

## INTISARI

Tujuan penelitian ini adalah (1) mengidentifikasi karakteristik fisik, kimia dan fungsional pati keladi alami dari 3 lokasi di Maluku yaitu Buru, Porto dan Saumlaki, (2) memodifikasi pati keladi melalui modifikasi asetilasi dengan perlakuan konsentrasi asam asetat glasial sebagai reaktan dan konsentrasi NaOH sebagai katalis dan mengkarakteristik sifat fisik, kimia, fungsional dan kandungan pati resisten dan (3) mengevaluasi efek fisiologis pati keladi asetat (RS tipe 4) dalam menurunkan kadar glukosa darah tikus diabet dan menentukan mekanismenya. Hasil penelitian menunjukkan bahwa analisis proksimat dan fungsional tidak menunjukkan hasil yang berbeda nyata antar ketiga pati. Warna pati keladi adalah putih dengan nilai L yang mencapai 91,28 – 91,35, bentuk granula pati keladi polihedral yang terpotong dengan permukaan granula yang sedikit kasar. Ukuran partikel 11.4  $\mu\text{m}$  - 12.9  $\mu\text{m}$ . Derajat kristalinitas yaitu 35,74% pati Saumlaki (PS), 33,06% pati buru (PB), dan 34,87% pati Porto (PP). Nilai  $2\theta$  menunjukkan bahwa keladi termasuk tipe A. Nilai suhu gelatinisasi berada pada kisaran 76°C – 77°C dengan nilai entalpi -130 - (-174,76) J / g. Hasil analisis FTIR menunjukkan bahwa gugus pati keladi yang terbentuk adalah C-H bending, C-O stretching, OH.

Hasil pengujian derajat substitusi dan persen asetilasi dari 9 kombinasi perlakuan dengan 3 ulangan. Kisaran nilai DS dari sembilan kombinasi perlakuan adalah 0,5-0,9% dan kisaran nilai % asetilasi adalah 1,49-2,56. Perlakuan yang dipilih berdasarkan kestabilan nilai %As dan DS yaitu PAS\_3 (asam asetat 4%, NaOH 15%), PAS\_4 (asam asetat 6%, NaOH 11%) dan PAS\_8 (asam asetat 8%, NaOH 13%). Hasil uji anova menunjukkan bahwa untuk kadar air, kadar abu, kadar lemak, kadar protein pati asetat berbeda nyata dengan pati alami. Kombinasi perlakuan asam asetat dan NaOH berpengaruh dalam meningkatkan kadar amilosa, pati resisten, swelling power, kelarutan. Hasil analisa menghasilkan nilai parameter tersebut berbeda nyata dengan pati alami. Hasil analisis SEM yaitu polihedral terpotong, permukaan granula pati alami sedikit lebih kasar dibandingkan dengan pati asetat. Ukuran diameter partikel pati mengalami peningkatan dan perubahan persentase pada saat modifikasi, hasil uji XRD menunjukkan terjadi penurunan derajat kristalinitas pada pati asetat dan tipe kristalinitas yaitu tipe A. Hasil analisis DSC, nilai entalpi pati asetat lebih rendah dari pati alami. Karakteristik pasta pati asetat menunjukkan penurunan pada ketiga pati asetat daripada pati alami. Asam asetat dan NaOH berperan dalam menurunkan viskositas pati. Hasil analisis FTIR menunjukkan terjadi substitusi gugus asetil pada granula pati keladi, serapan spektra pada nilai 2928,38; 1736,32; 1647,08; 1163,87; 1020,93 yang mengindikasikan telah terjadi substitusi pada gugus pati keladi asetat. Hasil analisis pada tahap 3 dan uji statistik yang meliputi berat badan, kadar glukosa darah, kadar insulin puasa, HOMA-IR, HOMA  $\beta$ , adsorpsi glukosa, profil SCFA, sifat antioksidatif memperlihatkan hasil yang berbeda nyata dengan pati alami.

*Kata kunci : pati keladi, pati asetat, diabetes mellitus*

## ABSTRACT

The aim of this study was to (1) identify the physical, chemical and functional characteristics of natural cocoyam starch from 3 locations in Maluku, namely Buru, Porto and Saumlaki, (2) modify cocoyam starch through modification of acetylation by treating glacial acetic acid concentrations as reactants and NaOH concentrations as catalysts and to characterize physical properties, chemical, functional and content of resistant starch and (3) evaluate the physiological effect of acetate cocoyam starch (type 4 RS) in reducing blood glucose levels in diabetic rats and determine the mechanism. The results showed that the proximate and functional analyses did not show significantly different results among the three starches. The color of cocoyam starch is white with an L value reaching 91.28 – 91.35, the form of truncated polyhedral cocoyam starch granules with a slightly rough surface. The particle size was 11.4 m - 12.9 m. The degree of crystallinity was 35.74% for *Saumlaki* starch (PS), 33.06% for *Buru* starch (PB), and 34.87% for *Porto* starch (PP). The value of  $2\theta$  indicated that cocoyam belonged to Type A. The gelatinization temperature was in the range of 76°C – 77°C with an enthalpy value of -130 - (-174.76) J/g. The results of the FTIR analysis showed that the starch clusters formed were C-H bending, C-O stretching, OH.

The results of testing the degree of substitution and acetylation percentage of nine treatment combinations with three repetitions are elaborated as follows. The range of DS values of the nine treatment combinations was 0.5-0.9%, and the range of % acetylation value was 1.49-2.56. The selected treatments were based on the stability of % As and DS values, namely PAS\_3 (4% acetic acid, 15% NaOH), PAS\_4 (6% acetic acid, 11% NaOH), and PAS\_8 (8% acetic acid, 13% NaOH). The results of the ANOVA test showed that the contents of water, ash, fat, and protein of acetate starch were significantly different from those of natural starch. The combination of acetic acid and NaOH treatment had an effect on increasing the amylose content, resistant starch, swelling power, solubility where the values of these parameters were significantly different from the natural starch's. For the pasta clearness, acetate starch decreased slightly more slowly than the natural starch. The acetate starch's pH and color were not significantly different from the natural starch's. The results of the SEM analysis were truncated polyhedral and the surface of natural starch granules which was slightly rougher than the acetate starch's. The size of the starch particle diameter increased and the percentage changed during the modification; the XRD test results showed a decrease in the degree of crystallinity of acetate starch, namely 31.02-31.36% which was lower than 33.06% natural starch, but the peak angle of  $2\theta$  did not change and the type of crystallinity was also unchanged i.e. type A. The results of the DSC analysis showed that there was an increase in the initial temperature, peak temperature, final temperature, and the enthalpy value of acetate starch compared to natural starch. The characteristics of the acetate starch pasta showed a decrease in the three acetate starches than the natural starch. Acetic acid and NaOH played a role in reducing the viscosity of starch. The data from the FTIR analysis showed that there was a substitution of acetyl cluster in the cocoyam



starch granules; the absorption spectra were 2928.38; 1736.32; 1647.08; 1163.87; 1020.93 indicating that there had been a substitution in the acetate cocoyam starch group.

The overall results of the analysis in Stage 3 which included body weight, feed residue, blood glucose levels, fasting insulin levels, HOMA-IR, HOMA  $\beta$ , glucose adsorption, SCFA profile, antioxidant properties showed significantly different results from natural starch. This showed that starch acetate could be used as an alternative food in lowering blood glucose levels in DM patients.

*Keywords: cocoyam starch, acetate starch, diabetes mellitus*