

**FORMULATION AND EVALUATION OF DUSTING POWDER BY USING
KETOCONAZOLE**

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ABSTRACT

The aim of this present study is two formulations and evaluation of the antibacterial and antifungal activity of which is widely used for the management of antifungal infections. The present study uses dusting powder. As formulated, the dusting powder is prepared by mixing all ingredients in a mortar and pestle uniformly. These are dusting powders and various types of creams. Gel powder ketoconazole is a lipophilic drug of an anti-yeast action used both locally and systematically. Dusting powder shows easy ability, non-irritability, free flowability & non-greasiness, and good absorption. Powder reduces inflammation and treats conditions like dermatitis.

KEYWORDS: Dusting powder, Antimycotic activity, Benzoic acid, Antimicrobial activity.

INTRODUCTION

A powder is a dry material composed of extremely fine particles that is typically formed by crushing, grinding, or drying a solid material. It is used to treat or avoid skin conditions like rashes, itching, or infections.

Definition - Dusting powder is a topical medicinal formulation applied to the skin or wounds, mostly to alleviate irritation or absorb moisture.

These are an antifungal agent widely used as a first-line treatment for oral candidiasis.

Dusting powders are used externally for local application and are not intended for systematic action. A characteristic of dusting powder is free flow of homogeneity. Good spreadability and covering capability :the formulation usually contains the salicylic acid and benzoic acid. ketoconazole menthol starch are often included to enhance the effectiveness and provide relief from symptoms. These ingredients work together to ensure proper adherence to the affected area and promote healing.

Dusting powders are used to prevent and treat minor skin infections caused by scrapes, burns, and small cuts. Some skin infections can also be treated by using dusting powder, such as jock itch & ringworm or athlete's foot fungal rashes. It relieves the burning, itching, and cracking of the skin & discomfort caused by these infections. They are prepared by using a single-dose or multidose preparation. Such containers provide protection from air moisture & contamination as well as the convenience of application. It should be labeled for external use only. The categories of the drug are antiseptics, absorbents, protectives, and astringents.

There are two main types of dusting powder:

1] medical dusting powder 2] Surgical dusting powder

1. Medical Dusting Powder -

- ✓ Used for therapeutic purposes on the skin or wounds.
- ✓ Contains antiseptic, antifungal, or antibacterial ingredients.
- ✓ Helps in preventing or treating infections.
- ✓ Example: Clotrimazole dusting powder, neomycin powder.

2. Surgical Dusting Powder -

- ✓ Used during surgical procedure to reduce friction and prevent infection.
- ✓ Must be sterile and free from harmful substances.
- ✓ Commonly applied to gloves, surgical instruments, or wounds.
- ✓ Example: Sterile talc, starch-based surgical dusting powder.

POWDER PROPERTIES:

Organoleptic properties

Organoleptic properties refer to the characteristics of a formulation that can be evaluated using human senses such as sight, smell, and touch. These properties are crucial for determining the acceptability and quality of dusting powders.

(a) State-The formulation was taken in a required container and examined with naked eyes.

The physical state of the formulation is assessed by placing the powder in a suitable container and observing it with the naked eye. Dusting powders should be fine, free-flowing, and homogeneous, without lumps or agglomerates. A uniform texture ensures proper application and even distribution on the skin.

(b) Color-The formulation was taken in a container and the color of the preparation was observed with the naked eyes. The color of the powder is visually examined. Ideally, dusting powders should have a uniform and appealing color, often white or slightly tinted depending on added ingredients. Any discoloration may indicate contamination, degradation, or improper formulation.

(C) Odour- The formulation was taken in a suitable container and the fragrance was observed with the nose. The fragrance is evaluated by smelling the formulation. A good dusting powder should have a pleasant or mild odor, especially if intended for cosmetic use. In medicated powders, the odor should not be offensive, as it can affect user compliance.

(d) Solubility-The solubility test is performed by using various solvents such as water, chloroform, isopropyl alcohol, methanol, and acetone. Solubility testing involves assessing the powder's behavior in various solvents such as water, chloroform, isopropyl alcohol, methanol, and acetone.

This helps determine the nature of ingredients and their compatibility. Most dusting powders are insoluble in water, which allows them to remain on the skin surface and perform protective or absorbent functions.

