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Humboldt Kolleg:

THE VOICE OF ASEAN RESEARCHERS

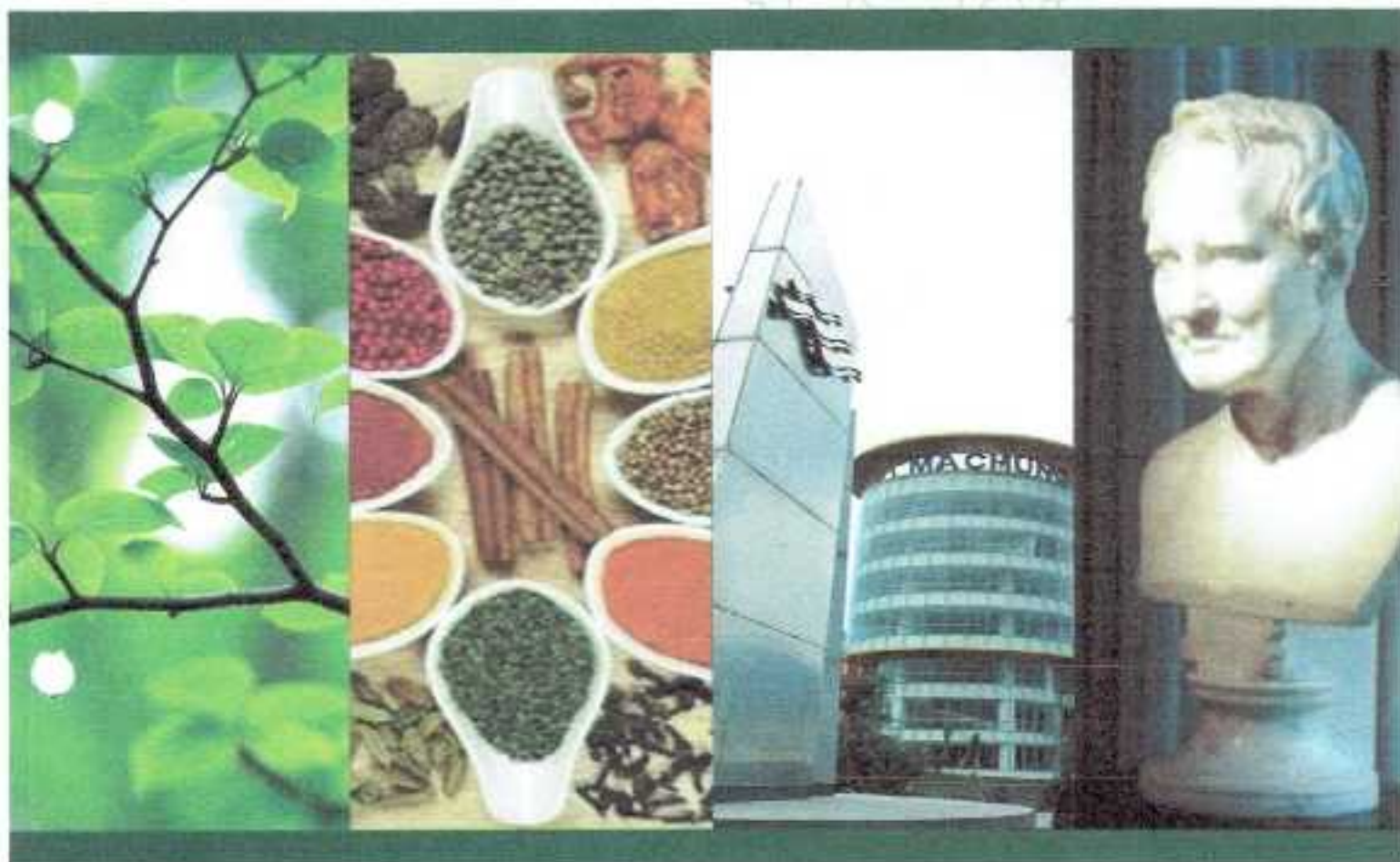
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awarded to

