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# Formulation and Evaluation of In-Situ Gel by Using Naproxen

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**ABSTRACT:**
The last few years has seen a significant increase in interest in the development of in-situ gel system. Benefits demonstrated by the Naproxen in-situ formed delivery method including convenience of administration, decreased frequency of administration, more patient compliance, and comfort, have inspired this interest. Gel formation is dependent on a number of variables, including temperature changes, pH shifts, ion presence, and FTIR, which releases the medication gradually and under control. A variety of biodegradable polymers HPMC, Carbopol934 that are employed in the in-situ gel formation process. Gel is mostly delivered in-situ via injectable, vaginal, Oral, Ocular, Rectal, Parenteral and intraperitoneal methods. In-situ gelling system technique, numerous polymer kinds, and a brief introduction are all included in this review.

## I. INTRODUCTION

A Drug delivery system release the drug in a particular compartment at the controlled rate required for a specific treatment. Sustained-release, sustained action, extended action, prolonged action are the terms used to identify the drug delivery system. The design of effective drug delivery system has recently become an integral part of the development of new medicines. Now a days most available drug delivery system use bio-compatible and natural bio polymers HPMC, Carbopol 934 are capable of rate-controlled drug release.The 'in situ gel' drug delivery system has appeared as one of the best novel drug delivery system.The in situ gel drug delivery system helps in the sustained and controlled release of the drugs improve patient compliance and comfort by its special characteristics feature of transition from ' SOL TO GEL'. In situ gelling system is a formulation that is in solution form before entering in to the body ,but it will change to gel form under various physiological condition such as Ph, temperature, ionic concentration, ,UV radiation, presence of specific molecules or ions, external triggers etc…

**In-situ gel:**

In situ gel produce a constant plasma drug profile in the body by extending the release of a drug . So it is attached or absorbed in gel form and is known to prolong the life of the drug in the mucosa. It aids to reduce the dosing frequency and to improve the therapeutic efficiency of drug. Furthermore, systemic side effect would also be reduced due to less systemic adsorption. therefore enhance patient'scompliance and convinience. The conventional dosage form such as preformed gel and solution have limitations that they do not remain for long time at the site of application.

## II. MATERIALS AND METHODS:

Naproxen is obtained as gift sample from Medopharmpharmaceutical Pvt. Ltd. HPMCK15 Polymer is obtained as gift sample from Colorcon Asia Pvt.ltd.Goa. Carbapol is brought from Banglore fine chemicals. Triethanolamine is brought from Isochemicals. Methyl paraben is obtained from Isochemicals.

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**FORMULATION OF NAPROXEN In-SITU GEL:**

| Formulation Mode | Naproxen [g] | HPMC K15M [g] | Carbopol 934 [g] | NaoH [ml] | Methyl paraben [ml] | Distilled water [ml] |
|---|---|---|---|---|---|---|
| **F1** | 0.2 | 0.5 | 1.5 | 5 | 0.5 | 100 |
| **F2** | 0.2 | 1 | 0.5 | 5 | 0.5 | 100 |
| **F3** | 0.2 | 1.5 | 1 | 5 | 0.5 | 100 |

Table 1: Formulation of In-situ gel

**PREPARATION OF IN-SITU GEL:**

Weight the accurate amount of HPMC, CARBOPOL 934 in distilled water continuously while stirring at room temperature. Naproxen dissolved in polymer solution with stirring naproxen eventually distributed within the polymer matrix. Adjust the PH at 7.4 by using the buffer solution NaoH. Monitor the PH with a calibrated PH meter until the desired range achieved. Add methyl paraben as a preservative and observe the mixture of gelation, which should be occur overnight. Record the time required for gelation and the resulting gel texture and appearance.

Fig.1 In-situ gel

**EVALUATION OF NAPROXEN In-SITU GEL:**

**Clarity:**

The in-situ gel solution was prepared and evaluated visually for clarity against white and black background , with the content set in motion with a swirling action also it was observed for formulation of turbidity or any unwanted particle dispersed in the solution.