(e) Particle size- The particle size of the powder can be analyzed by the dry sieve analysis. Particle

plays a vital role in the performance of dusting powders. It is typically analyzed using dry sieve analysis. The powder should be finely divided to ensure smooth application, better adhesion to the skin, and avoidance of irritation. However, particles should not be too fine, as this may increase the risk of inhalation. Dusting powders for medical and skin care applications offer

several advantages and some drawbacks.^[4]

ADVANTAGES

1. Good chemical stability compared with fluids.
2. Easy to carry than the liquid dosage forms.
3. Suitable for small children and elderly patients.
4. Easy to apply over wounds.
5. Economical.
6. Rapid onset of action.
7. Higher local concentration at the affected area with fewer systemic effects.
8. Simple to apply over wounds and suitable for children and the elderly.
9. Generally cheaper than creams or ointments.
10. Fast relief of itching and irritation due to rapid absorption.
11. Usually more chemically stable, aiding storage and transport.

DISADVANTAGES

inconvenient.

1. Achieving uniform coverage over the entire area can be challenging.
2. Hygroscopic or aromatic components may degrade if not stored properly.
3. Possibility of applying too much, leading to adverse effects.
4. Prone to caking or settling if mishandled or poorly stored.
5. When multiple formulations are needed, the treatment plan can become
6. Difficult to protect powders containing hygroscopic or aromatic materials from decomposition.
7. Risk of overuse.

APPLICATION

- They help absorb excess moisture and sweat, keeping the skin dry and preventing bacterial growth.
- Dusting powders reduce friction between skin folds, thereby preventing chafing and skin irritation.
- They are commonly used in prickly heat (miliaria) to provide a cooling and soothing effect.
- Dusting powders are helpful in fungal infections such as athlete's foot, ringworm, and intertrigo.

- They are used for diaper rash (nappy rash) in infants to protect delicate skin.
- Dusting powders form a protective layer on the skin against irritation and infection.
- They are applied to underarms, feet, groin, and neck folds to control sweating.
- Some medicated dusting powders show antibacterial and antifungal activity.
- They help relieve minor skin irritation, redness, and itching.
- Dusting powders are used after bathing to keep the skin dry and fresh.
- Dusting powders are used for external application on the skin to maintain hygiene and provide comfort.
- They are suitable for daily skin care and personal hygiene.

REVIEW OF LITERATURE

Table No.1

Sr.No.	Year	Author	Title	Work Done
1.	2012	H.A.El-Rabey & W.H.Ibrahim	“Ketoconazole: A review of its therapeutic uses in dermatology.” <i>J. Pharm. Med. Ther.</i> 16(2): 73–79	Reviews therapeutic uses of ketoconazole in dermatology
2.	2020	S.P.Karande, Y.U. Rahangdale, H.S.Kanhere, S.K.Rathod, S.Y.Dhabale	“Formulation of antimicrobial polyherbal dusting powder and its evaluation.” <i>IJR</i> 9:1–6	Reports formulation and evaluation of antimicrobial polyherbal dusting powder
3.	2014	P.Sharma & N. Chand	“Salicylic acid: A review on therapeutic potential in skin conditions.” <i>IJR</i> 5(8): 2960–2965	Reviews therapeutic potential of salicylic acid in dermatology
4.	2018	D.S.Y.Lee, A.M.M.Yiu, et al.	“The role of benzoic acid and its derivatives in the preparation of skin care products.” <i>IJR</i>	Discusses role of benzoic acid derivatives in skin care formulations
5.	2020	S.P.Karande, Y.U. Rahangdale, H.S.Kanhere, S.K.Rathod, S.Y.Dhabale	“Formulation of antimicrobial polyherbal dusting powder and its evaluation.” <i>IJR</i> 9:1–6	Reports formulation and evaluation of antimicrobial polyherbal dusting powder

OBJECTIVES

- Absorb moisture – To keep skin dry by reducing sweat and dampness. Dusting powders are formulated to absorb excess moisture from the skin surface. This helps keep the skin dry and

prevents sweat accumulation. By reducing dampness, the powder minimizes discomfort and lowers the risk of skin infections. It is especially useful in hot and humid climates.

