



UNIVERSITI PUTRA MALAYSIA

**NUTRITIONAL COMPOSITION, ANTIOXIDANT PROPERTIES OF
Hylocereus Polyrhizus POWDER AND THEIR EFFECTS ON
PLASMA GLUCOSE LEVEL AND LIPID PROFILES IN
DIABETIC RATS AND PRE-DIABETIC SUBJECTS**

MOHD AL-SAUFREEN BIN AKHIRUDDIN

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By

MOHD AL-SAUFREEN BIN AKHIRUDDIN

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
In Fulfilment of the Requirements for the Degree of Master of Science**

May 2013

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This thesis is dedicated to my parents

Akhiruddin Bin Hasanbasry

Norazin Binti Ahmad

&

My lovely wife

Azimah Binti Rabu

~For their endless love, support and encouragement~

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment
of the requirement for the degree of Master of Science

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May 2013

Chairman : Associate Professor Rokiah Binti Mohd Yusof, PhD

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This study was carried out to determine nutritional composition, antioxidant properties of red pitaya (*Hylocereus polyrhizus*) powder (RPP) and to evaluate the effects of RPP consumption on blood glucose level and lipid profiles in streptozotocin-induced diabetic rats and pre-diabetic human subjects. The study consisted of three phases. In phase one, the proximate analyses of RPP were determined according to the methods of Association of Official Analytical Chemists (AOAC) international. Meanwhile, ascorbic acid assessment was carried out according to the modified method using high performance liquid chromatography (HPLC) assay. The RPP antioxidant power was determined using FRAP assay. The proximate composition of RPP were moisture (5.27 %), ash (1.22 g), carbohydrate (26.6 g), protein (1.59 g), fat (0.014 g), soluble fiber (12.05g) and insoluble fiber (5.65 g). The vitamin C content was 32.14 mg/100 g. The FRAP assay value of RPP was $31.36 \pm 3.45 \mu\text{M}/100\text{g}$ or $8.72 \pm 0.16 \text{ mg}/100\text{g}$.

In phase two, study on hypoglycemic effects of RPP on plasma glucose level and lipid profiles in diabetic induced rats was conducted. This study used forty eight male Sprague-Dawley rats weight between 250 g-300 g. All the rats were divided equally into six groups. The groups consisted of control groups (NC & DC) and treatment groups (NPP, DPP, DPPM & DM). After four weeks of treatment, all treatment groups had showed significantly reduced ($p < 0.05$) in the plasma glucose level. The highest percentage reduction in glucose level was observed in DPPM group with 69.97 %. For plasma total cholesterol (TC) level, the highest percentage reduction was observed in NPP group with 62.39 %. In phase three, community trials were conducted among pre-diabetic human subjects at Felda Mempaga Bentong, Pahang. Total thirty six subjects were randomly divided into two groups which were pre-diabetic treatment groups consisted of PT3 (consumed 60 g RPP/day), PT4 (consumed 80 g RPP/day), and PT5 (consumed 100 g RPP/day) and pre-diabetic control groups which were not consumed RPP. For plasma glucose level, among treatment groups, PT5 had showed the highest percentage of reduction (22.90 %) with significant difference ($p < 0.05$) in the mean plasma blood glucose level after 4 weeks of treatment. For plasma lipid profiles, showed that group PT5 had the highest percentage of reduction with significant difference ($p < 0.05$) in TC (26.44 %), TG (20.54 %), and LDL-C (49.55%) levels followed by PT4 and PT3 groups after 4 weeks of treatment. For HDL-C level, PT5 group also showed the highest percentage of increment 63.8 %. The results revealed that all dosages of RPP drinks showed positive effects in increasing HDL-C and TAS levels, in the same time lowering glucose, TC, TG and LDL-C levels in pre-diabetic subjects.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai
memenuhi keperluan untuk ijazah Master Sains

