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Review Article

Review on Film Coating Techniques for Ferrous Ascorbate and Folic Acid Tablets

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ABSTRACT

Tablets containing Ferrous Ascorbate and Folic Acid are widely used to prevent and treat iron and folate deficiencies, which are common in India. However, these active ingredients face challenges such as poor stability, metallic taste, and sensitivity to environmental factors. Film coating techniques are employed to overcome these issues by improving stability, masking unpleasant taste, enhancing appearance, and controlling drug release. This review discusses traditional and modern coating methods, including sugar coating, polymer film coating, enteric coating, ready-to-use systems, and natural polymer coatings. It also highlights coating materials, process parameters, and evaluation methods, providing insights for producing high-quality, patient-friendly tablets.

Keywords: Ferrous Ascorbate, Folic Acid, Film Coating, Tablet Stability, Taste Masking

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INTRODUCTION

In the present time, tablets are one of the most common forms of medicine used by people. They are easy to carry, convenient to take, and have a long shelf life. Many tablets are prepared using active ingredients that help in treating various diseases and health conditions. Among such tablets, *Ferrous Ascorbate* and *Folic Acid* tablets are very important because they are used to treat and prevent iron deficiency anemia and folate deficiency¹. These deficiencies are common in India, especially among women, children, and elderly people. Due to poor nutrition, lack of proper diet, and certain health issues, many people suffer from low levels of iron and folic acid. Therefore, these tablets are widely prescribed by doctors and used in health programs across the country².

However, iron salts like *Ferrous Ascorbate* have certain problems such as a metallic taste, poor stability, and interaction with moisture and other ingredients. Similarly,

Folic Acid is sensitive to light and heat, which may lead to its degradation and reduce its effectiveness. To overcome these problems, pharmaceutical scientists use *film coating techniques* while manufacturing tablets. Film coating is a process where a thin layer of material is applied to the tablet surface to protect it from environmental factors, mask unpleasant taste, and improve the appearance of the tablets. It also helps in controlling the release of the active ingredients in the body².

Film coating plays an important role in enhancing the stability, bioavailability, and patient compliance of tablets. Different techniques are used depending on the nature of the active ingredients, equipment available, and cost-effectiveness. In India, where there is a need for affordable and efficient medicines, film coating methods are widely applied in the manufacturing of iron and folic acid tablets³⁻⁶.

This review focuses on the various film coating techniques used in the preparation of *Ferrous Ascorbate* and *Folic Acid*

tablets. It will highlight the advantages, disadvantages, and practical aspects of these techniques that are commonly used in pharmaceutical industries. Understanding these techniques is essential for scientists and manufacturers to produce high-quality, stable, and effective tablets for patients.

Objectives

- A. To study and explain the different film coating techniques used in the formulation of Ferrous Ascorbate and Folic Acid tablets.
- B. To highlight the benefits and challenges of film coating in improving the stability, taste, and effectiveness of these tablets.

Review Approach

For this review, I searched important scientific articles from websites like PubMed, Google Scholar. I used keywords such as “film coating,” “Ferrous Ascorbate tablets,” “Folic Acid coating,” “coating polymers,” and “evaluation of coated tablets” to find the right information. I only included studies from the last 10–15 years like research papers, review articles, patents, and official standards, so that the information is correct and useful. Articles that were not related or not reviewed by experts were not considered. After collecting the information, I organized it based on different coating methods, materials used, process steps, and how the tablets are tested to give a clear idea about the topic.

Results of the Review

Film coating plays an important role in improving the quality and effectiveness of tablets like Ferrous Ascorbate and Folic Acid. Different coating techniques are used depending on the purpose, such as taste masking, protecting the tablet from moisture, or controlling how the medicine is released in the body. Various materials like polymers, plasticizers, and natural substances are used to make the coating better and safe for patients^{5,6}. The coating process depends on factors like temperature, spray rate, and equipment used. After coating, tablets are tested for their strength, stability, taste, and how well the medicine is released in the body^{6,8}.

A. Film Coating Techniques; Following are the techniques comes under this category-

1. **Sugar Coating:** Sugar coating is one of the oldest and traditional methods used in tablet formulation. In this process, a layer of sugar is applied over the tablet in multiple steps, including sealing, sub-coating, smoothing, and polishing. It is mainly used to mask the unpleasant taste and odor of tablets and to make them look more attractive and easier to swallow. However, this technique has some limitations like being time-consuming and making the tablet thicker, which can increase the size and weight of the final product^{7,9}.
2. **Polymer Film Coating:** Polymer film coating is a widely used method where tablets are coated with thin layers of polymers like hydroxypropyl methylcellulose (HPMC), ethyl cellulose, and polyvinyl alcohol (PVA). These coatings provide benefits such as controlled drug release, protection from moisture, and improved stability during storage. This technique is more efficient and practical

compared to sugar coating and is commonly used in modern pharmaceutical manufacturing⁸⁻¹¹.