- **Reduce friction**– To Prevents chafing and irritation in skin folds. Dusting powders reduce friction between skin surfaces and clothing. This helps prevent chafing, redness, and irritation in sensitive areas such as skin folds. The smooth texture allows skin surface to glide easily. As a result, it enhances comfort during daily activities.
- **Provides soothing effect**– To Relieve itching, burning, or minor irritation. Dusting powders often contain soothing ingredients that calm irritated skin. They help relieve itching, burning sensation, and minor skin discomfort. The cooling effect provides immediate comfort after application. This makes them suitable for sensitive and irritated skin.
- **Prevent microbial growth**– To Act against bacteria and fungi to avoid infections. Some dusting powders contain antimicrobial or antifungal agents. These ingredients help prevent the growth of bacteria and fungi on the skin. By controlling microbial growth, the powder reduces the risk of infections. This is particularly important in moist areas prone to infection.
- **Maintain hygiene**– To Promotes cleanliness and freshness on the skin surface. Dusting powders help maintain skin cleanliness and freshness. They absorb sweat and reduce unpleasant odor. Regular use promotes personal hygiene and improves skin health. This makes them ideal for daily use.
- **Ensure free flowability**– To Fine particles spread easily and evenly over the skin. Dusting powders are designed with fine and uniform particles. This ensures smooth and even distribution over the skin. Good flowability allows easy application without clumping. It also improves the effectiveness of the formulation should be damage comfort
- **Non-irritating formulation**– To Designed to be gentle, avoiding abrasiveness or allergic reactions. Dusting powders are prepared using gentle and skin-friendly ingredients. They are designed to avoid abrasiveness and allergic reactions. The formulation is safe for regular use on sensitive skin. This ensures comfort and prevents skin
- **Improve comfort**– To Enhance skin feel, especially in hot and humid climates. Dusting powders enhance overall skin comfort by keeping the skin cool and dry. They reduce stickiness and sweating during hot weather. This improves daily and confidence. They are especially beneficial in humid environments.

Adverse effect of dusting powder:

The fine particles in dusting powders can be inhaled, causing respiratory irritation.

Overuse of dusting powders can lead to excessive dryness, which may cause cracking or peeling of skin.

If dusting powder comes into contact with the eyes, it can cause redness, tearing and pain.

Common adverse effects are itching, burning, redness, swelling, etc. Methods of Preparation of dusting powders

MATERIAL AND METHODOLOGY**5.1 MATERIALS AND METHODS**

- Grinding
- Weighing
- Mixing
- Wrapping
- ❖ Formula

Table 1: Formulation of Ketoconazole dusting powder.

Sr.No	Ingredients	Quantity(g)	Category
1.	Ketoconazole	1.00g	Antifungal agent (active drug)
2.	Talc	58.20g	Diluent
3.	Salicylic acid	3.00g	Keratolytic agent
4.	Benzoic acid	6.00g	Antifungal agent
5.	Menthol	0.08g	Cooling agent
6.	Starch	31.00g	Absorbent

- Drug Profile

1. Ketoconazole: It is an antifungal agent commonly used in dusting powders due to its effectiveness in treating various fungal skin infections. Ketoconazole is primarily used to treat fungal infections such as athlete's foot, ringworm, jock itch, and other dermatophyte infections. It works by inhibiting the growth of fungi, disrupting their cell membrane, and preventing the spread of infection. Dusting powders containing Ketoconazole are effective for preventing and treating fungal infections, especially in areas of the body prone to sweating, such as the feet, groin, and underarms. These areas are more susceptible to fungal growth due to moisture accumulation.

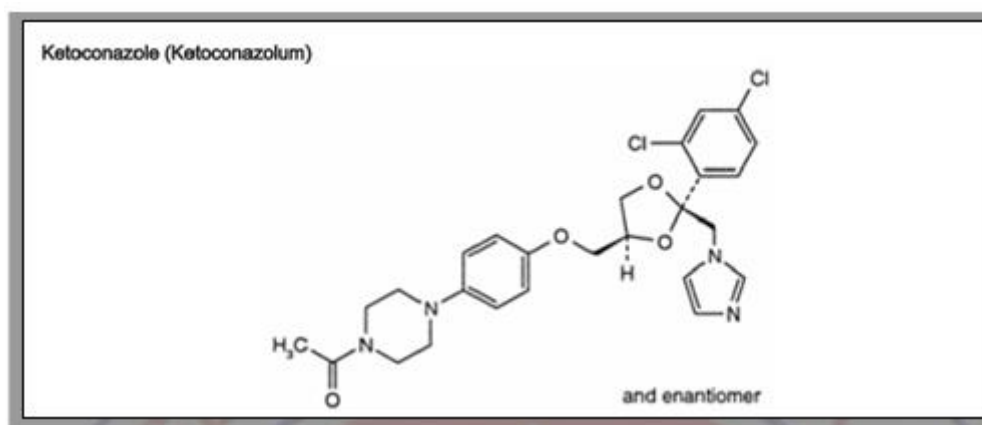


Fig: Ketoconazole.

