



# **OPTIMIZATION OF PRE-TREATMENT CONDITIONS OF ACID BLANCHING AND PECTINASE IN PRODUCTION OF PAPAYA JUICE**

by

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Sekian, terima kasih.

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NURUL ANIS JASMIN BINTI ARIFFIN

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## LIST OF ABBREVIATIONS

Abbreviation	Caption
AB	Acid blanching
PE	Pectinase enzyme
RSM	Response Surface Methodology
CCD	Central Composite Design
TSS	Total soluble solids
TA	Titrateable acidity
ppm	Parts per million
mPas	Millipascal-second
R <sup>2</sup>	Coefficients of determination
CA	Citric acid
ANOVA	Analysis of variance
min	Minute
g	Gram
μg	Microgram
mg	Milligram
kcal	kilocalorie
kJ	kiloJoule
Y <sub>i</sub>	The predicted response
β <sub>0</sub>	The value of the fixed response at the central point of the experiment
β <sub>1</sub> and β <sub>2</sub>	The regression coefficients for linear effect terms
β <sub>11</sub> and β <sub>22</sub>	The regression coefficients for quadratic effect terms
β <sub>12</sub>	The regression coefficients for interaction effect terms

# **PENGOPTIMUMAN KEADAAN PRA-RAWATAN PENCELURAN BERASID DAN PEKTINASE DALAM MENGHASILKAN JUS BETIK**

## **ABSTRAK**

Malaysia adalah salah satu pengeluar buah betik global terbanyak. Ini kerana pematangan awal, pengeluaran yang tinggi dan kandungan nutrien yang tinggi menyebabkan pokok betik ditanam secara meluas di Malaysia. *Carica papaya* adalah buah klimaterik yang akan terus matang setelah dipetik dari pokok. Walau bagaimanapun, betik sangat mudah rosak mengakibatkan kerugian selepas penuaian. Oleh itu, betik yang masak dapat diproses menjadi jus betik untuk meningkatkan jangka hayat. Namun, sukar untuk mengekstrak jus betik kerana kandungan pektinnya yang tinggi. Objektif kajian ini adalah untuk menghasilkan jus betik dengan ciri sensori yang diingini dan penerimaan pengguna. Buah betik dirawat dengan penceluran berasid (0%, 0.5%, 1.5% dan 2.5% asid sitrik) dan rawatan enzim pektinase (10 ppm, 20 ppm dan 30 ppm) semasa kajian awal. Penentuan hasil dan sifat fizikokimia (warna, kepekatan, pH, jumlah pepejal larut (TSS) dan keasidan titrat (TA)) dilakukan. Untuk pengoptimuman, buah betik dirawat dengan kepekatan asid sitrik yang berbeza dalam penceluran berasid (0.5% - 1.5%) dan enzim pektinase (10 ppm - 30 ppm) yang telah disarankan oleh metodologi permukaan tindak balas (RSM). Tiga belas sampel jus betik dianalisis dengan sifat fizikokimia (warna, kelikatan, pH, jumlah pepejal larut (TSS) dan keasidan titrat (TA)) dan ujian hedonik (warna, perasa, rasa, rasa selepas makan dan penerimaan keseluruhan). Hasil awal menunjukkan penceluran asid secara signifikan ( $P < 0.05$ ) meningkatkan hasil jus, kecerahan ( $L^*$ ) dan kekuningan ( $b^*$ ) jus betik. Walaupun, peratusan TA meningkat dengan ketara pada kepekatan 1.5% dan 2.5% asid sitrik. Hasil kemerahan (nilai  $a^*$ ), kepekatan, pH dan TSS jus betik menunjukkan penurunan yang ketara setelah dirawat dengan penceluran asid. Dalam rawatan enzimatik, hasil jus, kecerahan (nilai  $L^*$ ), dan TA jus betik meningkat dengan

ketara setelah dirawat dengan enzim pektinase tetapi kemerahan (nilai \*a) dan kekuningan (nilai b\*), kepekatan, pH dan TSS jus betik menurun dengan ketara setelah dirawat dengan enzim pektinase. Akhir sekali, rawatan pra memberi kesan yang besar kepada jisim fizikokimia. Hasil Analisis Varians (ANOVA) untuk model kuadratik tindak balas menunjukkan model kecerahan ( $L^*$ ), kemerahan ( $a^*$ ), pH, warna, perasa, rasa, rasa selepas makan dan penerimaan keseluruhan adalah berbeza secara signifikan ( $P < 0.05$ ), dan pekali penentuan ( $R^2$ ) adalah antara 0.55 hingga 0.92. Kepekatan terbaik asid sitrik dan enzim pektinase dalam menghasilkan jus betik yang diterima tinggi diperolehi dengan pra-merawat jus betik dengan 0.63% asid sitrik dan 14.34 ppm pektinase.

## **OPTIMIZATION OF PRE-TREATMENT CONDITIONS OF ACID BLANCHING AND PECTINASE IN PRODUCTION OF PAPAYA JUICE**

### **ABSTRACT**

Malaysia is the one of top global producer of papaya fruit. Due to early maturation, high production and high nutritional contents cause the papaya tree widely planted in Malaysia. *Carica papaya* is a climacteric fruit that will continue to ripen once being plucked from the tree. However, papaya is highly perishable lead to the post-harvest losses. Therefore, ripe papaya can process into papaya juice to improve the shelf life. However, it is difficult to extract the papaya juice due to its high pectin content. The objectives of this study are to produce papaya juice with desired sensory characteristics and consumer acceptance. The papaya flesh was treated with acid blanching (0%, 0.5%, 1.5% and 2.5% citric acid) and pectinase enzyme treatment (10 ppm, 20 ppm and 30 ppm) during a preliminary study. Determination of yield and physicochemical properties (colour, viscosity, pH, total soluble solids (TSS) and titratable acidity (TA)) were carried out. For optimization, papaya flesh was treated with different concentrations of citric acid in blanching water (0.5% - 1.5 %) and pectinase enzyme (10 ppm - 30 ppm) that have been suggested by Response Surface Methodology (RSM). Thirteen samples of papaya juice were analysed with physicochemical properties and hedonic test (colour, flavour, taste, aftertaste and overall acceptability). Preliminary results showed acid blanching significantly ( $P < 0.05$ ) increased the juice yield, colour lightness ( $L^*$ ) and yellowness ( $b^*$ ) of papaya juice. Although, the percentage of TA was increased significantly at concentration 1.5% and 2.5% citric acid. The result of redness ( $a^*$  value), viscosity, pH and TSS of papaya juice showed significantly decreased after treated with acid blanching. In enzymatic treatment, the juice yield, lightness ( $L^*$  value), and TA of papaya juice increased significantly after pre-treated with pectinase enzyme but redness ( $a^*$  value)