3. **Enteric Coating:** Enteric coating is specially designed to protect tablets from the acidic environment of the stomach. It helps in preventing the premature release of the drug and ensures that the tablet dissolves only in the intestine where it can be absorbed properly. Common materials used in enteric coating include cellulose acetate phthalate and methacrylic acid copolymers. This technique is useful for tablets that can be damaged by stomach acid or need targeted release in the intestine^{10,11}.
4. **Opadry and Ready-to-Use Coating Systems:** Opadry and other ready-to-use coating systems are modern solutions that simplify the coating process. These systems come as pre-formulated coating materials, which help in achieving uniform and consistent coating on tablets. They are also scalable, making it easier for manufacturers to produce large batches without compromising on quality. This approach has gained popularity due to its efficiency and ease of handling^{8,9,12}.
5. **Film Coating with Natural Polymers:** There is a growing interest in using natural polymers like plant-based gums, chitosan, and other bio-friendly materials for film coating⁹. These natural substances are being explored as eco-friendly alternatives to synthetic polymers, offering similar protection and stability. This approach supports sustainable pharmaceutical development and caters to the increasing demand for green and safer products in the healthcare industry¹²⁻¹⁴.

B. Coating Materials and Process Parameters

Tablet coating requires careful selection of materials and control of process conditions to ensure high-quality products. Polymers form the main coating layer, while plasticizers like triethyl citrate and polyethylene glycol make the film flexible and prevent cracking. Anti-tacking agents stop tablets from sticking together, and surfactants help the coating spread evenly^{15,16}. Colorants and flavors are added to improve the appearance and taste, making tablets more acceptable to patients. The coating process depends on equipment such as a coating pan or fluidized bed coater, along with factors like temperature, spray rate, atomization pressure, tablet bed movement, and drying conditions. Proper management of these parameters ensures uniform, stable, and defect-free coatings that protect the active ingredients and enhance tablet performance^{6,8-10}.

C. Evaluation of Coated Tablets: Evaluations are classified and explained below-

1. **Thickness Uniformity and Weight Gain:** After coating, tablets are checked for uniform thickness and weight gain to ensure that the coating is applied evenly. Uneven coating can affect the release of the drug, stability, and appearance. Measuring weight gain also helps confirm that the desired amount of coating material has been deposited on each tablet^{10,17}.
2. **Disintegration and Dissolution Profiles:** Disintegration testing determines how quickly the tablet breaks down in the body, while dissolution testing measures the rate at which the active ingredient is released into solution.

These tests ensure that the coated tablets deliver the drug effectively at the right site and within the expected time^{12,13,18}.

3. **Moisture Uptake and Stability:** Coated tablets are evaluated for their ability to resist moisture absorption, which can cause swelling, softening, or degradation. Stability studies under accelerated conditions, such as high temperature and humidity, are also conducted to predict shelf life and ensure the tablet remains effective during storage^{10,12,19}.
4. **Taste Masking Efficiency:** Taste masking is especially important for drugs with unpleasant or metallic flavors like Ferrous Ascorbate. The efficiency of coating in masking the taste is tested to ensure patient compliance

and make the tablet more acceptable, particularly for children and sensitive patients^{10-12,20}.

5. **Mechanical Strength and Friability:** Tablets must be strong enough to withstand handling, packaging, and transportation without breaking. Mechanical strength and friability tests are performed to check the hardness, resistance to chipping, and overall durability of the coated tablets^{11,13}.
6. **Assay of Active Ingredients:** The content of the active ingredients is measured both before and after coating to confirm that the coating process does not reduce potency. This ensures that each tablet delivers the correct dose to the patient, maintaining therapeutic efficacy^{13,20}. Following table is given for the concise collection of information

Table 1: Comparison of Film Coating Techniques for Ferrous Ascorbate and Folic Acid Tablets

Sr. No	Coating Technique	Materials	Advantages	Limitations	Application
1	Sugar Coating	Sugar, Gum, Colorants	Masks taste, improves appearance	Time-consuming, increases tablet size	Traditional tablets
2	Polymer Film Coating	HPMC, PVA, Ethyl Cellulose	Controlled release, moisture protection, stability	Requires optimized process parameters	Modern tablets
3	Enteric Coating	Cellulose acetate phthalate, Methacrylic copolymers	Protects from stomach acid, targeted release	Costly, requires careful formulation	Acid-labile drugs
4	Ready-to-Use Systems (Opadry)	Pre-formulated polymer blends	Uniform coating, scalable, time-saving	Higher cost	Industrial production
5	Natural Polymer Coating	Chitosan, Plant gums	Eco-friendly, patient-safe	Limited data on long-term stability	Green/sustainable formulations

DISCUSSION

This review highlights various coating methods and materials used for Ferrous Ascorbate and Folic Acid tablets, showing how modern polymer-based techniques improve stability, taste masking, and controlled drug release compared to traditional sugar coating. While traditional methods are time-consuming and less uniform, modern approaches like Opadry and natural polymer coatings offer efficiency, scalability, and better patient compliance^{6,9,11}. Challenges such as cost, moisture sensitivity, and uniform application remain. Future research should focus on polymer blends, biodegradable coatings, and innovative technologies to enhance stability, reduce gastrointestinal side effects, and meet global regulatory standards, benefiting both industry and healthcare outcomes^{13,20}.

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