C₂₆H₂₈C₂N₄O₄

Relativemolecularmass.531.4

Chemical name.±-cis-1-Acetyl-4-[p-[2-(2,4-dichlorophenyl)-2-(imidazol-1-ylmethyl)-1,3-dioxolan-4-

yl)methoxyphenyl]piperazine;cis-1-acetyl-4-(4-[[2-(2,4-dichlorophenyl)-2-(1H-imidazol-1-ylmethyl)-

1,3-dioxolan-4-yl)methoxy]phenyl]piperazine,cis-1-acetyl-4-[p-[2-(2,4-dichlorophenyl)-2-

(1H- 42-1.n mimidazol-1-yimethyl)-1,3-dioxolan-4-yl]methoxy]phenyl]-piperazine:CASReg.No.65277-

Description.Awhiteoralmostwhitepowder.

Solubility. Practically insoluble in water, freely soluble in dichloromethane R; soluble in methanol R:

sparinglysolubleinethanol(~750g/l)TS.

Category.Antifungaldrug.

Storage.Ketoconazoleshouldbekeptinawell-closedcontainer,protectedfromlight.

• ExcipientProfile

2) Talc: Talcisahydratedmagnesiumsilicateusedas adiluent,lubricant,andadsorbentin

Dusting powderformulations.Ithelpsinabsorbingmoisture,reducingfriction,andprovidinga smoothand

soothingfeeltoskin.

3) SalicylicAcid:Salicylicacidisabeta-hydroxyacidthatactasakeratolyticand antiseptic agent. It

helps in removing dead skin cells, reducing inflammation, and managing skin conditions

such as acne
and dermatitis.

4. Benzoic acid: Benzoic acid has antimicrobial properties that help prevent bacterial growth, making it useful in preventing infections, especially in skin conditions where dusting powders are applied to absorb moisture and reduce friction. Benzoic acid acts as a preservative, extending the shelf

life of dusting powders by inhibiting microbial growth and degradation of the powder's components.

5. Menthol: Menthol produces a cooling sensation on the skin by triggering the cold receptors in the skin, which can help soothe skin irritation, minor rashes, or itching. This cooling effect can provide immediate relief in conditions like diaper rash, heat rashes, or after shaving.

6. Starch: It is used as an adsorbent in the formulation. It is an insoluble residue which remains after a granular starch is partially solubilized by an enzyme. This is used as the base for dusting powder either alone or in combination with other ingredients like talc.

5.2 Method

• PROCEDURE

❖ Weighing: Accurately weigh the required amount of clotrimazole and excipients (such as above mentioned in Table 1).

❖ Mixing: Thoroughly mix the clotrimazole with the excipients. This step should be done to ensure that the clotrimazole is evenly distributed throughout the powder, ensuring consistent dosing when the powder is applied.

❖ Sieving: Pass this powder through the sieve 120# to remove any large particles and to ensure the powder is uniformly fine and free-flowing. Sieving process as shown below in figure-1.

❖ Final Mixing: After sieving, mix the powder once more to ensure a homogeneous product. The final mixture should have a smooth texture, free of lumps, and should flow easily when applied.

”ú Formulation Aspects

Formulation of dusting powder generally involves mixing the active ingredient with

suitable excipients

to obtain a uniform, free-flowing powder. The commonly used excipients include talc, zinc oxide,

kaolin, and starch. These components help to improve the absorbency, adherence, and flow properties of

the final product. Various methods such as simple blending, geometric dilution, and sifting are employed

to ensure uniform distribution of drug particles.

- Future directions suggested:
- Investigate the mechanisms driving the observed synergistic effects.
- Conduct long-term safety evaluation to reinforce clinical value.