**KOMPOSISI NUTRIEN, KANDUNGAN ANTIOKSIDA SERBUK *Hylocereus
Polyrhizus* DAN KESANNYA KE ATAS PARAS GLUKOSA PLASMA DAN
PROFIL LIPID DALAM TIKUS DIABETIK DAN SUBJEK PRA-DIABETIK**

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Kajian ini dijalankan untuk menentukan komposisi pemakanan, kandungan antioksidan serbuk pitaya merah (RPP) dan mengkaji kesan pengambilan RPP ke atas paras glukosa darah dan profil lipid di kalangan subjek Pra-diabetik. Terdapat tiga fasa dalam kajian ini. Dalam fasa satu, analisis komposisi nutrient RPP telah ditentukan mengikut panduan *Association of Official Analytical Chemists (AOAC international)*. Sementara itu, penentuan vitamin C telah dijalankan mengikut cara yang telah diubahsuai menggunakan kaedah *high performance liquid chromatography (HPLC) assay*. Kuasa antioksidan RPP ditentukan menggunakan kaedah *FRAP*. Komposisi nutrient dalam RPP adalah kelembapan (5.27 %), abu (1.22 g), karbohidrat (26.6 g), protein (1.59 g), lemak (0.014 g), fiber larut (12.05g) dan fiber tidak larut (5.65 g). Kandungan vitamin C ialah 32.14 mg / 100 g. Nilai *FRAP* dalam RPP ialah $31.36 \pm 3.45 \mu\text{M}/100 \text{ g}$ atau $8.72 \pm 0.16 \text{ mg}/100 \text{ g}$.

Dalam fasa kedua, kajian tentang kesan hipoglisemik serbuk pitaya merah ke atas paras plasma glukosa dan profil lipid dalam tikus yang diaruh dengan streptozotocin menjadi diabetik telah dijalankan. Kajian ini menggunakan 48 tikus jantan jenis Sprague-Dawley berat diantara 250 g-300 g. Semua tikus-tikus dibahagikan secara rawak kepada enam kumpulan. Kumpulan-kumpulan ini termasuk kumpulan kawalan (NC & DC) dan rawatan (NPP, DPP, DPPM, & DM). Selepas empat minggu rawatan, Semua kumpulan rawatan telah menunjukkan penurunan ke atas paras glukosa. Peratusan pengurangan tertinggi ke atas paras glukosa telah diperhatikan dalam kumpulan DPPM sebanyak 69.97 %. Untuk plasma kolesterol (TC), peratusan pengurangan tertinggi telah diperhatikan dalam kumpulan NPP sebanyak 62.39 %. Dalam fasa ketiga, ujian komuniti telah dijalankan ke atas subjek pra-diabetik di Felda Mempaga Bentong, Pahang. Keseluruhan tiga puluh enam subjek dibahagikan secara rawak kepada dua kumpulan iaitu kumpulan pra-diabetik rawatan diwakili oleh PT3 (ambil 60 g RPP/hari), PT4 (ambil 80 g RPP/hari) dan PT5 (ambil 100 g RPP/hari) dan pra-diabetik kawalan yang tidak mengambil RPP. Bagi paras glukosa plasma, PT5 menunjukkan peratusan pengurangan tertinggi (22.90 %) selepas 4 minggu rawatan. Untuk paras profil lipid plasma, kumpulan PT5 menunjukkan peratusan pengurangan tertinggi dalam paras TC (26.44 %), TG (20.54 %), dan LDL-C (49.55 %) diikuti oleh kumpulan PT4 dan PT3. Untuk paras HDL-C, kumpulan PT5 juga menunjukkan peratusan peningkatan tertinggi iaitu sebanyak 63.8 %. Hasil kajian menunjukkan kesemua dos minuman RPP memberikan kesan positif dalam meningkatkan paras HDL-C dan TAS, dan dalam masa yang sama dapat menurunkan paras glukosa, TC, TG dan LDL-C subjek pra-diabetik.

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This thesis was submitted to the senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follow:

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