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# Formulation and evaluation of Micro encapsule of anti-gout drug by solvent evaporation technique using natural polymers

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**Abstract**
QbD principles for establishment of a HPLC method for Furazolidone with improved robustness and performance. On the basis of the initial prioritization and factor screening studies, the highly influential factors were identified and subsequently optimized for improving the method robustness. The response surface mapping particularly facilitated improved understanding of the factor–response relationship and interactions associated with them. Extensive validation studies further ensured high degree of method robustness with extreme variation in the key variables influencing the method performance. In addition, the method showed improved sensitivity for the Furazolidone much beyond the values reported in the literature.

**Keywords:** QbD, Validation, furazolidone, robustness, frequency

## Introduction

Microencapsulation may be defined as the process of enclosing a substance inside a miniature capsule. Extremely tiny droplets or particles of liquid or solid material are packed within a second material or coated with a continuous film of polymeric material for the purpose od shielding the active from surrounding environment dual layer coating active ingredient Fig 1

Microcapsule may spherically shaped with a continues wall surrounding the core, while others are asymmetrically and variably shaped with a quantity of smaller droplets of core material embedded thought out the microcapsule.

The word “capsule “implies a core and shell structure .and term microcapsule states the membrane enclose particles or droplets in solid matrix lacking a distinctive external wall phase as well a intermediate types Commercial micro particles have a diameter 3 and 800 micrometer and contain 10-90% w/w/core. A wide range of core materials has been encapsule, including adhesives, agrochemicals, live cell, active enzyme, flavors fragrance, pharmaceutical and ink morphologically two generals structure exist micro encapsule and microsphere.

Microencapsulation of pharmaceutics was first in the year by preparing sphere gelatin using coacervation technique, Processes and materials used for coating have since been developed by the pharmaceutical industries to aid in formulation of varies dosage form such as tablets, capsule, injection, powders and topical the more recent result of pharmaceuticals research is that the absorption rate of a drug can be contracted by controlling.

The controlled released dosage forms are so designed and formulated as having the sustained action, sustained release, prolonged action, delayed action and timed-release medication. 4 This has been done by developing the new drug entities, discovering of new polymeric materials that are suitable for prolonging the drug release, safety, improvement in therapeutic efficacy. 8

Microencapsulation technology allaow a compound to be encapsule inside a tiny as 1 mm to several hundred micro meters 9 many different active materials like drug, enzyme, vitamins, pesticides. flavours and calalysts have been successfully encapsulated inside micro balloons or microcapsule made from a variety of polymeric materials including polyethylene glycols.

## Materials and methodology

### 1. Materials

**Table 1:** List of Materials

| S.no | Equipments | Chemicals |
|---|---|---|
| 1 | UV/VIS Double Beam Spectrophotometer | Allopurinol |
| 2 | pH meter | Ethyl cellulose |
| 3 | Electronic Balance | acetonitrile |
| 4 | Melting Point Apparatus | dichlomethane |
| 5 | Magnetic stirrer | Hydrochloric acid (HCL) |
| 6 | Ultra Sonicator | Octanol |
| 7 | FTIR | Chloroform |
| 8 | Dissolution Apparatus | Ethanol |
| 9 | Shaking Incubator | Methanol |
| 10 | Bulk density Apparatus | Span 80 |
| 11 | Scanning electron microscopy | - |

### 2. Method

**Preformulation studies of drug**

a. organoleptic characterization of drug samle.
b. Melting point determination of drug sample.
c. PH determination of drug sample
d. Partition coefficient determination of drug sample.
e. identification of drug sample by UV-Spectroscopy and FTIR analytical methods.
f. Prepration of calibration curve for selected drug in pre-reported solvent at the respective wavelengths (λ max)
g. Qualitative and quantitative solubility of drug various aqueous and non –aqueous solvent.

