



**UNIVERSITI PUTRA MALAYSIA**

***MICROENCAPSULATION AND FLAVOR STABILITY OF SPRAY-DRIED  
OLEORESIN FROM WATER DROPWORT (*Oenanthe javanica*) AND KACIP  
FATIMAH (*Labisia pumila*)***

**PARVEEN DEVI A/P PATTIRAM**

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By

**PARVEEN DEVI A/P PATTIRAM**

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**MICROENCAPSULATION AND FLAVOR STABILITY OF SPRAY-DRIED OLEORESIN FROM WATER DROPWORT (*Oenanthe javanica*) AND KACIP FATIMAH (*Labisia pumila*)**

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**PARVEEN DEVI A/P PATTIRAM**

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**Chairman: Associate Professor Lasekan Olusegun Olaniyi, PhD**

**Faculty: Food Science and Technology**

Water Dropwort (*Oenanthe javanica*) is a perennial herb with distinctive aroma and taste. It is cultivated in marshy places of Asia and Australia. Besides that, “Kacip Fatimah” (*Labisia pumila*) is a small herbaceous under shrub that roots and stems. There were three objectives established in this study that are identification and sensory characterization of compounds from water dropwort (*Oenanthe javanica*) and “Kacip Fatimah” (*Labisia pumila*). Second objective is stability of aroma-active constituents in oleoresin of Water dropwort (*Oenanthe javanica*) and “Kacip Fatimah” (*Labisia pumila*) herbs during spray drying at  $170\pm 2^{\circ}\text{C}$  and  $180\pm 2^{\circ}\text{C}$ . Thirdly is to study the effect of storage condition on the release flavors profiles of the encapsulated water dropwort (*Oenanthe javanica*) and “Kacip Fatimah” (*Labisia pumila*) oleoresin. The first part in this study was established by GC-MS and GC-O analysis to identify the chemical constituents of the oleoresins from both water dropwort and “Kacip Fatimah” leaves. A

total of 41 compounds were identified in Water dropwort. The major compound obtained was richer in diterpenes such as incensole (9.04%). However, 33 compounds were obtained from “Kacip Fatimah” and predominated with sesquiterpenes alcohol such as T-cadinol (13.33%). Furthermore, stability of aroma-active constituents in oleoresin of Water dropwort and “Kacip Fatimah” were successfully conducted by using microencapsulation technique with a combination of gum Arabic (1.5%) and food grade gelatin (2.5%) in the formulation of spray dried encapsulated leaves extracts whereby, inlet temperatures of  $170\pm 2$  °C and  $180\pm 2$  °C with constant outlet temperature  $84\pm 4$  °C and the feed rate of 6 rpm were established for both leaves. At drying temperature  $170\pm 2$  °C and  $180\pm 2$  °C, a total of volatile compounds of water dropwort were reduced from 41 compounds to 9 and 6 compounds respectively. Incensole has the highest concentration at these both drying temperatures (29.49% and 37.49%) respectively. Meanwhile, in “Kacip Fatimah” also found reduction in number of volatile compounds from initially 33 compounds to 25 and 12 compounds respectively. T-cadinol has among the highest concentration at these drying temperatures  $170\pm 2$  °C (22.56%) and  $180\pm 2$  °C (33.18%). Finally, study the effect of storage condition on the release flavors profiles of the encapsulated water dropwort (*Oenanthe javanica*) and “Kacip Fatimah” (*Labisia pumila*) oleoresin was established. The microcapsules were stored under the same temperature at  $45\pm 2$  °C and 24 % RH for further studies. The microcapsules were maintained for 30 days in a climate chamber. The numbers of volatile compounds in microcapsules of water dropwort were reduced drastically after day 24. For instance, at drying temperature  $170\pm 2$  °C, encapsulated water dropwort has reduced to 2 compounds as compared with day 6 (6 compounds). Encapsulated “Kacip Fatimah” also showed the same reduction whereby, a total of 5 compounds were detected at 24 days of storage as