**pH:**

The pH was determined by using pH paper. Apply a small gel sample on pH paper. The colour change was observed. The colour changes from blue to red. It is considered as acid.The colour change from red to blue. It is considered as Base.

**GELLING CAPACITY:**

The gelling capacity of the prepared formulation was determined by placing a drop of the formulation in a beaker containing 50ml of freshly prepared concentrated calcium chloride solution was visually observed for gelling time.

**VISCOSITY:**

The viscosity of in-situ gel was determined by measure the viscosity of fluid by measuring the time it takes for the fluid to flow through a U-shaped tube viscometer. The solution was allowed to convert to solution to gel by increasing the temperature of the solution with the help of water bath whose temperature was maintained at 37±1℃. In the formulation containingcarbopol pH was increased along with temperature. Then the viscosity of this formed gel was measured

**DRUG CONTENT:**

The prepared in situ gel formulation were analyzed for drug content by transferring 1ml of formulation in 100ml volumetric flask. In this volumetric flask, 50ml of phosphate buffer with pH 6.6 was added by continuous shaking until the gel was totally dispersed to give a clear solution. Final volume was adjusted to 100ml with the help of phosphate buffer pH 6.8 and filter the solution. Drug concentration in filtered solution was determined spectrophotometrically at 257nm using uv visible spectrophotometer.

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## III. RESULT AND DISCUSSION

**Evaluation studies**

**Clarity:** The clarity of in-situ gel was found to be as a table 2

| S.NO | Formulation code | clarity |
|---|---|---|
| 1 | F1 | colourless |
| 2 | F2 | colourless |
| 3 | F3 | colourless |

**Drug content:** The drug content of in-situ gel was found to be as a table 3

| S.NO | Formulation code | PercentageDrug content(%) |
|---|---|---|
| 1 | F1 | 93% |
| 2 | F2 | 82% |
| **3** | **F3** | **98%** |

**Gelling capacity:**The gelling capacityof in-situ gel was found to be as a table 4

| S.NO | Formulation Code | Gelling time |
|---|---|---|
| 1 | F1 | 2 MIN |
| 2 | F2 | 5MIN |
| **3** | **F3** | **30 MIN** |

**VISCOSITY:**The viscosity of in-situ gel was found to be as a table 5

| S.NO | Formulation code | Viscosity |
|---|---|---|
| 1 | F1 | 13.5 cps |
| 2 | F2 | 11.5cps |
| **3** | **F3** | **14.5cps** |

**pH:** The pH of in-situ gel was found to be table 6

| S.NO | FORMULATION CODE | PH |
|---|---|---|
| 1 | F1 | 7.6 |
| 2 | F2 | 7.8 |
| **3** | **F3** | **7.4** |

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**FT-IR SPECTROSCOPIC STUDY:**

IDENTIFICATION OF NAPROXEN BY FT-IR SPECTROSCOPY:

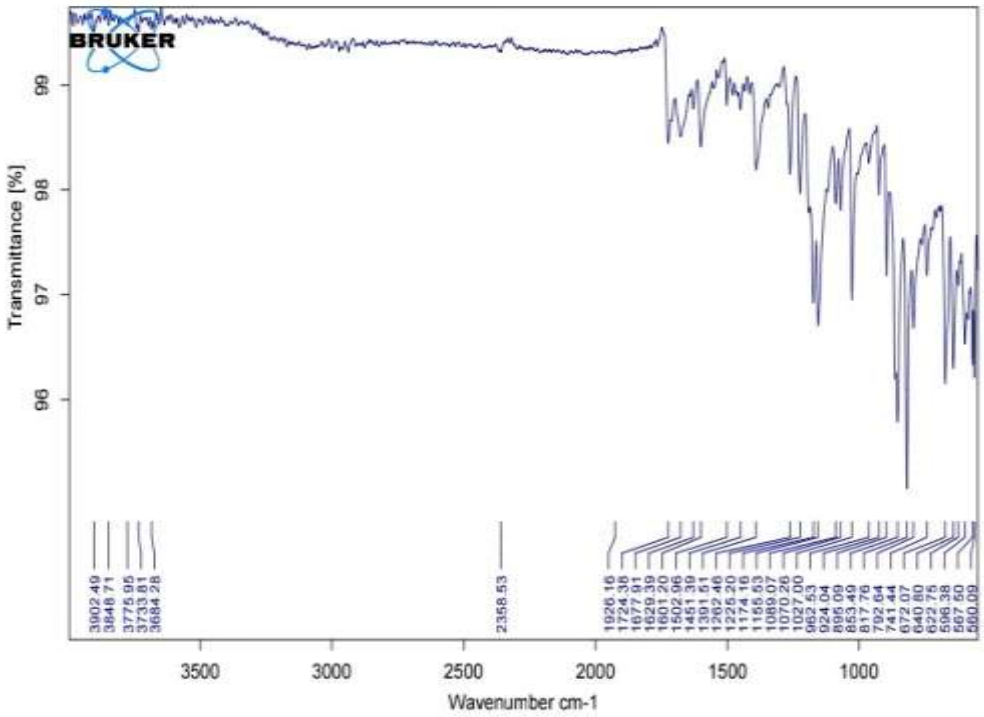


**Figure 2: FT-IR spectrum of pure drug Naproxen**

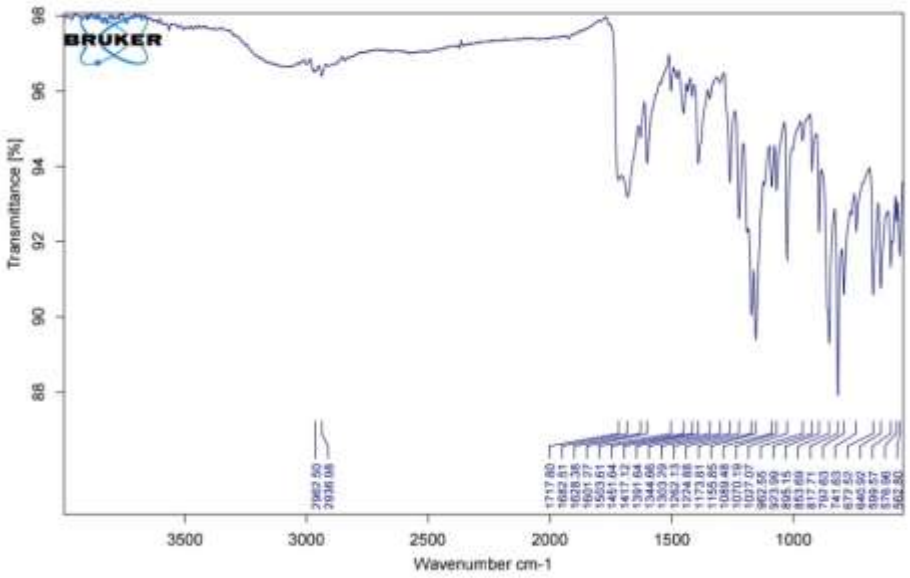


**Figure 3: FT-IR spectrum of pure drug Naproxen and Carbopol 934**

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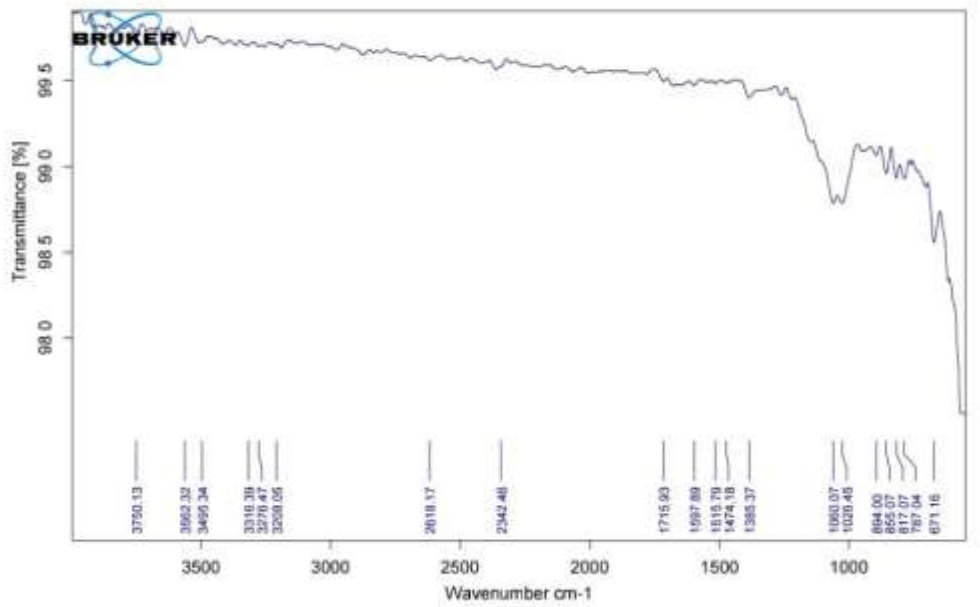


