UNIVERSITI PUTRA MALAYSIA

COMPRESSION CHARACTERISTICS OF *ANDROGRAPHIS PANICULATA* HERBAL PLANT EXTRACT

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COMPRESSION CHARACTERISTICS OF *ANDROGRAPHIS PANICULATA* HERBAL PLANT EXTRACT

By

NORAWANIS ABDUL RAZAK

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

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

COMPRESSION CHARACTERISTICS OF *ANDROGRAPHIS PANICULATA* HERBAL PLANT EXTRACT

By

NORAWANIS ABDUL RAZAK

March 2010

Chairman : Dr. Yus Aniza Binti Yusof, PhD

Faculty : Engineering

This study was conducted to investigate tablet formulation of *Andrographis paniculata* extract powder by direct compression in a 13mm-diameter-cylindrical unaxial die in two different amounts of feed, 0.5 and 1.0g. The tablets were formed using microcrystalline cellulose and *k-carrageenan* as binders. The compression pressure was varied between 7.5 to 73.8 MPa. Kawakita and ludde (1970/71) and Heckel (1961) models were selected to validate the experimental data. The objectives were to (i) examine the compressibility of *Andrographis paniculata* in the presence of binders (ii) validate the data with established models that describes the compression, and (iii) determine their optimum operating conditions. Compression characteristics were evaluated using density-pressure and tensile strength-volume reduction relationships. The tablet characteristics including tensile strength, ejection force, friability and dissolution time, were analyzed on different amounts of

Andrographis paniculata and binders. The tensile strength was positively related to the volume reduction, tablet's density and applied pressure during compression. This study showed that microcrystalline cellulose had better binder quality compared to *k-carrageenan* in direct compression of *Andrographis paniculata* tablet. The shape, size and quantity of the feed powders greatly affected to the particle arrangement during compression. The optimum condition and formulation for *Andrographis paniculata* tablet at 0.5g of feed powder was 10 to 30% microcrystalline cellulose at 37.7 to 73.8 MPa pressure. However, at 1.0g of feed powder, the best formulation was 30% microcrystalline cellulose at 52.7 to 73.8 MPa pressure. When *k-carrageenan* was used as a binder, the best formulation was 10% *k-carrageenan* at 73.8 MPa pressure. The *k-carrageenan* can be used in pharmaceutical tablet manufacturing because of its health benefits and much lower price compared to microcrystalline cellulose. This data for tablet processing may contribute to the development of herbal tablet industry in Malaysia.

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

SIFAT KEMAMPATAN EKSTRAK TUMBUHAN HERBA *ANDROGRAPHIS PANICULATA*

Oleh

NORAWANIS ABDUL RAZAK

Mac 2010

Pengerusi : Dr. Yus Aniza Binti Yusof

Fakulti : Kejuruteraan

Penyelidikan ini bertujuan untuk mengkaji pembentukan dan perumusan serbuk ekstrak *Andrographis paniculata* melalui kaedah pemampatan terus di dalam acuan silinder berdiameter 13mm. Pil dibentuk dengan penambahan serbuk pengikat selulos mikrokristalin dan *k-carrageenan*. Tujuan penyelidikan adalah untuk (i) mengkaji kemampatan *Andrographis paniculata* bersama pengikatnya (ii) mengesahkan data yang diperoleh melalui persamaan yang telah terbukti (iii) menentukan keadaan optima operasi semasa proses pemampatan. Sifat kemampatan dinilai menerusi perkaitan ketumpatan-tekanan dan perkaitan kekuatan ketegangan-pengurangan isipadu. Sifat pil seperti kekuatan ketegangan, daya penyingkiran, kerapuhan dan masa keterlarutan telah dianalisis mengikut berat jisim *Andrographis paniculata* serta pengikatnya yang berbeza. Kekuatan ketegangan berkaitan dengan pengurangan isipadu dan ketumpatan pil serta tekanan yang dikenakan semasa

proses pemampatan. Hasil penyelidikan ini menunjukkan bahawa selulos mikrokristalin memiliki kualiti yang lebih baik berbanding *k-caraagenan* semasa proses pemampatan *Andrographis paniculata*. Rupa bentuk, saiz serbuk dan kuantiti serbuk memberi kesan melalui proses pergerakan partikel semasa proses pemampatan. Keadaan dan perumusan yang optima bagi selulos mikrokristalin adalah pada julat rumusan 10 sehingga 30% dan julat tekanan 37.7 sehingga 73.8 MPa sebagai bahan pengikat untuk pil *Andrographis paniculata* yang berjisim 0.5g. Walau bagaimana pun, rumusan terbaik untuk 1.0g kuantiti serbuk adalah 30% selulos mikrokristalin pada tekanan 52.7 sehingga 73.8 MPa. Apabila *k-carrageenan* digunakan sebagai bahan pengikat rumusannya adalah 10% pada tekanan 73.8 MPa sahaja. Pemilihan *k-carrageenan* sebagai bahan pengikat mungkin boleh digunakan dalam sektor pembuatan pil farmasi berdasarkan komponen semulajadi yang dimilikinya adalah baik untuk kesihatan dan harganya yang murah berbanding dengan selulos mikrokristalin. Data ini adalah untuk pemprosesan pil ubatan dan mungkin boleh member sumbangan dalam pembangunan industri penghasilan pil herba di Malaysia.

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Finally, my earnest appreciation is to my family and friends for their encouragement and demonstration of love.

"The spirit, the will to win, and the will to excel are the things that endure. These qualities are so much more important than the events that occur."

By Vince Lombardi

I certified that an examination committee has met on _____ to conduct the final examination of Norawanis Binti Abdul Razak on her Master of Science thesis entitle "Compression Characterictics of *Andrographis paniculata* Herbal Plant Extract" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1990 and Universiti Pertanian Malaysia (Higher Degree) Regulation 1981. The Committee recommended that candidate be awarded relevant degree.

Members of the Examination Committee were as follows:

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(Chairman)

Examiner 1, PhD
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_____

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Date:

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 follows:

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Professor and Dean
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Date: 15 July 2010

DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

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NORAWANIS ABDUL RAZAK

Date: 22 March 2010

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