compared to 25 compounds detected at 6 days storage. At  $180\pm 2^{\circ}\text{C}$  drying temperature, encapsulated water dropwort and “Kacip Fatimah” showed the volatile compounds reduced after 18 days of storage. A total of 4 and 3 compounds respectively were detected as compare with 6 days of storage (5 and 2 compounds were identified) respectively. Volatile compounds were no detected in both encapsulated water dropwort and “Kacip Fatimah” at day 30 which is probably caused by the invisible cracks on the surface of the microcapsules. Overall, particle size and emulsion size of microcapsules also increased due to agglomeration occurs after storage. From this study, it can be concluded that encapsulated water dropwort and “Kacip Fatimah”, incensole and T-cadinol have the highest concentration during storage.

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

**PEMIKROKAPSULAN DAN KESTABILAN PERISA SEMBURAN-  
PENYALIRAN OLEORESIN WATER DROPWORT (*Oenanthe javanica*) DAN  
KACIP FATIMAH (*Labisia pumila*)**

Oleh

**PARVEEN DEVI A/P PATTIRAM**

**Jun 2013**

**Pengerusi: Profesor Madya Lasekan Olusegun Olaniyi, PhD**

**Fakulti: Sains dan Teknologi Makanan**

“Water dropwort” (*Oenanthe javanica*) ialah herba yang mempunyai aroma dan rasa yang tersendiri. Kebanyakan herba ini terdapat di tempat yang paya di Negara Asia dan Australia. Selain daripada itu, Kacip Fatimah (*Labisia pumila*) ialah herba yang kecil yang tumbuh di bawah pokok renek dari akar dan batang. Terdapat tiga objektif dijalankan dalam kajian ini iaitu Mengenalpasti dan pencirian deria sebatian daripada “water dropwort” (*Oenanthe javanica*) and Kacip Fatimah (*Labisia pumila*). Objektif kedua adalah kestabilan juzuk aroma-aktif dalam oleoresin daripada “water dropwort” (*Oenanthe javanica*) and Kacip Fatimah (*Labisia pumila*) herba semasa pengeringan semburan pada  $170\pm 2^{\circ}\text{C}$  and  $180\pm 2^{\circ}\text{C}$ . Ketiga adalah untuk mengkaji kesan keadaan penyimpanan di atas rasa pembebasan profil terkandung “water dropwort” (*Oenanthe javanica*) and Kacip Fatimah (*Labisia pumila*) oleoresin. Bahagian pertama dalam kajian

ini telah menggunakan analisis GC-MS and GC-O untuk mengenalpasti jujuk kimia dan aroma dari oleoresin dari kedua-dua daun tersebut. Jumlah sebanyak 41 sebatian meruap telah dikenalpasti dalam “water dropwort”. Sebatian utama yang diperolehi adalah kaya dengan diterpenes seperti incensole (0.95%). Walaubagaimanapun, 33 sebatian meruap telah diperolehi dalam Kacip Fatimah dan dikuasai dengan alkohol sesquiterpenes seperti T-cadinol (29.14%). Selanjutnya, kestabilan jujuk aroma-aktif dalam oleoresin daripada “water dropwort” dan Kacip Fatimah telah berjaya dijalankan dengan menggunakan teknik pemikrokapsulan dengan gabungan gam Arabik (1.5%) dan gelatin gred makanan (2.5%) di dalam formulasi seburan kering terkandung daun dimana, suhu dalaman  $170\pm 2$  °C dan  $180\pm 2$  °C dengan suhu luaran malar  $84\pm 4$  °C dan kadar 6 rpm telah ditubuhkan untuk kedua-dua daun. Pada suhu  $170\pm 2$  °C dan  $180\pm 2$  °C, jumlah sebatian meruap dari “water dropwort” telah berkurang dari 41 kompaun ke 9 dan 6 kompaun masing-masing. Didapati incensole mempunyai kepekatan yang tertinggi dalam kedua-dua suhu pengeringan (29.49% dan 37.49%) masing-masing. Sementara itu, dalam Kacip Fatimah juga mendapati pengurangan dalam bilangan sebatian meruap iaitu dari mulanya 33 kompaun ke 25 dan 12 kompaun masing-masing. T-cadinol mempunyai antara kepekatan yang tertinggi di kedua-dua suhu pengeringan  $170\pm 2$  °C (22.56%) dan  $180\pm 2$  °C (33.18%). Akhirnya, mengkaji kesan keadaan penyimpanan di atas rasa pembebasan profil terkandung daripada “water dropwort” dan Kacip Fatimah.

