

Development of Pharmaceutical Gel Base Containing Sodium Carboxymethyl Mungbean Starch

Ornanong S. Kittipongpatana^{1*}, Siriporn Burapadaja²
and Nisit Kittipongpatana¹

¹Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

²Department of Pharmaceutical Care, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

*Corresponding author. E-mail: ornanong@pharmacy.cmu.ac.th

ABSTRACT

A high-viscosity sodium carboxymethyl mungbean starch (SCMMS), prepared by a carboxymethylation reaction with monochloroacetic acid in an alkaline condition, using methanol as a solvent, was investigated for the potential use as a pharmaceutical gelling agent. Gel bases were originally prepared from four commercial polymers, including carbopol (CP), hydroxypropylmethylcellulose (HPMC), methylcellulose (MC) and sodium carboxymethylcellulose (SCMC) to yield starting gel bases at different concentrations. The appropriate concentrations of gelling agents in gel bases were found to be 1.5% w/w for Carbopol 941, 4% w/w for HPMC and MC and 2%w/w for SCMC. SCMMS was then used to partially substitute the commercial gelling agents at the commercial polymer to SCMMS ratio of 3:1, 1:1 and 1:3. Six mixed-gelling agent formulations with good appearances and viscosity were selected and, along with the four starting formulations, were subjected to the satisfaction evaluation in 34 volunteers. The results showed that the formulations containing CP-SCMMS at ratio of 1:1 and 1:3, HPMC-SCMMS at ratio of 1:1 and MC-SCMMS at ratio of 3:1 yielded gel bases with higher scores of satisfaction, compared to their starting sole gelling agent formulations. Statistical analysis revealed that the satisfaction was influenced significantly by the spreadability ($p = 0.001$) and the ease of rubbing ($p = 0.009$). The incorporation of ibuprofen into the selected gel base formulations showed no evidence of separation and resulted in only slight decrease of viscosity, while the clarity and stability remained unchanged. These results exhibited the potential of SCMMS, which can be produced domestically, either as a partial substitute to the commercial gelling polymers or, with more intensive study, as a new, effective, sole gelling agent for topical gel preparation.

Key words: Mungbean starch, Gel base, Carboxymethylation, Modified starch, Ibuprofen gel, Product's satisfaction, Descriptive statistic, SPSS