



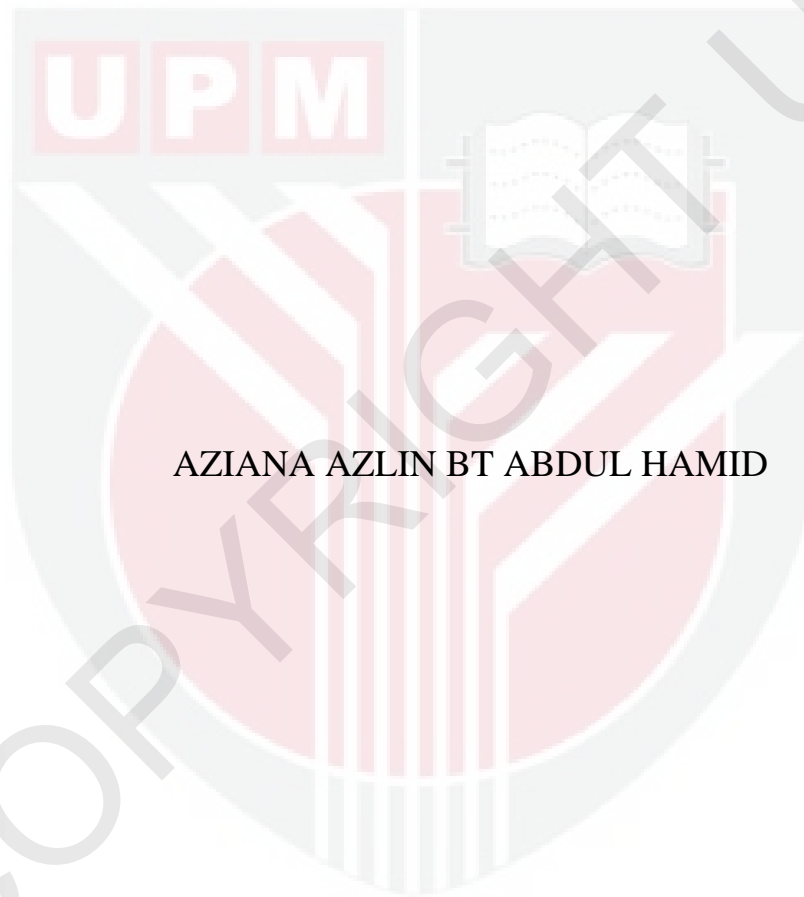
UNIVERSITI PUTRA MALAYSIA

**THE EFFECT OF BINDERS ON MECHANICAL AND PHYSICAL PROPERTIES
OF *EURYCOMA LONGIFOLIA* JACK EXTRACT UNDER DRY COMPRESSION**

