

## THERMOREVERSIBLE *IN-SITU* NASAL GEL FORMULATIONS AND THEIR PHARMACEUTICAL EVALUATION FOR THE TREATMENT OF ALLERGIC RHINITIS CONTAINING EXTRACTS OF *MORINGA OLIFERA* AND *EMBELIA RIBES*

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### ABSTRACT

**Objective:** The present study was planned to develop thermoreversible *in-situ* gel for the treatment of allergic rhinitis (AR). The objective of the present investigation was to develop a mucoadhesive *in-situ* gel with reduced nasal mucociliary clearance to improve the local effect of the polyherbal extract in the treatment of allergic rhinitis (AR). The prolonged residence of the drug formulation in the nasal cavity is one of utmost importance for intranasal drug delivery. The prepared formulations were subjected for gelling temperature, gelling time, viscosity, gel strength, pH, drug content, mucoadhesive strength, spreadability and irritancy studies.

**Methods:** In the study, the pluronic F127 (PF127) based mucoadhesive *in-situ* nasal gels containing *Moringa olifera* (MO) and *Embelia ribes* (ER) extracts were used having an antioxidant and anti-inflammatory effect. A polyherbal thermosensitive *in-situ* hydrogel was designed and evaluated by the mixing of pluronic F127, poly (ethylene glycol) (PEG400) and Xanthan gum with a small amount of (hydroxypropyl methylcellulose) HPMC K4M and Carbopol 934. Total 13 thermosensitive *in-situ* gels of extracts were prepared through a combination of HPMC K4M or Carbopol or xanthan gum and PF127. All the preparations were investigated, and the selected method for gel formation underwent the thermal transition from sol to the hydrogel.

**Results:** The mucoadhesive gel after being administered into the nasal cavity, get transformed into the viscous hydrogel at body temperature, which diminished nasal mucociliary clearance and prolonged the duration of action. The *in-situ* nasal herbal gel prepared by a combination of the different concentration of to HPMC K4M or carbopol or xanthan gum with PF127 (10% w/v) produces the better and effective gel. The findings of evaluation parameter indicate that the *in-situ* gel prepared by combination with carbopol were better quality compared to HPMC K4M and xanthan gum.

**Conclusion:** From these findings, it can be concluded that *in-situ* herbal nasal gels may be potential drug delivery systems for *Moringa olifera* and *Embelia ribes* extracts to overcome the first-pass metabolism and thereby to improve the bioavailability. The mucoadhesive *in-situ* gel system is a promising approach for the intranasal delivery of polyherbal extracts for the therapeutic effects improvement of Allergic rhinitis.

**Keywords:** *Moringa olifera*, *Embelia ribes*, HPMC, Carbopol, *In-situ*, Pluronic F127

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