



EFFECT OF HEATING WITH DIFFERENT INCUBATION PERIODS ON HEAT STABILITY OF ISOLATE WHEY PROTEIN-PECTIN CONJUGATES

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Abstract

The purest form of whey protein is whey protein isolate (WPI) which contains 90% protein or greater. It is widely used in protein supplementation product, meal replacer, protein-fortified beverages, protein bars in order to maintain healthy lifestyle of consumers. Despite having beneficial effects towards health, whey protein isolate is found to have some limitations due to its sensitivity to heat. In this research, in order to improve the heat stability, whey protein isolate (WPI) undergoes conjugation with polysaccharide which is low-methoxyl pectin (LMP) through Maillard reaction at a temperature of 60 °C and different incubation period of 5, 8 and 14 days. The conjugation between WPI and LMP is carried out by using dry heat treatment. Physicochemical analysis such as OPA analysis, color development analysis, SDS-PAGE analysis, and pH measurement are conducted to observe at which extent the conjugation occurred. On the other hand, heat treatment and differential scanning calorimetry (DSC) are the thermal analysis conducted to observe heat stabilisation of the conjugates. The results from all the analysis are subjected to One-Way ANOVA, Tukey's Test and Pearson Correlation Coefficient to identify the relationship between heat stability and different incubation period.

Objectives

1. To determine the physicochemical properties of whey protein isolate conjugate.
2. To analyze the thermal stability of whey protein isolate conjugates with low methoxyl pectin

Problems

1. Whey protein is extremely heat sensitive (heat labile). When heated above the denaturation temperature (70 °C), denaturation and aggregation will occur quickly. This will change the structure and its characteristics.
2. The dairy industry uses heat treatment to increase the shelf life of food and ensure food is free from microorganisms, but this is a major constraint due to the thermal instability of whey protein (Wijayanti et al., 2014)

Ideas and discussion

- Whey protein conjugated with other biopolymers such as polysaccharides is the method used to improve thermal stability through the Maillard reaction (Wang et al., 2018).
- The conjugates that undergo dry heat treatment were found to have high stability compared to unconjugated whey protein.
- The Maillard reaction which happens naturally without the addition of any chemical substances is suitable to be used to combine both biopolymers.
- Pectin is a type of hydrocolloid that gives stable structure when it is conjugated to whey protein due to non-covalent interactions such as hydrophobic, hydrogen bonding and van der Waals forces.

Expected results

- Physicochemical properties such as brown color, pH, and degree of glycation can be determined to identify the Maillard reaction for whey protein & low methoxyl pectin conjugates
- The thermal stability of heat heating samples at different incubation days i.e. on the 5th, 8th, 14th day can be identified based on 2 ratios of conjugated whey protein and low methoxyl pectin i.e. 1: 0, 2: 1

Potential Application

This research is expected to provide an alternative methodology in order to improve physicochemical and heat stabilizing properties of conjugated whey protein-pectin and producing heat stabilized conjugated whey-protein in food industry.