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Functional properties of modified starch from *Pachyrhizus erosus*
(yam bean) tuber / Nurhidayu Che Azlan.

PUSAT PEMBELAJARAN DIGITAL SULTANAH NUR ZAHIRAH
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

1100090233	

Lihat Sebelah

HAK MILIK
PUSAT PEMBELAJARAN DIGITAL SULTANAH NUR ZAHIRAH

**FUNCTIONAL PROPERTIES OF MODIFIED STARCH FROM *PACHYRHIZUS EROSUS*
(YAM BEAN) TUBER**

By

Nurhidayu binti Che Azlan

**Research Report submitted in partial fulfillment of
The requirement for degree of
Bachelor of Food Science (Food Technology)**

**DEPARTMENT OF FOOD SCIENCE
FACULTY OF AGROTECHNOLOGY AND FOOD SCIENCE
UNIVERSITI MALAYSIA TERENGGANU**

2012

ENDORSEMENT

The project report entitled Functional Properties of Modified Starch from Pachyrhizus Erosus (Tombok) Tuber by Nurhidayu bt Che AZIAN Matric No. 17695

has been reviewed and corrections have been made according to the recommendations by examiners. This report is submitted to the Department of Food Science in partial fulfillment of the requirement of the degree of Food Science (Food Technology), Faculty of Agrotechnology and Food Science, University Malaysia Terengganu.



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(DR.NOR HAYATI BT IBRAHIM)

Supervisor

-Stamp-

DECLARATION

I hereby declare that this research project is based on my original work except the quotations and summarizes, which have been duly acknowledged.

Signature :
Name : Nurhidayu Che Azlan
Matric No. : 17695
Date : 1/2/2012

ACKNOWLEDGEMENT

First at all, I would like to present my deepest thanks and appreciation to my final year project supervisor Dr. Nor Hayati binti Ibrahim for conducting my final product, support and guiding me to make sure my project can finish smoothly and promptly. Besides, I also very appreciate that the change she gives to me to finish my study and research under her.

Furthermore, a grateful thank to all lab assistant from Food Science laboratory, Food Chemistry laboratory for always give their cooperation and helping me to settle problem during lab section. Other than that, I sincerely thank to all my family members and beloved friends that always give me moral to make sure I will to go through any obstacles to finishing lab report and lab work until the end.

Thank you.

ABSTRACT

In this study, chemical characteristics of starch isolated from *Pachyrhizus erosus* (yam bean) tuber were determined. The starch was then modified through pregelatinization, cross-linked phosphorylation and acetylated starch esterification and characterized in terms of their physical properties. The yield of *Pachyrhizus erosus* starch was 2.26% and the starch contained 83.99% total starch, 84.94% carbohydrate, 5.11% protein, 0.0063% lipid, 3.04% moisture content, 6.83% ash, 14.39% amylose and 85.61% amylopectin. Pregelatinization resulted in a better swelling power (10.90 g/g) compared to acetylated esterified starch (7.98 g/g) and cross-linked phosphorylated (7.23 g/g). Better solubility also present in pregelatinized starch (12.98%) follow with acetylated esterified starch (11.35%) and cross-linked phosphorylated starch (11.28%). Meanwhile, acetylated esterified starch gave better water binding capacity (9.20 g/g) relative to pregelatinized (8.27 g/g) and cross-linked phosphorylated starch (7.35 g/g). It was also found that the effect of each factor on swelling power, solubility and water holding capacity was significantly ($p < 0.05$) depended on types of starch at different temperature and vice versa. Acetylated starch (17.72%) demonstrated the best stability in freeze-thaw cycle followed by cross-linked phosphorylated starch (23.65%), pregelatinized starch (33.21%). Light microscope was using to observe granule characteristic and temperature onset until complete gelatinization. Acetylated starch gave higher gelatinization temperature (91°C) then pregelatinized starch (84°C), native starch (88°C) and cross-linked phosphorylated starch (78°C).

ABSTRAK

Dalam kajian ini, ciri-ciri kimia kanji yang terpencil dari *Pachyrhizus erosus* (keladi kacang) ubi telah ditentukan. Kanji itu kemudiannya diubahsuai melalui *pregelatinization*, *cross-linked phosphorylated* dan *acetylated esterificated starch* dan ciri-ciri dari segi sifat-sifat fizikal mereka. Hasil kanji *Pachyrhizus erosus* adalah 2,26% dan mengandungi kanji 83,99%, karbohidrat 84,94%, 5,11% protein, lipid 0,0063%, 3,04% kandungan lembapan, abu 6,83%, amylose 14,39% dan amylopectin 85,61%. Pregelatinization yang menghasilkan kuasa lebih baik bengkak (10,90 g / g) berbanding dengan *acetylated esterificated starch* (7,98 g / g) dan *cross-linked phosphorylated* (7,23 g / g). Kebolehlarutan yang lebih baik juga hadir dalam kanji pregelatinization (12,98%) mengikut dengan *acetylated esterificated starch* (11,35%) dan *cross-linked phosphorylated* (11,28%). Sementara itu, *acetylated esterificated starch* memberikan kapasiti air yang lebih baik mengikat (9,20 g / g) berbanding dengan *pregelatinized* (8,27 g / g) dan *cross-linked phosphorylated* (7,35 g / g) Ia juga mendapati bahawa kesan setiap faktor kuasa bengkak keupayaan kelarutan dan memegang air dengan ketara ($p < 0.05$) bergantung kepada jenis kanji pada suhu yang berbeza dan sebaliknya. Kanji *acetylated* (17,72%) menunjukkan kestabilan yang terbaik dalam kitaran beku-cair diikuti dengan *cross-linked phosphorylated* (23,65%), kanji *pregelatinized* (33,21%). Mikroskop cahaya digunakan untuk memerhatikan ciri-ciri biji dan permulaan suhu sehingga gelatinization lengkap. Kanji *acetylated* memberi gelatinization yang lebih tinggi (91 ° C) kanji kemudian *pregelatinized* (84 ° C), kanji asli (88 ° C) dan *cross-linked phosphorylated* (78 ° C) suhu.