KARAKTERISTIK GELATIN TULANG KAMBING KACANG DENGAN EKSTRAKSI ENZIMATIK, MODIFIKASI DAN APLIKASINYA PADA PRODUK ES KRIM

INTISARI

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Penelitian ini bertujuan mengeksplorasi potensi enzim protease untuk produksi gelatin tulang kambing Kacang, meningkatkan sifat fungsional gelatin dan mengevaluasi karakteristik es krim dengan stabilizer gelatin. Tiga jenis enzim komersial (alcalase, bromelin dan neutrase), tulang kambing Kacang dan *microbial transglutaminase* (MTGase) digunakan. Karakteristik gelatin yang dievaluasi meliputi analisis proksimat, rendemen, pH, berat molekul (BM) protein, profil asam amino, profil gugus fungsional, morfologi, suhu leleh, kekuatan gel, viskositas, sifat *foaming* dan emulsi, *water-holding capacity* (WHC), *fat binding capacity* (FBC) dan protein terlarut. Kualitas es krim yang dievaluasi meliputi *overrun*, viskositas, waktu leleh, *total solid*, mikroskopis globula lemak, kadar protein dan lemak serta sifat sensori. Hasil penelitian menunjukkan bahwa rendemen gelatin alcalase (GA) tertinggi pada GA-3, adalah 9,78%. Kadar protein, suhu leleh, kekuatan gel, sifat *foaming* dan emulsi, WHC tertinggi, dengan kadar air, abu dan lemak terendah, serta struktur halus dengan pori kecil pada GA-1. Rendemen gelatin bromelin (GB) tertinggi pada GB-3, adalah 8,31%. Kadar air, protein, sifat *foaming* dan emulsi tertinggi pada GB-2, dengan pH, kadar abu terendah, namun WHC dan FBC tidak berbeda dengan GB-3. Rendemen gelatin neutrase (GN) adalah 6,35%, kadar protein, sifat emulsi dan FBC tertinggi pada GN-3, namun WHC tidak berbeda dengan GN-2. Penambahan konsentrasi neutrase tidak berpengaruh terhadap suhu leleh, pH, kekuatan gel, viskositas, kadar abu. Rantai ß telah terdegradasi, rantai α terlihat samar pada GA dan GB, sedangkan GN menunjukkan peptida BM, yang diamati dengan elektroforesis, dan menghilangnya tripel heliks ditunjukkan FTIR. Gelatin GA-1, GB-2 dan GN-3 dimodifikasi MTGase (0,45; 0,68; 0,90 U), berpengaruh nyata ($P<0,05$) pada viskositas, kekuatan gel, titik leleh, FE, FS, WHC, aktivitas dan stabilitas emulsi gelatin. Kekuatan gel, FE, FS, kapasitas emulsi dan WHC tertinggi ($P<0,05$) pada GN dengan MTGase 0,68 U (GNT-2), viskositas pada GN dengan MTGase 0,90 U (GNT-3) dan kadar protein terlarut pada GB dengan MTGase 0,90 U (GBT-3). Terjadi peningkatan BM protein 25,02% intensitas tinggi pada GN dengan MTGase, namun menurun pada GA dengan MTGase dan menghilang pada GBT-3. Gelatin GAT-2, GBT-3 dan GNT-2 0,3% sebagai stabilizer, meningkatkan ($P<0,05$) viskositas, waktu leleh, *total solid*, kadar protein dan lemak dengan ukuran globula kecil yang mempengaruhi tidak kasar dan berpasir, tetapi *creamy* serta suka pada penerimaan es krim secara keseluruhan. Kesimpulan dari penelitian ini adalah ekstraksi tulang kambing Kacang dengan alcalase, bromelin dan neutrase menghasilkan gelatin dengan karakteristik standar, selanjutnya dimodifikasi dengan MTGase dapat meningkatkan sifat fungsional gelatin yang digunakan sebagai stabilizer untuk memperbaiki kualitas es krim.

Kata kunci: Gelatin tulang kambing Kacang, Metode ekstraksi enzimatik, Modifikasi sifat fungsional, Transglutaminase dan Es krim.

CHARACTERISTICS OF KACANG GOAT BONE GELATIN WITH ENZYMATIC EXTRACTION, MODIFICATION, AND ITS APPLICATIONS IN ICE CREAM PRODUCTS

ABSTRACT

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This study aims to explore the potential of protease enzymes for the production of Kacang goat bone gelatin, improve the functional properties of gelatin and evaluate the characteristics of ice cream with gelatin stabilizer. Three types of commercial enzymes (alcalase, bromelain, and neutrase), Kacang goat bone, and microbial transglutaminase (MTGase) were used. The characteristics of gelatin evaluated included proximate analysis, yield, pH, molecular weight (BM) of protein, amino acid profile, functional group profile, morphology, melting temperature, gel strength, viscosity, foaming, and emulsion properties, water-holding capacity (WHC), fat binding capacity (FBC) and soluble protein. The quality of ice cream evaluated included overrun, viscosity, melting time, total solid, fat globule microscopic, protein and fat content, and sensory properties. The results showed that the highest yield of gelatin alcalase (GA) was in GA-3, which was 9.78%. Protein content, melting temperature, gel strength, foaming and emulsion properties, the highest WHC, with the lowest water, ash, and fat content, as well as a fine structure with small pores in GA-1. The highest yield of gelatin bromelain (GB) was at GB-3, which was 8.31%. The highest water content, protein, foaming, and emulsion properties were in GB-2, with the lowest pH and ash content, but WHC and FBC were not different from GB-3. The yield of gelatin neutrase (GN) was 6.35%, the highest protein content, emulsion properties, and FBC in GN-3 but WHC was not different from GN-2. The addition of neutrase concentration did not affect the melting temperature, pH, gel strength, viscosity, and ash content. ß-chain degraded, the α-chain was vaguely visible on GA and GB, whereas GN revealed the presence of low molecular weight peptides which was observed by electrophoresis, and the disappearance of the triple helix indicated by FTIR. Gelatin GA-1, GB-2, and GN-3 modification with MTGase (0.45; 0.68; 0.90 U) had a significant effect ($P<0.05$) on viscosity, gel strength, melting point, FE, FS, WHC, activity, and stability emulsion of gelatin. The highest gel strength, FE, FS, emulsion capacity, and WHC ($P<0.05$) in GN with MTGase 0.68 U (GNT-2), viscosity at GN with MTGase 0.90 U (GNT-3), and protein content dissolved at GB with MTGase 0.90 U (GBT-3). There was an increase in protein molecular weight by 25.02% with high intensity in GN with MTGase but decreased in GA with MTGase and disappeared in GBT-3. Gelatin GAT-2, GBT-3, and GNT-2 0.3% as a stabilizer increasing ($P<0.05$) viscosity, melting time, total solid, protein, and fat content with small globule size that affects not coarse and gritty, but creamy, and overall ice cream acceptance. This study concludes that the extraction of goat bones with alcalase, bromelain, and neutrase produces gelatin with standard characteristics, then modified with MTGase can improve the functional properties of gelatin, which is used as a stabilizer to improve the quality of ice cream.

Keywords: Kacang goat bone gelatin, Enzymatic extraction, Modification of functional properties, Transglutaminase, and Ice cream.