**Figure 4: FT-IR spectrum of Naproxen and HPMC**

**STANDARD PLOT CURVE OF NAPROXEN:**

The standard curve of naproxen in methanol was obtained as follows:

| S.NO | Concentration (µg/ml) | Absorbance |
|---|---|---|
| 1 | 10 | 1.15 |
| 2 | 20 | 1.96 |
| 3 | 30 | 2.81 |
| 4 | 40 | 3.68 |

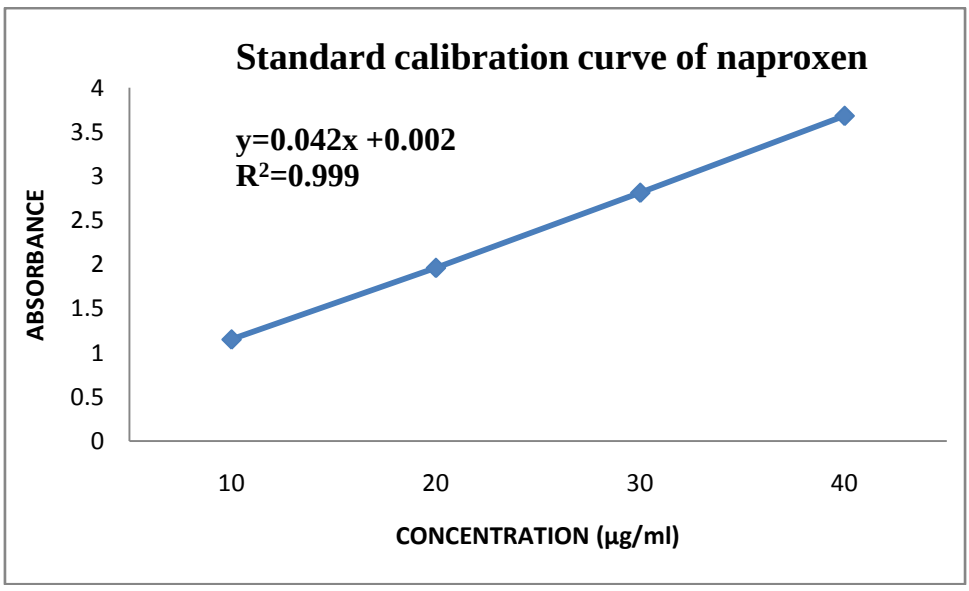


**FIGURE 5: Standard calibration curve**

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## IV. CONCLUSION:

Naproxen is a broad-spectrum anti inflammatory used in the treatment of ocular infections, was successfully formulated as in situ gel-forming eye drops using Carbopol 934 as a gelling agent in combination with HPMC as a viscosity enhancing agent. The formulation **F3** was found to be best among of all batches with consisting release rate for 8 hours for the management of anti inflammatory. Also important is the easy of administration afforded and decreased frequency of administration resulting in better patient compliance. It showed good gelation, rheological properties and exhibited better ability to retain drug. Based on results it was observed that the prepared Naproxen in-situ gel can overcome limitations of the conventional ocular dosage form. Hence, it concluded the naproxen may prove to be potential candidate for safe and effective control drug delivery over an extended period of time.

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