CHAPTER V

CONCLUSION

In this study controlled release nifedipine microspheres were prepared by directly spray drying technique. The inlet temperature and concentration of spray solution affected the total percentage yield. The highest yield was obtained in the system with higher proportion of PVP K30. As the higher inlet temperature and concentration of spray solution increased, the yield decreased. The Eudragit RS100 system gave higher yield than the Eudragit RL100 system.

Spray dried particles were smooth and spherical with different degree of shrunken surface. Higher spray concentration produced larger microspheres and more agglomerated particles, whereas higher inlet temperature gave smaller sizes. The particle size distribution ranged from 1.12-18.75 μm. The moisture content of spray dried powder ranged from 1.83 to 2.89%. The product prepared at the highest temperature provided the lowest moisture content and the higher concentration of spray solution resulted in the microspheres with the higher moisture content.

The powder X-ray diffraction patterns were consistent with the results from the differential scanning calorimetric thermograms. They demonstrated that nifedipine was transformed from the highly crystalline form to the amorphous form by spray drying in the existence of either single polymer or combined polymers. The diffraction peaks of nifedipine disappeared and halo patterns were

obtained where as the thermograms showed the disappearance of nifedipine melting endotherm in the Eudragit microspheres. However, the Eudragit RL microspheres in some mixing ratios still showed the existence of nifedipine crystalline from powder X-ray diffraction patterns, differential scanning calorimetric thermograms and FTIR spectra. From the FTIR spectra, the intermolecular interaction, that might be hydrogen bonding, between nifedipine and polymers was evident, especially in the microspheres with high content of PVP K30.

The release rate constant of nifedipine from nifedipine:Eudragit RS100:PVP K30 and nifedipine:Eudragit RL100:PVP K30 microspheres were influenced by the polymer type and combining ratios of Eudragit polymers and PVP K30. Additionally, the process parameter such as inlet temperature and concentration of spray solution also affected the release rate constant of nifedipine. At the high content of PVP K30 in the combined carrier ratios, the release rate constant of nifedipine from microspheres provides the higher release rate than the high Eudragit RS100 or Eudragit RL100 system. Increasing the inlet air temperature resulted in a reduction of drug release rate. The higher concentration of spray solution provided higher release rate than the lower concentration.

Between two copolymers, Eudragit RL and Eudragit RS showed different release rate constants of nifedipine. The Eudragit RS100 obtained the lower release rate constants whereas Eudragit RL100 gave higher constants. The drug release data were examined kinetically and were found to follow Higuchi diffusion-controlled model. Nifedipine release was found to be similar in both

acidic (pH 1.2) and alkaline (pH 7.5) in the release pattern. However, the release rate constants in the acid medium were demonstrated to be lower than in the basic medium. Similar effects were observed with the dissolution efficiency and the release rate constants.

From the results as regarding to the high yield and release characteristic of the microspheres, the spray dried nifedipine microspheres at 55°C inlet temperature from 5% spray concentration and containing more than 80% of PVP content showed the most prominent properties. However, further study on the appropriate formulation for controlled release dosage form and in vivo study are needed.