ANALYSIS OF THE QUALITY CHARACTERESTICS OF DIFFERENT PRODUCTS CONTAINING ENZYME-TREATED EGGS

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Eggs, renowned for their nutritional richness, captivate food engineers and researchers due to their intricate composition. The proteins, lipids, and bioactive compounds in eggs contribute to flavour and texture, playing a crucial role in diverse food creations. To improve convenience and reduce microbiological risks, food industry manufacturers frequently choose processed egg products such as liquid eggs, egg powders, and cooked egg products over shelled eggs. However, once the eggshell is broken, the eggs' natural protection is lost, resulting in the rapid degradation of liquid egg products, posing a challenge to the food industry. Freezing emerges as a potential solution for long-term storage, but gelation during freezing prevents frozen eggs from being used optimally. To address this issue, researchers are investigating the use of enzyme-based approaches. A possible approach is to use an enzyme preparation containing aminopeptidase activity to reduce gelation and improve the rheological properties of liquid egg products.

In this study, an experiment was performed on liquid egg products, eight samples were prepared from liquid egg yolk and liquid whole egg, with six samples being treated with varying enzyme concentrations (0.1%, 0.2%, 0.3% w/w) and two serving as a control without enzyme. A commercial aminopeptidase Flavorpro™ 750MDP enzyme was used for the enzymatic treatment. Except for the control, the samples were subjected to a 2-hour water bath at 40°C. Half of the samples were frozen at -24°C for 14 days after treatment, while the other half were measured. Thawing was accomplished by immersing frozen samples in a 4°C thermal bath for 2 hours prior to further experimentation. Finished products like sponge cake and mayonnaise

were made from both enzyme treated and untreated samples following specific recipes for characteristics and quality comparison.

It was found, that enzyme-treated egg yolk samples exhibited lower pH in fresh compared to frozen samples, suggesting a minor alkalizing effect linked to protein hydrolysis. Freezing had a greater impact on control egg yolk colour than whole egg, attributed to the latter's higher water content. Enzyme-treated samples darkened with increasing concentration, possibly due to enzymatic reactions modifying pigments. Freezing consistently reduced redness in all enzyme-treated samples, more so in egg yolk. Enzyme-treated samples demonstrated improved emulsion stability, linked to enzymatic hydrolysis breaking down aggregated molecules formed during freezing. Fresh and frozen enzyme-treated samples outperformed untreated ones in terms of lower absorbance values, indicating enhanced emulsion stability in egg yolk-based formulations. Sponge cake texture analysis revealed, freezing significantly increased hardness, amd reduced springiness, making the cake denser, while enzyme treatment enhanced springiness up to a certain concentration. Freezing increased gumminess significantly, creating a chewier texture, whereas enzyme treatment had limited effect. In mayonnaise texture analysis, freezing increased firmness, while enzyme treatment decreased it, especially at higher concentrations. Consistency increased in frozen-thawed egg yolk mayonnaise, indicating a thicker texture. Enzyme treatment reduced consistency due to aminopeptidase activity, lowering molecular weight and viscosity.

At the end, the study investigated the impact of enzyme treatment on various egg-based products. The texture of the sponge cake was altered by freezing, while enzyme treatment had concentration-dependent effects. Lower enzyme concentrations (0.1 % w/w) preserved the texture of the fresh control, while higher concentrations (0.3 % w/w) provided a softer texture with promising springiness. The effects of freezing and enzyme treatment on mayonnaise firmness, consistency, cohesiveness, and viscosity index were significant. Lower enzyme concentrations (0.1% w/w) reduced attributes further, while higher concentrations (0.3% w/w) reduced them even further. Choosing the optimal enzyme concentration should be in accordance with the desired sensory and textural properties. However, higher enzyme concentrations and longer freezing times can be investigated in future experiments to better understand their impact on liquid egg yolk and whole egg quality. Exploring combined enzyme treatments with multiple types may also reveal synergies for improved product characteristics.

Keywords: Eggs, Enzymatic hydrolysis, Gelation, protein hydrolysis, Freezing.