**Formulation &evaluation of microcapsules by double emulsion solvent diffusion techniques**

a. Drug content
b. Solubility studies
c. Dissolution studies
d. Fourier transform infrared (FTIR) spectroscopy

## Results and discussion

### 1. Bulk characterization of microencapsulation

**Table 2:** Bulk characterization and flow properties of formulation

| Formulation Code | Bulk ss Density | Tapped Density | Hausner's Ratio | Carr's Index | Angle of repose |
|---|---|---|---|---|---|
| F1 | 0.34 | 0.58 | 1.70 | 41.37 | 26.4° |
| F2 | 0.51 | 0.71 | 1.39 | 28.16 | 30.06° |
| F3 | 0.70 | 0.95 | 1.35 | 26.31 | 25.4° |
| F4 | 0.33 | 0.55 | 1.66 | 40.00 | 26.95° |

### 2. Determination of saturation solubility

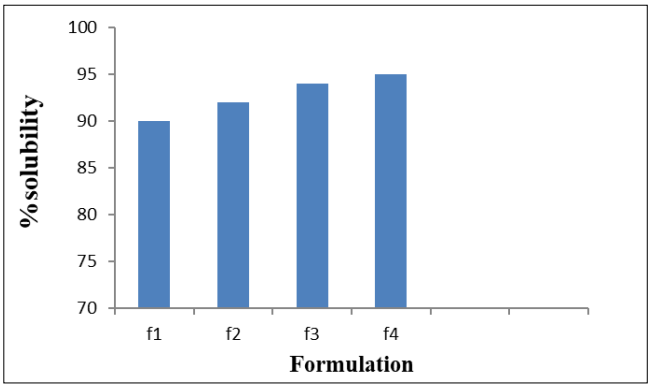



**Fig 1:** Comparison of solubility of pure drug with formulations

### 3. Drug content microencapsule

The drug content estimation was performed to ensure uniform distribution of drug. The drugcontent of solid dispersion of Allopurinol was performed for all the prepared formulations. The result indicates that the drug content in all the formulations was found uniform between 87% to 96% which was analysed spectrophotometrically at λmax 250nm. The drug content ofvarious formulations are shown in table 6.1.

**Table 3:** Drug content of various formulation

| FormulationCode | %DrugContent |
|---|---|
| F1 | 87.09% |
| F2 | 91.20% |
| F3 | 90.30% |
| F4 | 93.60% |

### 4. *In vitro* dissolution of allopurinol from microcapsule

**Table 4:** *In vitro* dissolution of allopurinol from various formulations

| Time | F1 | F2 | F3 | F4 | Tablet |
|---|---|---|---|---|---|
| 5 | 15.18 | 6.75 | 10.12 | 12.93 | 9.56 |
| 10 | 16.87 | 28.12 | 19.68 | 27.00 | 18.00 |
| 15 | 28.12 | 30.37 | 28.12 | 29.81 | 32.62 |
| 30 | 51.75 | 66.37 | 46.12 | 51.75 | 51.75 |
| 45 | 75.37 | 79.31 | 77.62 | 77.62 | 79.31 |
| 60 | 96.18 | 95.06 | 89.43 | 97.31 | 95.66 |

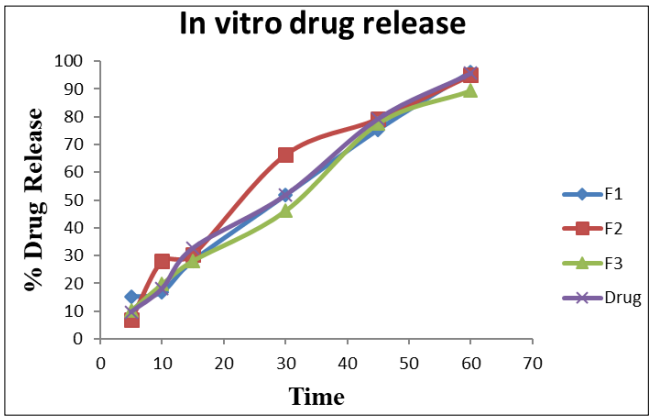



**Fig 2:** Comparison of drug release profile of pure Allopurinol & F1, F2, F3 Batches.

### 5. Particles size determination

**Table 5:** Particles size distribution of different formulation

| S.NO. | Formulation | Particles size (um) | | |
|---|---|---|---|---|
| | | Minimum | maximum | Average ± s.d |
| 1 | F1 | 4.357 | 14.694 | 9.153 ±3.223 |
| 2 | F2 | 5.903 | 14.254 | 9.374±3.451 |
| 3 | F3 | 6.120 | 16.171 | 9.729±4.765 |
| 4 | F4 | 6.788 | 18.894 | 10.58±5.769 |

