

**Karakteristik dan Potensi-Antidiabetik serta Perbaikan Profil Lipid  
Pati Sitrat Kacang Gude (*Cajanus cajan*) pada Tikus Wistar Hiperkolesterol  
Diabetes Induksi *Streptozotocin-Nicotinamide* (STZ-NA)**

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**INTISARI**

Tujuan umum penelitian ini adalah mengetahui potensi antidiabetik dan perbaikan profil lipid darah pati sitrat kacang gude pada tikus *Wistar* hiperkolesterol diabetes induksi *streptozotocin-nicotinamide*. Penelitian dilaksanakan dalam 3 tahap, yaitu 1). Penentuan pati kacang gude dari lokasi tumbuh terpilih berdasarkan kadar amilosa tertinggi dan kristalinitas terendah; 2). Modifikasi dan karakterisasi pati sitrat kacang gude; 3). Uji *in vivo* potensi antidiabetik dan perbaikan profil lipid darah pati sitrat kacang gude dan uji *in vitro* kapasitas adsorpsi glukosa, kapasitas penghambatan enzim  $\alpha$ -amilase dan  $\alpha$ -glukosidase. Pati kacang gude dari Yogyakarta mempunyai kadar amilosa tertinggi (58,51%) dan kristalinitas terendah (24,20%). Modifikasi pati kacang gude menggunakan asam sitrat 30% dan NaOH 20% menghasilkan kadar pati resisten tertinggi, yaitu 18,45%. Pati sitrat kacang gude mempunyai derajat substitusi 0,05-0,17 dengan rendemen sebesar 110,24-122,82%. Pati sitrat kacang gude mempunyai viskositas, kristalinitas, entalpi gelatinisasi, kadar amilosa, *swelling power*, kelarutan yang lebih rendah namun mempunyai WHC, OHC, kecerahan warna dan kadar pati resisten yang lebih tinggi daripada pati alami kacang gude. Terjadinya ikatan ester antara sitrat dengan pati kacang gude ditandai munculnya pita baru spektra FTIR pada bilangan gelombang  $1735\text{ cm}^{-1}$  dan puncak baru spektra  $^{13}\text{CNMR}$  pada 171,846 ppm. Hasil uji *in vivo* menunjukkan bahwa pati sitrat kacang gude mampu menurunkan kadar glukosa darah sebesar 64,95% dan memperbaiki profil lipid darah yang ditunjukkan dengan penurunan kadar kolesterol total, kadar kolesterol LDL dan kadar trigliserida sebesar 47,07%; 55,69%; 37,77% serta peningkatan kadar kolesterol HDL sebesar 206,04% pada tikus *Wistar* hiperkolesterol diabetes induksi *streptozotocin-nicotinamide*. Penurunan absorpsi glukosa, perbaikan fungsi pankreas, peningkatan kapasitas penghambatan enzim  $\alpha$ -amilase dan  $\alpha$ -glukosidase, peningkatan sensitivitas insulin serta peningkatan kadar GLUT 4 merupakan mekanisme pati sitrat untuk menurunkan kadar glukosa darah. Penurunan reabsorpsi asam empedu, penurunan emulsifikasi lipid dalam usus halus dan penurunan biosintesis kolesterol merupakan mekanisme pati sitrat untuk memperbaiki profil lipid darah.

**Kata kunci: pati kacang gude, asam sitrat, pati resisten, diabetes mellitus tipe 2, profil lipid**

**Characteristics, Antidiabetic Potential and Improvement of Lipid Profiles of Citrate Starch of Pigeon Pea (*Cajanus cajan*) in Wistar Rats Hypercholesterolemia Diabetes Induced by Streptozotocin-Nicotinamide (STZ-NA)**

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**ABSTRACT**

This study's main goal was to determine the antidiabetic potential and improvement of the blood lipid profiles of pigeon pea citrate starch in Wistar diabetic hypercholesterol-induced *streptozotocin-nicotinamide* rats. Three stages of the research were conducted, specifically 1). Determination of pigeon pea starch from the selected growing location based on the highest amylose content and lowest crystallinity; 2). Modification and characterization of pigeon pea citrate starch; 3). *In vivo* assay of the antidiabetic potential and improvement of blood lipid profiles of pigeon pea citrate starch; *in vitro* assay of glucose-adsorption capacity, the inhibition capacity of  $\alpha$ -amylase and  $\alpha$ -glucosidase. The pigeon pea starch from Yogyakarta had the highest amylose content (58.51%) and the lowest crystallinity (24.20%). Modification of pigeon pea starch using 30% citric acid and 20% NaOH produced the highest resistant starch content, 18.45%. Pigeon pea citrate starch had a degree of substitution of 0.05-0.17 with a yield of 110.24-122.82%. Pigeon pea citrate starch had lower viscosity, crystallinity, gelatinization enthalpy, amylose content, swelling power, and solubility but had higher WHC, OHC, color brightness, and resistant starch content than natural pigeon pea starch. A new FTIR spectrum band at wave number  $1735\text{ cm}^{-1}$  and a new peak in the  $^{13}\text{CNMR}$  spectrum at 171.846 ppm marked the occurrence of ester bonds between citric acid and pigeon pea starch. *In vivo* assay results showed that pigeon pea citrate starch was able to reduce blood glucose levels by 64.95% and improve blood lipid profiles as indicated by a reduction in total cholesterol levels, LDL cholesterol levels, and triglyceride levels by 47.07%; 55.69%; 37.77%, respectively, additionally, it resulted in a 206.04% increase in HDL cholesterol. Reduced blood glucose levels were achieved through mechanisms such as lowered glucose absorption, improved pancreatic function, increased inhibitory capacity of  $\alpha$ -amylase and  $\alpha$ -glucosidase enzyme, increased insulin sensitivity, and increased GLUT 4 levels by citrate starch. Citrate starch improved the blood lipid profiles by reducing bile acid reabsorption, reducing lipid emulsification in the small intestine, and decreasing cholesterol biosynthesis.

**Keywords:** pigeon pea starch, citric acid, resistant starch, type 2 diabetes mellitus, lipid profiles