Investigating the Effect of pH on Papain Enzyme Activity With Multiple Protein Substrates

Jakkula, Baruni (School: Cleveland Central High School)

This project's aim was to identify the optimal pH (slightly acidic to neutral pH range: pH 5-pH7) at which the enzyme papain works efficiently in the digestion of the different protein substrates milk, gelatin, and egg whites. The purpose was to determine whether papain's optimal pH was in a slightly acidic to a neutral range. The pH buffers 3, 4, 5, 6, 7, and 8 were prepared and the protein substrates were readied and incubated with and without papain under controlled conditions. After incubation, the Biuret test was conducted to identify the presence of proteins and peptide bonds, and the spectrophotometer test was taken at 540nm to measure the absorbance of the protein concentrations. The absorbance differences (Delta A) were calculated using the formula: Delta A equals A with papain minus A without papain. The results showed that the optimal pH for milk was pH 5, pH 7 for gelatin, and pH 6 for egg whites, confirming papain's efficiency in a slightly acidic to a neutral pH range (pH 5-pH 7), and thus proving the hypothesis. Some errors were made during the experiment, such as incorrect substrate measurements and extended time in the Biuret test but were not corrected due to time constraints. This project is essential for the utilization of papain in several industrial applications such as pharmaceuticals, biotechnology, food processing, cosmetics, and medicine. The experiment could improve by managing time, using the Bradford Assay so errors like lactose interference in milk would not occur in future studies.

Awards Won: