



MODIFICATION OF TAMARIND SEED STARCH WITH OCTENYL SUCCINIC ANHYDRATE (OSA) IN THE PRODUCTION OF MAYONNAISE

by

SITI SHAFINAZ BINTI MOHD SIDEK

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**PUSAT PENGAJIAN TEKNOLOGI INDUSTRI
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**BORANG PENYERAHAN DISERTASI MUTAKHIR
SATU (1) NASKAH**

Nama penyelia : Dr Uthumporn Utra @ Sapina Abdullah

Bahagian : Teknologi Makanan

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Encik/puan/cik : Siti Shafinaz binti Mohd Sidek

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LIST OF SYMBOLS AND ABBREVIATIONS

Abbreviation	Caption
α	alpha
μm	Micrometre
AT	Acid hydrolysed tamarind seed starch
AOST	Acid hydrolysed treated with OSA modified tamarind seed starch
AgNO_3	silver nitrate
CVD	Cardiovascular disease
DS	Degree of substitution
EI	Emulsification index
FDA	Food and Drug Administration
FTIR	Fourier transform infrared spectroscopy
g	Gram
GRAS	Generally recognized as safe
h	Hour
HCl	Hydrochloric acid
K	Consistency index
LDL	Low density lipoprotein
M	Molarity
min	Minutes
mL	Milliliter
mg	Milligram
M0	Mayonnaise with 100% egg yolk
M25	Mayonnaise with 75% egg yolk and 25% AOST

M75	Mayonnaise with 25% egg yolk and 75% AOST
M100	Mayonnaise with 100% AOST
mg/kg	Milligram per kilogram
Na ₂ S ₂ O ₅	Sodium metabisulphite
NMR	Nuclear magnetic resonance
n	Flow behaviour index
N	Normality
NaOH	Sodium hydroxide
NT	Native tamarind seed starch
OSA	Octenyl Succinic Anhydrate
OST	OSA modified tamarind seed starch
rpm	Rotation per minute
SEM	Scanning electron microscope
TSS	Tamarind seed starch
v/v	Volume per volume
w/v	Weight per volume
XRD	X-ray diffraction

MODIFIKASI KANJI BIJI ASAM JAWA DENGAN OKTENIL SUKSINAT ANHIDRAT (OSA) DALAM PENGELUARAN MAYONIS

ABSTRAK

Kuning telur mengandung lesitin yang memiliki kemampuan pengemulsi untuk menghasilkan mayonis tetapi mengandung kolesterol tinggi yang tidak digemari oleh pengguna. Kanji biji asam jawa (TSS) adalah sumber yang kurang digunakan dan murah menjadikannya pengganti yang sesuai untuk kuning telur sebagai pengemulsi. Objektif kajian ini adalah untuk mengkaji kesan pra-rawatan hidrolisis asid dan pengubahsuaian octenyl succinate anhydride (OSA) terhadap sifat pengemulsi TSS dan menganalisis lebih lanjut dalam penghasilan mayonis. Pra-rawatan dengan hidrolisis asid dilakukan sebelum pengubahsuaian OSA. Empat sampel, NT (kanji TSS asli), AT (TSS yang dirawat asid), OST (TSS yang diubahsuai dengan OSA) dan AOST (TSS yang dirawat dengan asid dan diubahsuai dengan OSA) dianalisis sifat pengemulsi mereka. Dalam pengeluaran mayonis, empat nisbah kuning telur : AOST digunakan M0 (100:0), M25 (75:25), M75 (25:75) dan M100 (0:100). Nilai DS yang tinggi apabila pengubahsuaian TSS berganda memberikan sifat pengemulsi kanji yang tinggi. Semua emulsi menunjukkan tingkah laku penipisan ricih ($n < 1$, pseudoplastik). AOST menunjukkan nilai indeks emulsi (EI) dan kelikatan yang paling tinggi dan analisis mikroskopik menunjukkan ukuran kecil titisan minyak berbanding yang lain. Oleh itu, AOST dipilih untuk melanjutkan dengan produksi mayonis. Semua mayonis didapati menunjukkan tingkah laku penipisan ricih ($n < 1$, pseudoplastik) dengan M25 menunjukkan kelikatan yang paling tinggi. M0 menunjukkan nilai EI tertinggi, nilai pH dan indeks krim dan terma krim terendah diikuti M25, M75 dan M100. Semua sampel menunjukkan nilai L^* , a^* dan b^* yang berbeza secara signifikan. Titisan berisi rapat

dengan tetesan minyak berukuran kecil yang sekata diperhatikan dengan jelas pada M25. Kesimpulannya, M25 terbukti sebagai kemampuan pengemulsi terbaik kerana pelbagai mekanisme seperti penstabilan sterik dan interaksi kanji.

MODIFICATION OF TAMARIND SEED STARCH WITH OCTENYL SUCCINIC ANHYDRATE (OSA) IN THE PRODUCTION OF MAYONNAISE

ABSTRACT

Egg yolk contains lecithin which has emulsifying ability to produce mayonnaise but contains high cholesterol which is not preferable by consumer. Tamarind seed starch (TSS) is an underutilized and cheap resource that makes it a suitable substitute for egg yolk as an emulsifier. The objective of this study is to study the effect of acid hydrolysis pre-treatment and octenyl succinate anhydride (OSA) modification on emulsifying properties of TSS and further analysis in the production of mayonnaise. Pre-treatment with acid hydrolysis was conducted prior to OSA modification. Four samples, NT (native TSS), AT (acid treated TSS), OST (OSA modified TSS) and AOST (acid treated with OSA modified TSS) were analysed for their emulsifying properties. In the mayonnaise production, four ratios of egg yolk to AOST were used: M0 (100:0), M25 (75:25), M75 (25:75) and M100 (0:100). High DS values upon dual modification of TSS give high emulsifying properties of starch. All emulsions exhibit shear thinning behaviour ($n < 1$, pseudoplastic). AOST showed the highest apparent viscosity and emulsion index (EI) values and microscopic analysis showed a small size of oil droplets compared to the others. Hence, AOST was chosen to further proceed with mayonnaise production. All mayonnaise was found to exhibit shear thinning behaviour ($n < 1$, pseudoplastic) with M25 showing the highest apparent viscosity. M0 presented the highest EI values, pH value and lowest creaming and thermal creaming index followed by M25, M75 and M100. All samples showed significantly different values of L^* , a^* and b^* . Droplets were closely packed with homogenous small size of oil droplets, which was clearly observed in M25. From all the results, M25 has shown to be the best emulsifying ability because of various mechanisms such as steric stabilization and granule interaction.