effects. As a result, industries began to invest time and money into the gluten-free market, doing research to determine what makes gluten unique and how to replace it in the context of gluten-free goods. Consequently, Mixolab becomes essential for figuring out the rheological properties of different doughs, including those made with and without gluten.

We are able to observe from the literature review that Mixolab's achievements with gluten-free flour are growing, but they are still not quite as accurate and widen as those with wheat-based flour, which lead to the hope of a lot of study in the gluten-free field to be expected in the upcoming years.

In my paper, I examined the corn and rice flour using Mixolab. I underlined the repeatability and dependability of the protocols and the provided data to highlight the reliability of the device and the earlier research. In addition, I shift from the guidelines processes and Handbook by experimenting with various hydrations, analyzing their effects on the kneading and cooling processes, and contrasting them with other hydrations.

Within my research, I used rice flour to analyze the reliability of the data suggested in the Mixolab Handbook, which allowed me to go further with my experiments confidently, since the resulted data were going parallel with the one suggested. Furthermore, using corn flour, I tested the repeatability of the equipment, which resulted in 2 contradictory results. The first repeatability test showed a great correlation between the three repetitions, highlighting the accuracy of the process within the Mixolab. However, the second repeatability test was somewhat disappointing since it gave mismatching graphs and incomplete data. These confusing results could be explained by many factors as I mentioned in the "Challenges" part of my thesis (chapter 6), which includes human and mechanical errors.

Moreover, in the last part of my paper, I decided to go beyond the handbook suggestions, and use a different hydration percentage for corn flour (not suggested by Mixolab). The results of the experiment were not complete and inconsistent, in contrast to the experiment when we followed the protocol, and the computed parameters were valid and as predicted.

Nevertheless, by comparing them, I was able to observe how a difference in water volume may have a significant impact on the dough's kneading and final product. In fact, the dough with a hydration of 92% was found to be easy to handle and shape, which can result in a high-quality final product. On the other hand, the experiment with a hydration of only 60% for the corn flour resulted in a crumbly dough that may not produce a final product of the desired quality.

To sum up, Mixolab has revolutionized the food industry by providing an innovative tool that mimics the kneading process of both industrial and home production. Research papers are able to test and bring the best out of this device, proving its reliability and the accuracy of its data, yet, it is important to be aware of the mistakes that could be made when kneading the dough, whether caused by human or mechanical error, which can lead to varied and unreliable results. Overall, Mixolab has enabled bakers and food engineers to gain a deeper understanding of the rheological properties of dough and how to improve recipes to produce quality products, but it is surely an area to be more developed.