AZIANA AZLIN BT ABDUL HAMID

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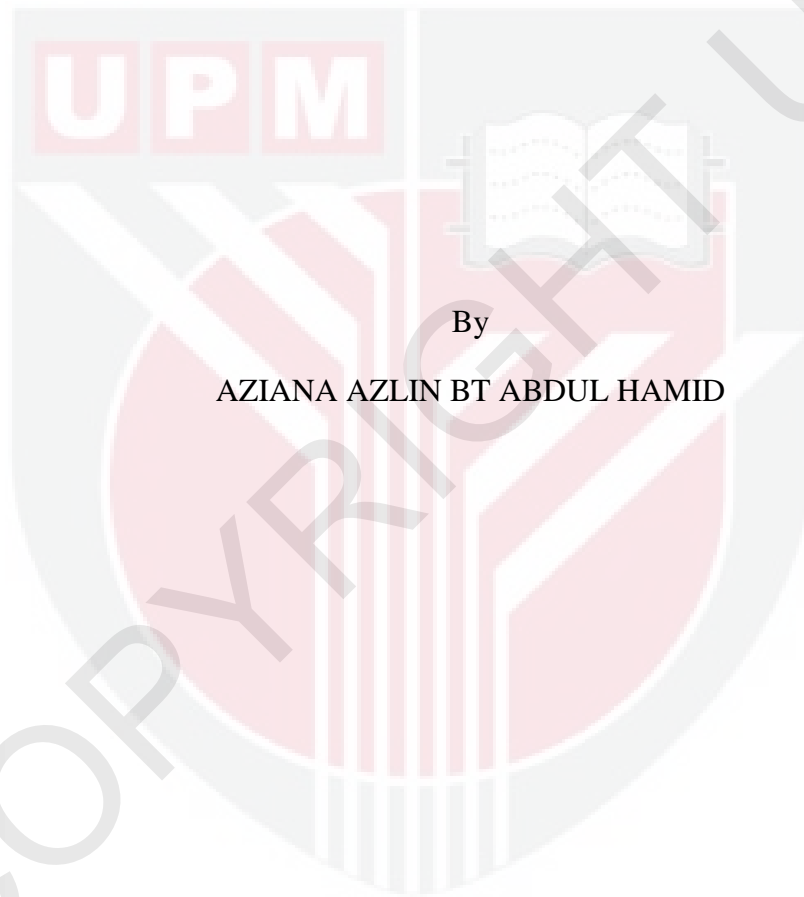


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MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA

2010

THE EFFECT OF BINDERS ON MECHANICAL AND PHYSICAL PROPERTIES
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By

AZIANA AZLIN BT ABDUL HAMID

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

2010

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

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OF *EURYCOMA LONGIFOLIA JACK* EXTRACT UNDER DRY
COMPRESSION**

By

AZIANA AZLIN BT ABDUL HAMID

March 2010

Chairman : Dr. Yus Aniza Binti Yusof, PhD

Faculty : Engineering

This thesis presents the effect of binders on mechanical and physical properties of *Eurycoma longifolia jack* extract's via direct compression. In the Malay's native tongue *Eurycoma longifolia jack* is commonly known as 'tongkat ali'. Traditionally, this herb is used for treating fever, mouth ulcers, hypertension, diabetes and intestinal worms. However, its most popular local use is as an aphrodisiac for men. The main objectives of this study is to investigate the effects of different compression pressures and percentage on binders' composition on binary mixtures of *Eurycoma longifolia jack* extract with binders; κ -Carrageenan and microcrystalline cellulose (MCC). In addition, validations of the compression behaviour through three classical equations were carried out. This was then used to predict the behavior of mixtures in *Eurycoma longifolia jack* formulation. The powders were compressed to various mixture percentages (w/w) ranging between 10 and 70 % and compression pressures ranged between 7.5 and 74 MPa at a constant compression speed of 5 mm min⁻¹. The tensile strength values of the tablets were determined by a diametral compression test.

Generally, it is predicted that *Eurycoma longifolia jack* extract and MCC binary mixtures has a better compressibility property in contrast to *Eurycoma longifolia jack* extract and κ -Carrageenan binary mixtures. Furthermore, the tablets produced from *Eurycoma longifolia jack* extract and MCC binary mixtures had good mechanical properties, with tensile strength increasing via compression pressure while the friability values decreased. However, the tablets had poor dissolution properties; it is conclude that while tablet mechanical and physical properties can be produced from the binary mixtures, disintegrants would need to be included in the formulations to ensure sufficient active ingredient release. Additionally, from analysis of variance (ANOVA) results, the effect of the tensile strength was significantly dependent ($P < 0.001$ in each case) on both compression pressure and binder percentage. Similarly, there was also a significant interaction ($P < 0.001$ in each case) between pressure and binder percentage. Subsequently, the best binary mixture for *Eurycoma longifolia jack* extract is preferably a 30 % of MCC at 0.5 g feed powder quantity. Based on this approach, this study may provide an extensive understanding of *Eurycoma longifolia jack* extract compressibility and may further be used in the development of formulating herbal products.