### 6. Scanning electron microscope (SEM) studies

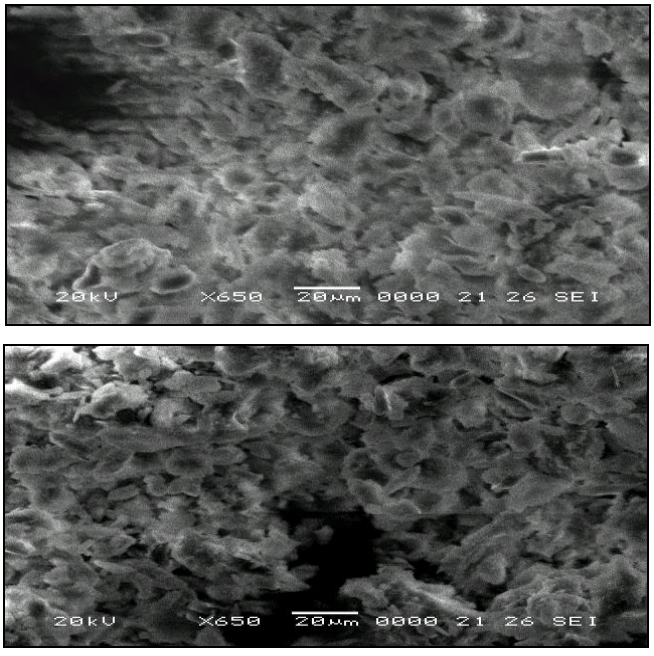
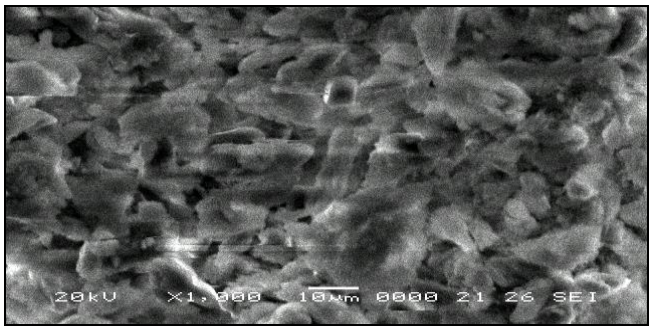



**Fig 3:** Scanning electron microscopy formulation F1



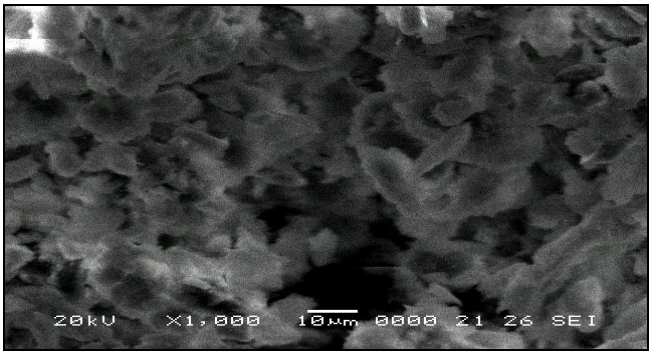



**Fig 4:** Scanning electron microscopy formulation F2

**Scanning electron microscopy**

The SEM o drug performed and shows the irregular, rough shaped crystals of the drug having nonspecific size crystals with rough surface in the SEM photograph of microencapsule

**Conclusion**

The study done reveals that the formulation and evaluation of microencapsulation by allopurinol using double emulsion solvent diffusion technique using ethylcellulose water solubility, dissolution rate of allopurinol can be enhanced and ultimately the bioavailability of allopurinol.

Based on the current study imrovment the dissolution of the water insoluble drug allopurinol was achive throught microencapsulation using different carrie.

The drug allopurinol is in crystalline form which is converted to amorphous form to enhance the solubility microencapsulation. This might be due to solubilising effect of carriers or amorphous state of the drug in microencapsulation or entrapping the drug in molecular state by the carrier.

Ethylcellulose are used as a polymer in the formulation of microencapsulation in different concentration such as 2:0.5, 2:1, 2:0.2, 2:0.3. As the concentration of the carriers increased, it also improved the solubility of the drug. The nature and amount of carrier used plays an important role in the enhancement of the dissolution rate.

The increased solubility and dissolution rate of allopurinol provided the rapid onset of action. The carrier used is easily available, feasible to use and have low cost. Thus, the formulation will be the cost effective.

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