Effect of applied compression force, mixing duration and manufacturing method on properties of Ibuprofen sustained release matrices

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ABSTRACT

Introduction: HPMC matrices are the most frequently used solid dosage in drug sustained release technology. Many formulation and processing variables are expected to influence the in vitro and, consequently, the in vivo performance of these matrices.

Objectives: This study aim to investigate the possible effects that mixing time, manufacturing method and applied compression force might have on the physicochemical properties of HPMC based Ibuprofen matrices.

Methods: To achieve the stated objectives, $2^3$ full screening and $3^2$ optimizing designs were selected and applied in a consecutive manner. At the screening stage, mixing time, manufacturing method and applied compression force were explored, each at two levels, for their influences on weight, content, thickness, friability and drug release profile of different matrix formulations. Within the optimization stage, most influential factors found in the screening design (manufacturing method and applied compression force) were verified and optimized further, each at three levels, for their individual and mutual impact on matrix friability and drug release properties.

Results: The influence of applied compression force on different matrix properties was quite apparent in contrast to that of mixing duration whereas the influence of manufacturing method was ambiguous. Upon optimization, however, both manufacturing method and applied compression force confirmed to have profound influences on matrix friability, thickness, and drug release characteristics. The Study concluded that consideration of either direct or slugging manufacturing methods and application of compression force equivalent to 6-8 kg/cm$^2$ are necessary to achieve matrix tablets with acceptable physical and drug release characteristics, at least under the adopted study conditions.

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