Mikrokapsul telah disimpan di bawah suhu yang sama pada  $45\pm 2$  °C dan 24% RH untuk melanjutkan kajian. Mikrokapsul telah dikekalkan selama 30 hari di dalam ruang iklim. Bilangan sebatian meruap dalam mikrokapsul “water dropwort” telah berkurang secara drastik selepas hari ke-24. Sebagai contoh, pada suhu pengeringan  $170\pm 2$  °C, seburan kering terkandung “water dropwort” telah berkurang kepada 2 kompaun jika berbanding

dengan hari ke-6 (6 kompaun). Seburan kering terkandung Kacip Fatimah” juga menunjukkan pengurangan yang sama di mana sejumlah 5 kompaun telah dikesan pada hari ke-24 jika dibandingkan dengan 25 kompaun dikesan pada penyimpanan 6 hari. Pada suhu pengeringan  $180 \pm 2$  °C, seburan kering terkandung “water dropwort” dan Kacip Fatimah telah menunjukkan sebatian meruap berkurang selepas 18 hari penyimpanan. Sebanyak 4 dan 3 kompoun masing-masing telah dikesan berbanding dengan 6 hari penyimpanan (5 dan 2 kompoun telah dikenalpasti) masing-masing. Sebatian meruap tidak dapat dikesan dalam kedua-dua “water dropwort” dan Kacip Fatimah pada hari ke-30 yang mungkin disebabkan oleh keretakan pada permukaan mikrokapsul. Secara keseluruhannya, saiz zarah dan saiz emulsi mikrokapsul turut meningkat akibat penumpuan berlaku selepas penyimpanan. Dalam kajian ini, dapat disimpulkan bahawa “water dropwort” dan Kacip Fatimah, incensole dan T-cadinol mempunyai kepekatan tertinggi semasa penyimpanan.



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I certify that a Thesis Examination Committee has met on 13 June 2013 to conduct the final examination of Parveen Devi a/p Pattiram on her thesis entitled “Microencapsulation and flavor stability of spray-dried oleoresin from Water dropwort (*Oenanthe javanica*) and *Kacip Fatimah (Labisia pumila)*” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U. (A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

**Farinazleen Mohd Ghazali, PhD**

Title: Associate Professor  
Name of Faculty: Food Science and Technology  
Universiti Putra Malaysia  
(Chairman)

**Sharifah Kharidah Syed Muhamad, PhD**

Title: Associate Professor  
Name of Faculty: Food Science and Technology  
Universiti Putra Malaysia  
(Internal Examiner)

**Abdul Karim Sabo Mohamed, PhD**

Title: Associate Professor  
Name of Faculty: Food Science and Technology  
Universiti Putra Malaysia  
(Internal Examiner)

**Zaibunnisa Abdul Haiyee, PhD**

Title: Senior Lecturer  
Name of Faculty: Fakulti Sains Gunaan  
Universiti Teknologi Mara  
Malaysia  
(External Examiner)

---

NORITAH OMAR, PhD  
Assoc. Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 16 August 2013

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

**Lasekan Olusegun Olaniyi, PhD**

Associate Professor  
Faculty of Food Science and Technology  
Universiti Putra Malaysia  
(Chairman)

**Tan Chin Ping, PhD**

Professor  
Faculty of Food Science and Technology  
Universiti Putra Malaysia  
(Member)

**Mohammad Zaidul Islam Sarker, PhD**

Professor  
Faculty of Pharmacy  
International Islamic University Malaysia  
(Member)

---

**BUJANG BIN KIM HUAT, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:

## **DECLARATION**

I declare that the thesis is my original work expect for the quotation 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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**PARVEEN DEVI A/P PATTIRAM**

Date: 13 June 2013



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