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PREFACE From Chairman

It is our pleasure to present you the proceedings of The 1st International Conference on Pharmaceutics and Pharmaceutical Sciences (ICPPS) organized by The Faculty of Pharmacy Universitas Airlangga Surabaya Indonesia.

The proceeding was produced based on papers and posters presented at The 1st International Conference on Pharmaceutics and Pharmaceutical Sciences (ICPPS), held in Surabaya, Indonesia, 14-15 November 2014.

The proceeding clearly reflects broad interest, from the participants that coming from all around the world.

The papers presented were pharmaceutics and biopharmaceutics; requirements on how to evaluate molecules in discovery and their appropriateness for selection as potential candidate; their development in context of challenges and benefits, together with associated time and cost implications and also requirements to progress through pre-clinical and clinical.

In this an opportunity, I would like to express my appreciation to the editorial team of the proceeding who have been working hard to review manuscripts, and making the first edition of this proceeding be possible.

I would like also to thanks to all invited speakers and presenters who participated in The 1st International Conference on Pharmaceutics and Pharmaceutical Sciences (ICPPS) and your contribution to this proceeding.

Finally, I hope this proceeding will give contribution to the Pharmaceutics and Pharmaceutical Sciences research.

Chairman,

Dra. Esti Hendradi, MSl., Ph.D., Apt
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Retno Sari, Faculty of Pharmacy, Airlangga University, Surabaya, Indonesia; Titin Suhartant,ti, Faculty of Pharmacy, Airlangga University, Surabaya, Indonesia; Dwi Setyawan, Faculty of Pharmacy, Airlangga University, Surabaya, Indonesia; Esti Hendradi, Faculty of Pharmacy, Airlangga University, Surabaya, Indonesia; Widji Soeratri, Faculty of Pharmacy, Airlangga University, Surabaya, Indonesia.

INTRODUCTION
Chitosan, a cationic polysaccharide has many advantages as carrier for drug delivery system such as biocompatible, biodegradable and non toxic. Chitosan has amino group that could be crosslinked with polianion such as triphosphate so that the active ingredient will be entrapped (Agnihotri, 2004, Sinha, 2004). Diterpene lactone fraction of sambiloto (Andrographis paniculata) has antimalarial activity but it has low solubility in water. Entrapped diterpene lactone into chitosan matrix could improve the bioavailability of the active substance.

The aim of this research is to investigate the effect of process parameter of chitosan carrier preparation - stirring rate (500 rpm and 1000 rpm) during ionic gelation and nozzle diameter (0.5 mm and 1.0 mm) of spray dryer on physical characteristics of diterpene lactone fraction-chitosan particles. Evaluation of morphology, thermal analysis and drug entrapment were conducted.

EXPERIMENTAL METHODS
Material and Methods
Material
Diterpene lactone fraction of sambiloto was obtained from Department of Pharmacognosy and Phytochemistry, Faculty of Pharmacy, Airlangga University, chitosan with deacetylation degree 85% was purchased from Biotech Suindo, Natrium tripolyphosphate, pro analysis grade from Nacalay Tesque. All other reagents used in this experiment were pro analysis grade.

Preparation of chitosan particles

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Nozzle diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stirring speed</td>
<td></td>
</tr>
<tr>
<td>500 rpm</td>
<td>P1</td>
</tr>
<tr>
<td>1000 rpm</td>
<td>P2</td>
</tr>
</tbody>
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Chitosan was dissolved chitosan in 0.15% acetic acid to make 0.1% chitosan solution. Preparation of diterpen lactone - chitosan particles was done by mixing chitosan solution and diterpene lactone fraction solution and then 0.1% tripolyphosphatesolution was added while stirring with two stirring speed. The mixture was continuously stirred with magnetic stirrer for 2 hours. Subsequently the mixture was dried with LabplantSD-Basic Spray Dryer at 100°C, flow rate 5 ml/min, pressure 2 bar with two different nozzle diameter. The ratio of drug-chitosan-TPP was 4:10:8.

Evaluation of nanoparticles morphology
The particles were evaluated by Scanning Electron Microscopy (SEM) FEI Inspect S50. Particles were dried and coated with gold palladium and then observed for its shape and surface morphology.

Thermal analysis
Thermal analysis for diterpene lactone fraction of sambiloto, chitosan and nanoparticles was performed with Differential Thermal Analyzer (DTA) Metler Toledo FP 85. Samples were scanned from 50 to 250°C at a rate of 10°C/min.
Entrainment efficiency (EE)
5 mg sample was dissolved in 10 ml of ethanol, then filtered. Solution was analyzed by HPLC Agilent 1100 with mobile phase of methanol: phosphoric acid pH 3: 50: 50 at wavelength of 228 nm. The assays were performed in triplicate. The entrainment efficiency (EE) of diterpene lactone in chitosan nanoparticles was calculated by this equation:

\[
EE = \frac{\text{actual drug/theoretically drug}}{} \times 100\%
\]

RESULTS

Figure 1 SEM micrographs of particles of diterpene lactone-chitosan prepared with different condition (mag 10,000x)

Sem photograph of particles diterpene lactone-chitosan (figure 1) showed that the particles have spherical shape and smooth surface with wide range particle size.

From DTATermogram (Figure 2) it was indicated that endothermic peak of diterpene lactone appears at 222 °C and chitosan glass transition appears at 146.6 °C. Endothermic peak of diterpene lactone fraction was no longer exist in chitosan particulate system since it had been entrapped in chitosan matrix.

Figure 2. DTATermogram of diterpene lactone (A), chitosan (B) and diterpene lactone-chitosan particles (C)

Table 2. Drug content and Entrapment Efficiency (EE) of diterpene lactone-chitosan particles (n=3)

<table>
<thead>
<tr>
<th></th>
<th>Drug content ± SD (%)</th>
<th>EE ± SD (%)</th>
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<tbody>
<tr>
<td>P1</td>
<td>4.79 ± 0.04</td>
<td>26.36 ± 2.42</td>
</tr>
<tr>
<td>P2</td>
<td>3.84 ± 0.04</td>
<td>21.11 ± 2.04</td>
</tr>
<tr>
<td>P3</td>
<td>4.38 ± 0.02</td>
<td>24.12 ± 0.82</td>
</tr>
<tr>
<td>P4</td>
<td>3.82 ± 0.03</td>
<td>21.01 ± 1.69</td>
</tr>
</tbody>
</table>

FTIR analysis was performed to confirm the crosslink interaction of chitosan and tripolyphosphate. Absorption band at 1643 cm⁻¹ attributed to amide bond of chitosan. New band at 1555 cm⁻¹ indicated hydrogen bond and 1643 cm⁻¹ band confirmed linkage between P305-5 of tripolyphosphate and NH⁺ of chitosan (Figure 3).

From drug entrainment efficiency, it was known that as stirring speed increased from 500 rpm to 1000 rpm, the entrainment of drug become lower decrease from about 24-26% to 21% (Table 2). From statistical analysis of one way Anova with α 0.05, it was known that drug entrainment efficiency of particles prepared with different stirring rate was significantly different since nozzle diameter didn’t affect the entrainment efficiency.
CONCLUSION
The result showed that diterpen lactone – chitosan particles prepared by ionic gelation-spray drying with composition and condition in this study has spherical shape with wide range size from 400 nm to 4000 nm. Highest drug entrapment efficiency was obtained from particles prepared with 500 rpm stirring rate and 1.0 mm nozzle diameter.

REFERENCES


