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Sensory evaluation of pea and milk protein hydrolysates used to develop protein-fortified tomato soup

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Protein is a required macronutrient for maintenance of muscle mass. Current guidelines recommend daily intake of 0.8 g of dietary protein per kilogram body weight (kg bw), regardless of age[(1)]. However, factors such as age and physiological changes may increase this requirement to 1.5g/ kg bw/day for older adults with sarcopenia[(2)]. Therefore, protein-fortified foods are used to enhance the protein intake of older adults. Milk protein concentrate (MPC) and pea protein isolate (PPI) ingredients are used to increase the protein content of different foods[(3–6)]. However, their addition changes the functional and sensory properties of the final protein-fortified product[(7)]. Therefore, enzymatic hydrolysis is employed to improve the techno-functional properties of these ingredients, however, the bitterness of the resulting hydrolysates limits their application. This study aimed to investigate the effect of hydrolytic enzyme preparation on the taste properties of MPC and PPI hydrolysates when incorporated as ingredients in protein-fortified tomato soup.

Solutions of MPC and PPI containing 3% total solids (w/w) were hydrolyzed at 50°C for 30 min using Neutrase®, Umamizyme and Protease AN "Amano" 100SD at an enzyme-to-substrate ratio of 1%. Bitterness in the hydrolysates was assessed with 16 semi-trained participants using labeled magnitude scales (LMS) and by 44 participants using a ranking test. Both tests showed that the least bitter hydrolysates were those generated using Umamizyme and Protease AN "Amano" 100SD. These hydrolysates were used to develop protein-fortified tomato soup with 3% of protein powders, that were characterised by 38 naïve consumers using hybrid quantitative descriptive profiling.

ANOVA on the bitter taste revealed that soups containing hydrolysed MPC (regardless of the hydrolytic enzyme used) were significantly more bitter compared to the control unhydrolyzed protein-fortified tomato soup ($p<0.001$). Bitterness in the protein-fortified tomato soup was masked using various ingredients, applying the principle of taste-taste interactions. A ranking test with 43 naïve participants showed that a combination of tomato puree and sucrose successfully reduced bitterness.

Overall, the enzyme preparation used affected the bitterness of the MPC and PPI hydrolysates and consequently the taste of the protein-fortified tomato soup. The use of Umamizyme and Protease AN Amano resulted in less bitter protein hydrolysates (both PPI and MPC) compared to Neutrase ($p<0.001$). Taste-taste interactions resulting from a combination of ingredients could successfully be employed to reduce bitterness in the protein-fortified tomato soup. Since these soups are aimed to be consumed by older people, further work will aim to test their preference.

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