SCIENCEFUND RESEARCH PROJECT

FINAL REPORT

PRODUCTION OF GRANULAR COLD WATER SOLUBLE SAGO STARCH AND RELATED INSTANT FOOD PRODUCTS

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ABSTRACT

The main objective of this study was to produce laboratory scale granular cold water soluble sago starch with high cold water solubility and improved granularity. The study was started by using Response Surface Methodology (RSM) and a two-factor three-level Faced-Centered Cube (FCD) Design to optimize the amount of NaOH and ethanol concentration to produce GCWS sago starch. The optimum conditions consisted of 40.7-50.5% ethanol and 278.5-296.3 g NaOH which achieved 52.2 ± 1.5% of cold water solubility. Later, alcoholic-alkaline treatment was combined with three types of chemical modification, namely hydroxypropylation, cross-linking and dual-modification to produce modified GCWS sago starch. RSM was used to investigate the effect of process variables and their interaction on the responses studied. Both cross-linking and dual-modification were successfully improved the cold water solubility (> 60% and > 80% respectively) and granularity of instant sago starch produced. However, the functionalities (pasting and thermal behavior) of instant starch produced were found different due to the structural alteration took place in the starch granules. Hydroxypropylation did not affect the cold water swelling power and solubility of GCWS sago starch ($p>0.05$), but improved the retrogradation by reducing the setback. In brief, all treatments share the fact that NaOH was the most important variable affecting the responses studied. Modified GCWS sago starch produced had been developed as instant thickener in instant cocoa filling and topping premix for bakery and confectionary products. The cost needed in preparation of this modified GCWS sago starch is somehow very expensive due to high wastage during washing process.

ABSTRAK

Objektif utama kajian ini adalah menghasilkan granul kaji sagu larut air sejuk (GCWS) skala makmal yang mempunyai keterlarutan air sejuk yang tinggi serta butiran granul yang lebih banyak. Kajian ini dimulakan dengan pengoptimuman jumlah NaOH dan kepekatan etanol diperlukan untuk menghasilkan kanji sagu GCWS menggunakan Metodologi Respons Permukaan (MRP) dan Rekabentuk Kubid Berpusat-Permukaan. Keadaan optimum terdiri daripada 40.7-50.5% etanol dan 278.5-296.3 g NaOH yang mempunyai keterlarutan air sejuk setinggi 52.2 ± 1.5%. Seterusnya, rawatan alkohol-alkali digabungkan dengan tiga jenis pengubahsuaian kimia, iaitu hydroksipropilasi, paut-silang dan dwi-pengubahsuaian untuk menghasilkan kanji sagu GCWS terubahsuai. MRP digunakan untuk mengkaji kesan pembolehubah-pembolehubah proses dan interaksi antaranya ke atas respons diuji. Kedua-dua paut-silang dan dwi-pengubahsuaian berjaya memperbaiki keterlarutan air sejuk (masing-masing > 60% dan > 80%) dan kesempurnaan granul kanji sagu segera. Akan tetapi, kefungsian (sifat pempesan dan terma) kanji segera dihasil adalah berlainan akibat perubahan struktur yang berlaku di dalam granul-granul kanji. Hidroksipropilasi didapati tidak mempengaruhi keterlarutan dan pengembangan dalam air sejuk ($p<0.05$), tetapi dapat memperbaiki retrogradasi kanji dengan mengurangkan `setback'. Secara ringkas, semua rawatan menunjukkan NaOH adalah pembolehubah terpenting untuk mempengaruhi respons diuji. Kaji sagu GCWS terubahsuai telah digunakan sebagai pemekat segera dalam pra-campuran inti dan toping koko segera untuk produk bakeri dan konfeksi. Bagaimanapun, kanji sagu GCWS terubahsuai ini agak mahal disebabkan kehilangan yang banyak sewaktu proses pembasuhan.