And

EVALUATION OF DUSTING POWDER

Evaluation of formulation was carried out as follows:

1. Physical characteristics: The color, odor, and appearance of the powder are evaluated by simple visualization.
2. pH: pH is a measure of the acidic or basic nature of the formulation. The pH of dusting powder is determined to avoid irritation to the skin.
3. Particle size: The particle size of prepared powder was determined by using microscope sieve analysis.
4. Moisture Content: Moisture content is evaluated to ensure stability and effectiveness of the dusting powder. Excess moisture can lead to microbial growth and clumping of powder. It may also affect shelf life and product performance. Therefore, maintaining low moisture content is essential for quality, stability, and shelf life.
5. Microbial Testing: Microbial testing is performed to ensure the product is free from harmful microorganisms. Contamination may cause skin infections or reduce product safety.

This test ensures hygienic preparation and safe use. It is an important quality control

parameter ensuring product safety.

6. Bulk density (BD) and tapped density (TD): The powder was passed through a no. 18 sieve into a pre-weighed 25 ml graduated cylinder with 0.5 ml markings. The bulk volume was measured

after manually tapping the cylinder two times on a flat table top surface. The tapped volume was measured with the tap density tester after tapping in increments of 500, 750, and 1250 taps with 250 drops per minute Bulk density = Bulk mass / Bulk volume

Tapped density = Mass of granules / volume of granules

7. Angle of repose: The flow properties of powders can be studied by measuring angle of repose.

It was determined by the funnel method. The funnel was fixed in place, 4 cm above the bench surface. After the cone from 5 g of sample was built, height of the granules forming the cone (h) and the radius (r) of the base were measured as shown below in figure-2. The angle of repose was calculated as follows:

Angle of repose = $\tan^{-1}(h/r)$

Where,

h = height of the powder cone r = radius of the powder cone

Figure-2 Angle of Repose

8. Carr's index: The bulk and tapped densities were used to calculate Carr's compressibility index to provide measure of the flow properties and compressibility

of powders Carr's index = $\frac{\text{Tap density} - \text{bulk density}}{\text{tap density}} \times 100$ and tapped indicates

9. Hausner ratio: It is indicative of flow properties. It is derived property from bulk density. Lower the Hausner ratio is indicating better flow whereas higher ratio poor flow of granules. Hausner ratio is calculated by the following formula

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RESULTS AND DISCUSSION

Carr's index	17%
Hausner ratio	1.20
Moisture contents	3.09% w/w

1. Physical characteristics- The physical characteristics of the powder were evaluated. The color of powder was white with characteristics odour and smooth appearance.

PARAMETERS	OBSERVATION
Colour	Whites
Odour	Characteristics
Appearance	Smooth

2. pH of the formulation- The pH of dusting powder was determined by digital pH meter. 1 gm of powder was dissolved in 100 ml of distilled water and the pH was measured. The pH was found to be acidic.

3. Particle size- The particle size of the powder was found in the range was found to be 0.125 mm.

pH	Mean
4.7	5
5.1	
5.2	

Particle size	Mean
0.124	0.125
0.125	
0.126	

4. Bulk density- The bulk density of the powder was found to be 0.31 g/cm³.

Bulk density	Mean
0.30	0.31
0.31	
0.32	

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Tap density	Mean
0.33	0.35
0.35	
0.37	

Angle of repose	Mean
20.8°	21°
21.0°	
21.2°	

Carr's index	Mean
15	17%
17	
19	

Hausner Ratio	Mean
1.18	1.20
1.20	
1.22	

9. Moisture content- The Moisture content was found to be 3.09% w/w.

Moisture content	Mean
3.07	3.09% w/w
3.09	
3.11	

CONCLUSION

Dusting powders continue to play an important role in topical drug delivery due to their ease of use and patient acceptability. Future research should focus on incorporating safe herbalactives, improving flow properties using novel excipients, and developing eco-friendly formulations. Standardization and quality control should also be emphasized to ensure product efficacy and safety.

SUMMARY

The present study focuses on the formulation and evaluation of Ketoconazole

Dusting powder used for the treatment of fungal skin infections. Dusting powders are topical pharmaceutical preparations applied externally to absorb moisture, reduce irritation, and prevent microbial growth

on the skin. Ketoconazole is a widely used antifungal drug effective against infections such as

athlete's foot, ringworm, and jock itch.