Felycia Edi Soetaredjo, S.T., M.Phil., Ph.D

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Mano M

Dr. Klaus Manderla
Head of Division Asia
Alexander von Humboldt Foundation

Leenawaty Limantera

Leenawaty Limantera, Ph.D
Chairwoman
HK - ICONS 2014

PROCEEDINGS OF

2nd Humboldt Kolleg: THE VOICE OF ASEAN RESEARCHERS

**in conjunction with
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SUPERCRITICAL CO₂ EXTRACTION OF PHYTOCHEMICAL FROM HERBACEOUS PLANT

Felycia Edi Soestardjo^{1*}, Suryadi Ismadi¹, Astrid Rahmawati¹, Debora Pang¹, Calista¹, Melia Stefani Tjipto²
and Yi-Hsu Ju²

¹Department of Chemical Engineering, Faculty of Engineering, Widya Mandala Catholic University,
Surabaya, Indonesia

²Department of Chemical Engineering, National Taiwan University of Science and Technology, Taipei,
Taiwan

*felyciae@yahoo.com

Indonesia has biodiversity, which is evolving source for compounds of medical importance. The use of medicinal plants for the treatment of parasitic diseases is well known and documented since ancient times, such as *Stachytarpheta jamaicensis* (L) Vahl (SJL) for the treatment of purgative, expectorant, diuretic, fever, diabetes and sore-throat gargles and *Mimosa pudica* Linn (MPL) for diabetic and inflammatory. Phytochemical screening of SJL and MPL reveal that they contain flavonoids, phenolic and alkaloid compounds.

Previous extraction studies of phytochemicals from SJL and MPL have been conducted using the Soxhlet extraction method. Even though these extractions are quite simple, they require a complex separation to obtain high purity of active compounds. Supercritical fluid extraction (SFE) is an attractive alternative for obtaining valuable compounds since it has unique properties that support effective extraction. For most SFE, carbon dioxide is the most widely used gas as the solvent since it has a relatively low critical temperature and pressure, is non-toxic, inexpensive and environmental friendly.

Extraction of phytochemicals from MPL was performed in a Supercritical Carbon Dioxide (SC-CO₂) Extractor system. The extraction system consisted of a high pressure pump (Eidex AA-100-S-2-CE, USA), a pressure transducer (Druck PTX 611, USA), and oven (Memmerttype UNB 500, Germany). All valves and tubes were made from 316 SS Grade (Swagelok, USA). A known mass of MPL powder (± 10 g) was placed in SC-CO₂ stainless steel extractor. The heating chamber was heated to the desired temperature (313.15-333.15K). Liquid CO₂ was then pumped then into the system until the targeted pressure was reached (10-28 MPa) using high pressure pump with a constant CO₂ flow rate. Finally, the CO₂ containing phytochemicals were introduced into a collector containing a known amount of ethanol and the CO₂ was released into the air.

The extraction of phytochemicals using SC-CO₂ extraction is significantly influenced by pressure and temperature. Temperature and pressure significantly influenced the density, viscosity and diffusivity of SC-CO₂, hence affecting the amount of phytochemicals in the extract. The time for SC-CO₂ extraction greatly influenced the yield of phytochemicals extracted prior to equilibrium.

The total phenolic content (TPC) of SJL and MPL extract significantly increased with pressure due to the increase of solvent density. The highest TPC of SJL was 59.9 mg GAE/g extract (25 MPa and 333.15K), and MPL was 74.94 mg GAE/g MPL (28 MPa and 333.15 K). The effects of pressure and temperature on the total flavonoid content (TFC) of SJL and MPL extract were similar to TPC since flavonoid is one of the phenolic compounds. The SC-CO₂ not only extracted phenolic compounds but also alkaloid compounds even though the result were lower than TPC and TFC.

The experimental data of phenolic, flavonoid, and alkaloid extracted from MPL were correlated by density based models. The Chrastil and Del-Valle & Aguilera model can represent the experimental data very well. From identification of phytochemicals by HPLC, the SC-CO₂ extract more selective than soxhlet extraction method (gallic acid, catechin, caffeic acid, p-coumaric acid, and quercetin from SJL and gallic acid and from MPL).

Keywords: supercritical CO₂ extraction, phenolic compound, *Stachytarpheta jamaicensis*, *Mimosa pudica*