Keywords: *Eurycoma longifolia jack* extract; microcrystalline cellulose; κ -Carrageenan; Binary mixtures; Tensile strength; Compressibility.

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

**KESAN PENGIKAT KEATAS SIFAT MEKANIKAL DAN FIZIKAL
EKSTRAK *EURYCOMA LONGIFOLIA JACK* MELALUI MAMPATAN
KERING**

Oleh

AZIANA AZLIN BINTI ABDUL HAMID

Mac 2010

Pengerusi : Dr Yus Aniza Yusof, PhD

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Tesis ini membentangkan kesan pengikat keatas sifat mekanikal dan fizikal tablet *Eurycoma longifolia jack* melalui proses mampatan terus. Bagi sebutan orang Melayu, *Eurycoma longifolia jack* selalunya dikenali sebagai tongkat ali. Secara tradisional herba ini telah digunakan untuk merawat demam, ulser mulut, tekanan darah tinggi, diabetes dan serangan cacing di dalam usus. Namun demikian, ianya sangat terkenal dikalangan orang tempatan sebagai simulasi keatas rangsangan seksual lelaki. Tujuan utama penyelidikan ini adalah untuk mengkaji kesan tekanan mampatan dan peratusan komposisi pengikat keatas campuran binari dari ekstrak *Eurycoma longifolia jack* dengan pengikat; κ -Carrageenan dan selulosa mikrokrystal (MCC). Sebagai tambahan, pengesanan sifat mampatan melalui tiga persamaan mampatan telah dilakukan. Ini kemudian digunakan untuk meramalkan sifat campuran formulasi *Eurycoma longifolia jack*. Serbuk-serbuk ini telah dimampatkan dengan variasi peratusan campuran (w/w) dari nisbah 10 dan 70 % dan kadar tekanan mampatan antara 7.5 dan 74 MPa pada kelajuan tekanan tetap 5 mm min⁻¹. Nilai

kekuatan tegangan tablet telah ditentukan melalui ujian mampatan satu arah. Amnya, telah dijangkakan campuran binari ekstrak *Eurycoma longifolia jack* dan MCC mempunyai sifat mekanikal yang baik, dengan kekuatan tegangan meningkat melalui tekanan mampatan sementara nilai friabiliti menurun. Walaubagaimanapun, tablet tersebut mempunyai kelemahan pada sifat larutannya; ini membuktikan semasa sifat mekanikal dan fizikal tablet mampu dicapai daripada campuran binari, bahan pelarut mesti juga ditambah didalam formulasi untuk memastikan bahan aktif penting dilaraikan. Tambahan pula, melalui keputusan variasi analisi (ANOVA), kesan daripada kekuatan tegangan tablet adalah sangat bergantung ($P < 0.001$ bagi setiap kes) kepada tekanan mampatan dan peratus pengikat. Dalam persamaan ini, terdapat juga interaksi penting ($P < 0.001$ bagi setiap kes) antara tekanan dan peratusan pengikat. Kemudiannya, campuran binari terbaik untuk ekstrak *Eurycoma longifolia jack* adalah dijangkakan pada 30 % kandungan MCC pada 0.5 g kuantiti jisim serbuk. Berdasarkan kajian ini, kajian ini mampu menyediakan pemahaman yang luas tentang mampatan ekstrak *Eurycoma longifolia jack* dan boleh digunakan dalam pembangunan produk herba.

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I certified that an examination committee has met on 29th March 2010 to conduct the final examination of Aziana Azlin Binti Abdul Hamid on her Master of Science thesis entitled “The Effect of Binders on Mechanical and Physical Properties of *Eurycoma Longifolia* Jack Extract Under Dry Compression” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1990 and Universiti Putra Malaysia (Higher Degree) Regulation 1981. The Committee recommended that the candidate be awarded relevant degree.

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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

(AZIANA AZLIN BINTI ABDUL HAMID)

Date:



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