The formulation was prepared using Ketoconazole as the active ingredient along with excipients like

talc, salicylic acid, benzoic acid, menthol, and starch. Each ingredient plays an important role in improving the effectiveness of the formulation by providing antifungal activity, absorbency, cooling effect, and smooth application. The preparation process involved weighing, mixing, sieving, and final blending to obtain a uniform and free-flowing powder.

The formulated dusting powder was evaluated for different parameters such as physical appearance, color, odor, pH, particle size, bulk density, tapped density, angle of repose, Carr's index, Hausner ratio, and moisture content. The results showed that the powder had good flow properties, smooth texture, acceptable pH, low moisture content, and satisfactory antifungal characteristics.

The study concludes that Ketoconazole dusting powder is an effective topical formulation for fungal infections. It provides easy application, better patient compliance, moisture absorption, and relief from itching and irritation. The formulations showed good stability and suitable pharmaceutical properties, making it beneficial for skin care and antifungal treatment.

Ketoconazole powder

BIBLIOGRAPHY

1. Kokare CK. Handbook of Pharmaceutical Microbiology: Experiments and Techniques. 3rd ed. Pune: Nirali Prakashan; p. 17-24.
2. Jain NK, Gupta GD. Modern Dispensing Pharmacy. 4th ed. New Delhi: CBS Publishers; p. 180-196.
3. Mehta RM. Pharmaceutics. 6th ed. Vallabh Prakashan; 2015. p. 3-4.
4. Jain NK, Sharma SN. Textbook of Professional Pharmacy. Vallabh Prakashan; p. 286-287.
5. Hajare AA, Bhagwat DA. Textbook of Pharmaceutics as per PCI Regulations. p. 6.1-6.14.
6. Astamed. External Powder. Available from. <https://www.astamed.com/externalpowder.htm>
7. El-Rabey HA, Ibrahim WH. Clotrimazole: A review of its therapeutic uses in dermatology. Journal of Dermatology and Dermatologic Surgery. 2012;16(2):73-79.
8. Karande SP, Rahangdale YU, Kanhere HS, Rathod SK, Dhabale SY. Formulation of antimicrobial polyherbal dusting powder and its evaluation. International Journal for Pharmaceutical Research Scholars. 2020;9:1-6.
9. Sharma P, Chand N. Salicylic acid: A review on therapeutic potential in skin conditions. International Journal of Pharmaceutical Sciences and Research. 2014;5(8):2960-2965.
10. Lee DS, Yiu AMM, et al. The role of benzoic acid and its derivatives in the preparation of skin care products. International Journal of Pharmaceutical Sciences and Research. 2018.
11. Marten S. Cosmetic ingredients and menthol. International Journal of Cosmetic Science. 2009;31(5):399-410.
12. Buchanan CM, O'Toole JA. Clotrimazole as an antifungal

- agentindermatology.ClinicalDermatologyReview.2013;18(4):204-
13. IndianPharmacopoeia.2018;2:1.
 14. CooperandGunn.TutorialPharmacy.CBSPublishers.
 15. Lachman, L., Lieberman, H.A. and Kanig, J.L., The Theory and Practice ofIndustrialPharmacy,3rdEdition,VarghesePublishingHouse, Mumbai.
 16. Aulton,M.E.,Aulton'sPharmaceutics:TheDesignandManufacture of Medicines, 5th Edition, Elsevier Publications.
 17. Remington,TheScienceandPracticeofPharmacy,22ndEdition, Pharmaceutical Press.
 18. Allen, L.V., Popovich, N.G. and Ansel, H.C., Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems, 10th Edition, Wolters Kluwer.
 19. Banker, G.S. and Rhodes, C.T., Modern Pharmaceutics, 4th Edition, Marcel Dekker Inc.
 20. BritishPharmacopoeiaCommission,BritishPharmacopoeia,2020, London.
 21. Tripathi, K.D., Essentials of Medical Pharmacology, 8th Edition, Jaypee Brothers Medical Publishers.
 22. Sinko, P.J., Martin's Physical Pharmacy and Pharmaceutical Sciences, 6th Edition, Lippincott Williams & Wilkins.
 23. UnitedStatesPharmacopeia(USP43–NF38),UnitedStates Pharmacopeial Convention, 2020.
 24. Rowe, R.C., Sheskey, P.J., and Quinn, M.E., Handbook of PharmaceuticalExcipients,7thEdition,PharmaceuticalPress.